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(SEWA)**

**SKILL ENHANCEMENT**

**EMPLOYABILITY**

**WISDOM**

**ACCESSIBILITY**

**JAGAT GURU NANAK DEV**

**PUNJAB STATE OPEN UNIVERSITY, PATIALA**

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

**MASTER OF ARTS**

**CORE COURSE (CC): ECONOMICS**

**SEMESTER- II**

**MAEC24201T -MACRO ECONOMICS**

Head Quarter: C/28, The Lower Mall, Patiala-147001

Website: [www.psou.ac.in](http://www.psou.ac.in)

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## **PREFACE**

Jagat Guru Nanak Dev Punjab State Open University, Patiala was established in December 2019 by Act 19 of the Legislature of State of Punjab. It is the first and only Open University of the State, entrusted with the responsibility of making higher education accessible to all, especially to those sections of society who do not have the means, time or opportunity to pursue regular education.

In keeping with the nature of an Open University, this University provides a flexible education system to suit every need. The time given to complete a programme is double the duration of a regular mode programme. Well-designed study material has been prepared in consultation with experts in their respective fields.

The University offers programmes which have been designed to provide relevant, skill-based and employability-enhancing education. The study material provided in this booklet is self-instructional, with self-assessment exercises, and recommendations for further readings. The syllabus has been divided in sections, and provided as units for simplification.

The University has a network of 100 Learner Support Centres/Study Centres, to enable students to make use of reading facilities, and for curriculum-based counselling and practicals. We, at the University, welcome you to be a part of this institution of knowledge.

Prof. G.S  
Batra Dean Academic  
Affair



**JAGAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY,  
PATIALA**  
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**M.A (ECONOMICS)**  
**SEMESTER - II**  
**MAEC24201T MACRO ECONOMICS I**

**MAX. MARKS: 100**

**PASS: 40%**

**INTERNAL: 30**

**EXTERNAL: 70**

**TOTAL CREDITS: 6**

**OBJECTIVE**

After introducing the students with the issues related with an individual consumer, firm and market in the first semester, this course in the second semester throws light on the national economy as a whole. This course includes the basic theories of determination of income, consumption, investment, employment, money and interest, inflation, Monetary and Fiscal policies, and business cycles.

**INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER:**

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any ten questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
4. The duration of each paper will be three hours.

**INSTRUCTIONS FOR THE CANDIDATES:** Candidates are required to attempt any two questions each from sections A and B of the question paper and any ten short questions from Section C. They have to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.

## SECTION – A

**Unit 1: Introduction to Macro Economics:** Meaning, Need and Scope of Macroeconomics; National Income Accounting: definitions and concepts of National Income and the methods of measurement.

**Unit 2: Determination of Income, Output and Employment:** Classical and Keynesian Approaches

**Unit 3: Consumption Function:** Keynes' Psychological Law of Consumption, Determinants of Propensity to Consume. Absolute and Relative Income Hypothesis.

**Unit 4: Investment Function:** Types, Investment demand schedule and factors affecting investment decisions. Marginal efficiency of capital. concept, operation and limitations of static and dynamic multipliers. Acceleration theory and its working.

## SECTION – B

**Unit 5: Business Cycles:** Meaning and Phases. **Inflation:** concept, causes and effects

**Unit 6: Money:** Definition, Types, Functions and Role; Theories of Money: Fisher's Transaction Balance Approach and Cambridge Cash Balance Equation, Keynesian Liquidity Preference Theory.

**Unit 7: Banking:** Functions of Commercial Banks and Process of Credit Creation.

**Unit 8: Monetary Policy:** Meaning, Objectives and Tools of Monetary Policy. Fiscal Policy: Objectives and tools of Fiscal Policy.

## SUGGESTED READINGS:

1. Blanchard, O. (2018). Macroeconomics, 7th ed. Pearson Education.
2. Dornbusch, R., Fischer, S., Startz, R. (2018). Macroeconomics, 12th ed. McGraw-Hill.
3. Jones, C. (2016). Macroeconomics, 4th ed. W. W. Norton.
4. Mankiw, N. (2016). Macroeconomics, 9th ed. Worth Publishers.
5. Ulbrich, H. (2003), Public Finance in Theory and Practice. Thomson.
- Aronson, J.R. (1985). Public Finance. New York: McGraw-Hill International.
6. Houghton, R. W. (1973). Public finance. London: Penguin Education.



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**M.A (ECONOMICS)**

**SEMESTER-II**

**MAEC24201T MACRO ECONOMICS I**

**COURSE COORDINATOR AND EDITOR: DR. KULDEEP WALIA**

**SECTION A**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
Unit 1A	Introduction to Macro Economics: Meaning, Need and scope of Macroeconomics
Unit 1B	National income accounting: definitions and concepts of National Income and the methods of measurement.
Unit 2	Determination of Income, Output and Employment: Classical and Keynesian approaches
Unit 3	Consumption Function: Keynes Psychological Law of Consumption, Determinants of Propensity to Consume. Absolute and Relative Income Hypothesis
Unit 4	Investment Function: Types, Investment demand schedule and factors affecting investment decisions. Marginal efficiency of capital. Concept, operation and limitations of static and dynamic multiplier. Acceleration theory and its working

**SECTION-B**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
Unit 5	Business Cycles and Inflation: Meaning, Phases and Types
unit 6	Money: Definition, Types, Functions and Role Theories of Money: Fisher's Transaction Balance Approach and Cambridge Cash Balance Equation, Keynesian Liquidity Preference Theory
Unit 7	Functions of Commercial Banks and Process of Credit Creation
Unit 8	Monetary Policy: Meaning, Objectives and tools of Monetary Policy. Fiscal Policy: Objectives and tools of Fiscal Policy

## **M.A (ECONOMICS)**

### **SEMESTER –II**

#### **COURSE:MACRO ECONOMICS I**

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#### **UNIT 1(A): INTRODUCTION TO MACRO ECONOMICS: MEANING, NEED AND SCOPE**

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##### **STRUCTURE**

##### **1.0 Learning Objectives**

##### **1.1 Introduction**

##### **1.2 Meaning of Macro Economics**

##### **1.3 Need Of Macro Economics**

##### **1.4 Features of Macro Economics**

##### **1.5 Scope Of Macro Economics**

##### **1.6 Importance or Uses of Macro Economics**

##### **1.7 Limitations Of Macro Economics**

##### **1.8 Assumptions of Macro Economics**

##### **1.9 Relation Between Micro Economics And Macro Economics**

##### **1.9.1 Inter-Relationship between Micro Economics and Macro Economics**

##### **1.9.2 Differences Between Micro Economics And Macro Economics**

##### **1.10 Summary**

##### **1.11 Questions For Practice**

##### **1.12 Suggested Readings**

##### **1.0 Learning Objectives**

After completion of this unit, learner will be able to:

- Know the concepts in macroeconomics
- Develop Analytical skills
- Understand the economic activities and aggregates studied under Micro economics.
- Discuss the scope of Macro economics
- Clarify the differences between Micro and Micro economics.



## **1.1 Introduction**

The term macro was first introduced in economics by the economist Ragnar Frisch in 1933. It is used to describe the study of aggregates and averages covering the economy as a whole such as total income, total employment, national income, aggregate demand, general Price level, total savings, wage level etc. It is that part of economic theory which studies the economy in its totality or as a whole. It studies not individual economic units like a household, a firm or an industry but the whole economic system. Macroeconomics is the study of aggregates and averages of the entire economy. Such aggregates are national income, total employment, aggregate savings and investment, aggregate demand, aggregate supply general price level, etc. In short, macroeconomics is the study of national aggregates or economy-wide aggregates. Main tools of its analysis are aggregate demand and aggregate supply. Macroeconomics is the basis of all plans of economic development of underdeveloped economies. Economists are now confidently exploring the possibilities and tools for maintaining economic growth and full employment. More than anything else, macroeconomic thought has enabled us to properly organize, collect and analyze the data about national income and coordinate international economic policies.

## **1.2 Meaning of Macro Economics**

The word 'Macro' is derived from the Greek word 'Makros' which means large. Macro Economics refers to economy as a whole i.e economy of large dimensions. It is that branch of economics which studies the economic activities of the economy as a whole. The focus of macroeconomics is on macro-economic variables like national income, general employment, general price level, aggregate demand, aggregate supply etc. To understand it more we will discuss some definition of Macro Economics given by various economists.

According to Boulding, "Macro economic theory is that part of economics which studies the overall averages and aggregates of the system."

According to Shapiro, "Macroeconomics deals with the functioning of the economy as a whole."

According to Prof. Ackley —Macroeconomics deals with economic affairs—in the large, it concerns the overall dimensions of economic life.

John Maynard Keynes is the founding father of macroeconomics. Keynesian economics is a

macro economic theory of total spending in the economy and its effects on output, employment, and inflation. Keynes's theory was the first to sharply separate the study of economic behavior and markets based on individual incentives from the study of broad national economic aggregate variables and constructs. K.E. Boulding, –Macroeconomics deals not with individual quantities as such, but with aggregates of these quantities, not with individual income but with national income, not with individual price but with price level, not with individual output but with national output

Keynes pioneered a new approach to macro economics. Prior to Keynes the problem of business cycles was inevitable with no specific approach to solve these problems. The classical economists focused on only micro aspects of the economy. The Great depression of 1930 left many of these economists helpless. In this backdrop Keynes came up with a new approach to look at the economy. In his book, ‘The General theory of Employment, Interest and Money’ he talked about the possibility of high unemployment and underutilization of capacities in the market economy. He also argued that Govt. can play bigger role during economic depression by effective utilization of fiscal and monetary policies.

### **1.3 Need of Macro Economics**

Macroeconomics has a greater role to play in our day-to-day life. The study of macroeconomics is of great importance due to the following main issues.

- 1. To Understand the Economy as a Whole:** We need to study macroeconomics to analyze and study the economy as a whole. Whatever is true at micro level i.e., individual level may not be true at macro level. This is called macroeconomic paradox. According to Boulding it will be misleading to apply the rules of micro economics to macroeconomics expecting the same results. We can explain it with the help of an example. To solve the problem of unemployment at the time of great depression, A.C.Pigou, a neoclassical economist suggested all round wage cut to promote employment. From micro point of view if a firm or industry goes for wage cut, it can employ more labour. But it is not valid for the whole economy. Because cutting down wages brings down their income and it further brings down the overall demand in the economy which in turn will lead to fall in production and employment.

2. **It Studies Issues Related to Well-Being of the Society:** Macro economics deals with problems like unemployment, inflation, unequal distribution of income, imbalance in balance of payment etc. Macro economics explains the causes of these problems and measures to solve them. It also suggests the policies to overcome these problems.
3. **Determination of National Income:** Calculation of aggregates of National Income like GNP at market price, factor income, interest on national debt etc. is measured under it.
4. **Determination and Acceleration of Economic Growth:** High economic growth is the goal of every developing economy. Economic growth helps raising the standard of living, curb poverty, reduce unequal distribution of income and generate employment. It suggests measures to achieve self-sustained growth.
5. **To Explain General Price Level and Inflation:** Fluctuations in price level and inflation remains the problem with many developing economies. Fall in value of money and persistent rise in general price level is called inflation. Macro economics helps developing measures to solve the problem of inflation with the help of monetary and fiscal policies. Macroeconomic models like Harrod-Domar and Solow explain the important factors determining economic growth.
6. **To Understand Business Cycles:** Significant developments have been made in macroeconomics to understand the causes of business cycles. Keynesian theory of effective demand along with the interaction of multiplier and accelerator gives adequate explanation of business cycles. On the basis of understanding of business cycles, macroeconomics helps us adopt proper monetary and fiscal policies to check business cycles.
7. **Formulating Macro Economic Policies:** Accurate and efficient macroeconomic policies play an important role in development of an economy. Policies related to employment generation, control of trade cycles, combating poverty, inflation etc. play a special role in developing economies.

#### 1.4 Features of Macro Economics

Macroeconomics has following features:

1. **Short-run in Nature:** Macroeconomics is a short run study. Short run refers to that time period in which some factors are fixed and some are variable. Short run nature of

macroeconomics can be expressed as given below.

- a) National output is assumed to be constant
  - b) Only labour is the variable factor in the short run
  - c) Consumption in the short run remains same more or less as habits of the people remain same in short run. Therefore, more stress is given in macroeconomics on investment as a factor to increase employment.
2. **Macroeconomics is Mainly Institutional:** Macroeconomics is more real. We can understand its real nature by examining the real factors like saving, investment, rate of interest and institutional factors influencing propensity to consume.
  3. **Importance of State Intervention:** Macro economics lays great stress on the role of state intervention in balancing the economy. State plays an important role in dealing with business cycles through monetary policy, raises propensity to consumption by equitable distribution of income.
  4. **Pivotal Role of Investment:** Investment has a pivotal role to play in macro economics. Effective demand depends on consumption and investment. Consumption remains same in the short period. It is change in investment which can bring increase in effective demand. Problem of unemployment and underproduction is mainly due to lack of investment.
  5. **A Monetary Economics:** classical economists put stress on the medium of exchange function of money but macro economics acknowledged the role of store of value function of money. According to macroeconomics determination of income and employment is affected by demand and supply of money.
  6. **Comparative Static Analysis:** Macro economics has an element of both static and dynamic analysis.
  7. **A Theory of Shifting Equilibrium:** Macro economics lays great stress on underemployment and over employment equilibrium. Both the situations are more realistic than full employment equilibrium. They explain the shifting equilibrium.
  8. **Role of Expectations:** expectations basically mean expectations from profit. If the entrepreneur is optimistic, he expects more profit, he will invest more. Investment according to macro economics depends upon of Marginal efficiency of capital (MEC) and

MEC further is governed by expected profitability.

9. **Role of National Income and Consumption:** Macro economics recognizes the role of national income and consumption in solving economic problems of a country. Keynes explained how the analysis of national income helps solving the problem of unemployment. Also, through his psychological law of consumption he explained that consumption does not rise in same proportion as the increase in income. This leads to fall in effective demand and rise in unemployment.

### **1.5 Scope of Macro Economics**

The scope of macro economics is multidimensional. It includes the problems, activities, issues and parameters related to macroeconomics. Following are the broad areas underlying the scope of macroeconomics.

1. **To Study the Working of the Economy:** it is impossible to understand the working of an economy without the study of macroeconomic variables. These macroeconomic variables are statistically measurable therefore making it easy to analyze. With the help of macro economics we can measure national income, output, employment, general price level etc. on the basis of which we understand the economic system.
2. **To Study the Theory of Employment:** High level of unemployment and underemployment is a common feature of developing economies. Macroeconomics studies problems related to unemployment. It studies factors determining employment like aggregate demand, aggregate supply, effective demand, aggregate consumption and saving etc.
3. **In Formulating Economic Policies:** Developing economies face innumerable national problems. Macro economics is extremely helpful in combating these problems by finding viable solutions. The main responsibility of the governments is to regulate and control the problems like overpopulation, unemployment, balance of payment and inflation etc.
4. **To Study the Theory of National Income:** Macro economics studies different concepts and components of National income and methods of measurement of national income and social accounting. National income data help in forecasting and policy making.
5. **To Study the Theory of Economic Growth and Development:** Boosting economic

growth remains an important goal of developing economies. Study of problems relating to economic growth, equal distribution of income and wealth, raising per capita income etc. comes under the scope of macro economics. On the basis of it, government frames and implements plan for the overall increase in national income, employment and output to increase development.

6. **In Study the Business Cycles:** business cycles refer to fluctuations in output and employment with altering periods of inflation and recession. Macroeconomics developed as an approach to solve the problem of Great depression of 1930's. it studies the causes of economic fluctuations and its remedies. Various theories of business cycles and monetary and fiscal policies to control business cycles are used under macroeconomics.
7. **To Study General Price level and Inflation:** Problem of inflation and rising prices is one of the major problems faced by both developed and developing countries. It studies and analyze the problem of inflation. It was Keynes who put forward demand pull theory of inflation. After Keynes many theories of inflation were developed depending on various causes leading to price rise.
8. **Balance of Payments and Exchange Rate:** Balance of payment is a systematic record of economic transactions of the residents of a country with rest of the world during one accounting year. There may be deficit or surplus in balance of payments. Both are problematic. Transactions in balance of payments are created by exchange rate. Exchange rate is the rate at which a country's currency is exchanged for foreign currencies. Instability in exchange rate and balance of payment problem has been major problem of developing countries these.

### **Check Your Progress- I**

Q1. What do you mean by Macro Economics?

Ans. ....

Q2. Explain any two features of Macro Economics.

Ans. ....

## 1.6 Importance or Uses of Macro Economics

1. **It Helps to Understand the Functioning of a Complicated Modern Economic System:**  
It describes how the economy as a whole function and how the level of national income and employment is determined on the basis of aggregate demand and aggregate supply.
2. **Issues of Vital Importance:** Macroeconomics deals with the issues of vital importance, such as unemployment, inflation, instability of foreign exchange rates etc. which directly affect the well-being of the people.
3. **Helps in Measuring and Achieving Economic Growth:** It helps to achieve the goal of economic growth, higher level of GDP and higher level of employment. It analyses the determinants of economic growth of a country. Also explains measures to attain high economic growth and sustain it.
4. **Macro Economics:** It helps to bring stability in price level and analyses fluctuations in business activities. It suggests policy measures to control Inflation and deflation.
5. **Explains Balance of Payment:** it determines the factors affecting balance of payment, identifies causes of deficit in balance of payment and suggests remedial measures.
6. **For International Comparisons:** Macroeconomics helps in making international comparisons. It helps in making international comparisons of national income, per capita income, consumption and savings etc.
7. **To Understand Macroeconomic Paradoxes:** Macroeconomics explains the concepts that hold good for individuals but are not valid when applied to the society.
8. **Solve Economic Problems:** It helps to solve economic problems like poverty, unemployment, business cycles, etc., whose solution is possible at macro level only, i.e., at the level of whole economy.
9. **To Formulate Economic Policies:** With detailed knowledge of functioning of an economy at macro level, it has been possible to formulate correct economic policies and also coordinate international economic policies.
10. **Wider Scope than Micro Economics:** Macroeconomic theory has saved us from the dangers of application of microeconomic theory to the problems of the economy at large.

- 11. Measurement of Material Welfare:** macroeconomics helps in measuring aggregates like aggregate income, consumption, saving and investment. Hence helps in assessing material welfare.
- 12. Decision Making:** Macroeconomics helps in policy making as it studies the economy as a whole. Hence on the basis of those individuals and businessmen are able to take right decisions timely.
- 13. Economic Planning:** On the basis of macroeconomic aggregates, countries formulate comprehensive economic plans to achieve economic goals.

### **1.7 Limitations of Macro Economics**

Main limitations are given as follows.

- 1. Contribution of Individual Units Ignored:** macroeconomics throws light on the function of aggregates only. It ignores the role of economic activities and the decisions taken by individual units.
- 2. Excessive Generalization:** Generalization of individual observation may lead to inaccurate results about the system as a whole.
- 3. Heterogeneous Units:** We study heterogeneous units under macroeconomics. Heterogeneous units are the units which are different from each other. It is not possible to measure these units in uniform pattern. e.g. consumers are assumed to differ from each other. Under macroeconomics heterogeneous units are measured in terms of money which may not be the true measure of their value in use.
- 4. Depends on Individual Units:** Whatever the fact correct for individual may not necessarily be correct for the whole economy. As a person starts saving in the form of money, but if everybody starts saving in terms of money then the aggregate demand will fall, which cause reduction in national income.
- 5. Limited Application:** Macroeconomics has limited applications as it deals with aggregates only, that is not practical in real life.

### **1.8 Assumptions Of Macro Economics**

Keynes propounded some assumptions of macroeconomics. These are given below.



1. **Short Period:** In short period it is not possible to change all the factors like technique of production, taste of the consumer, habits and fashion. Therefore, macro economics assumed all these factors to be constant. According to Lord Keynes the problem of unemployment in developed countries was a short-term problem because in long run period we are all dead.
2. **Perfect Competition:** In perfect competition situation of the market, no interference of other firms to determine the price of the product is to be assumed. Here, it assumes perfect competition into the market.
3. **No Government Interference:** It ignores the intervention of the government on aggregate demand. As per macro economics, aggregate demand is a function of consumption and investment only.
4. **Closed Economy:** A closed economy is that economy where there is no trade with any of the other country. There is no influence of trade on employment and level of income.
5. **Role of Money as a Store of Value:** It assumes that money is not used for medium of exchange only rather money used for store of value also. Therefore it is not necessary that the person spend all of their monetary income as he gets.
6. **Underemployment Equilibrium:** Macro economics assumes that the position of equilibrium can be achieved in full employment as well in the underemployment situation. Equilibrium is a situation where aggregate supply is equal to aggregate demand.
7. **No Time lags:** It assumes that there are no time lags in the variables. For example, the expenditure of person A on the day Friday depends upon the income he earns on Friday only. Therefore, present consumption depends on the present income only.
8. **Full Utilization of Resources:** It assumes that there is full utilization of resources that are available in the economy
9. **Diminishing Marginal Productivity:** It means that as more and more labour engaged for the process of production, the marginal productivity gained from the additional laborer goes diminishing. Macro economics assumes diminishing marginal productivity for additional laborer.

**10. Saving and Investment Function:** in Economics, saving is a function of income of the consumer. More the income of the person leads to more saving of the person.

**11. Labour is the Only Variable Factor of Production:** In short run period, it assumed that all other factors of productions like land and capital etc. are constant in nature and only the quantity of labour engaged on the process of production can be variable (i.e. increased or decreased the quantity of labour engaged as per requirement).

**12. Interest is a Monetary Phenomenon:** It assumes that interest is a monetary phenomenon only. Interest function is based on the demand and supply of money, here demand for money indicates to liquidity preference, which used for the purpose of transaction, precautionary and speculative motives.

### **1.9 Relation Between Microeconomics and Macroeconomics**

Micro economics and macro economics are closely related to each other. Their relation is clear from the following analysis.

#### **1.9.1 Inter-Relation Between Micro Economics and Macro Economics**

**1. Study of Microeconomics is the Basis for The Study of Macroeconomics:**

Macroeconomics is the study of aggregates and these aggregate results obtained from collection of individuals. To understand the functioning of whole economy it is essential to understand the behavior of individual units. e.g collection of firms makes an industry and several industries form an economy.

**2. Study of Macroeconomics is the Necessary for Microeconomic Analysis:** To study a problem at micro/ individual level macroeconomic analysis becomes indispensable. The general trend seen on macro level influences the micro level results to some extent. e.g. the sale of product of a firm not only depends on its price but also on the total supply of money in the economy.

#### **1.9.2 Differences Between Microeconomics and Macro Economics**

**1) Different Assumptions:** Micro economics is based on the assumption of full employment, fixed output and fixed expenditure. Whereas macro economics is based on the assumption of optimum allocation of resources in the country.

- 2) **Different Objectives:** Both these branches of economics have different objectives. Micro economics studies the principles, problems and policies related to optimum allocation of resources. Whereas macro economics studies the principles, problems and policies related to full employment and growth.
- 3) **Different Methods of Study:** We study partial equilibrium analysis under micro economics. We assume other things being equal under the principles of micro economics. Under the principles of macro economics we study quasi general equilibrium analysis. Here economic factors are divided into important aggregates like aggregate demand, aggregate supply, aggregate income and aggregate consumption etc.
- 4) **Different Importance to Price and Income:** The central determinant of the problem of micro economics is price and that of macro economics is income. Demand, supply, consumption etc. are taken on the basis of price. Under micro economics, consumers, producers etc. take decisions on the basis of price whereas under macro economics decisions regarding all aggregates like aggregate consumption, aggregate investment and aggregate saving etc. are taken on the basis of income.
- 5) **Difference Relating to Change:** Sometimes there are changes on individual basis i.e at micro level but these changes are not there at macro level and vice versa. e.g. if there is increase in demand in a particular sector, there may not be any change in the demand as a whole due to fall in demand in some other sector.
- 6) **Paradoxes:** In many activities advantages at individual level may prove detrimental to the society or economy as a whole. Prof. Boulding has called such paradoxes as macroeconomic paradoxes. e.g., more savings of an individual may benefit the person who saves but if the whole society starts saving more, aggregate demand will be short of aggregate supply leading to fall in national income.
- 7) **Differences in Degree of Aggregation:** Micro economics studies small units like a firm, group of firms etc. It studies aggregates like general output, total employment and national income etc.

### **Check Your Progress- II**

Q1. Give any two assumptions of Macro Economics.

Ans. ....

Q2. Explain three limitations of Macro Economics.

Ans. ....

### **1.10 Summary**

Macro Economics is the use of economic resources at the aggregate level i.e. national level. Macro economics studies the problems and issues related to the economy as a whole. For example, aggregate consumption, aggregate supply, aggregate savings, total employment, general price level and national income etc. macro economics not study the individual economic units as studies by micro economics, rather it studies the issues related to the collective society. Moreover, macro economics enabled the economist to organize, collect and analyze the data related to income and international economic policies. In other words, macro it deals with national income not the individual income, individual price level, individual utility etc. it also considers the sub aggregates of large aggregates related to the economy as a whole. However, macro economics is the study of aggregates, and these aggregate results obtained from the collection of data or behaviour of individuals. So, in order to understand the functioning of whole economy it is essential to understand the behaviour of an individual unit.

### **1.11 Questions For Practice**

#### **A. Short Answer Type Questions**

Q1. Define macroeconomics.

Q2. What are Macroeconomic paradoxes?

Q3. What are the main assumptions of macroeconomics? Q4. Give

five salient features of macroeconomics

Q5. Give some differences of microeconomics and macroeconomics.

Q6. Explain some major limitations or criticisms of macro economics.

#### **B. Long Answer Type Questions**

Q1. What do you mean by Macro economics? Explain its scope.

Q2. Bring out the relationship that exists between micro and macro economics. Also

distinguish between micro and macro economics.

Q3. Discuss the importance of macro economics. Also give its limitations.

Q4. Define Macro Economics. Also discuss its salient features.

#### **1.12 Suggested Readings**

- Branson, W.H. (1979). *Macroeconomic Theory and Policy*. Harper and Row Publishers New York.
- Dwivedi, D.N. (2010). *Macroeconomic Theory and Policy*. Tata McGraw Hill Education Private Limited.
- Mankiw, N.G. (2003) *Macroeconomics*. Worth publications.
- Krugman, P. & Wells, R.(2015). *Macroeconomics*. Worth Publishers.
- Sheehan, B. (2009). *Understanding Keynes' General Theory*, Palgrave Macmillan.

## **M.A( ECONOMICS)**

### **SEMESTER –II**

#### **COURSE: MACRO ECONOMICI**

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#### **UNIT 1(B): NATIONAL INCOME ACCOUNTING: CONCEPTS AND METHODS OF MEASUREMENT**

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#### **STRUCTURE**

##### **1.0 Learning Objectives**

##### **1.1 Introduction**

##### **1.2 Meaning and Definition of National Income**

##### **1.3 Basic Aggregates of National Income**

**1.3.1 Gross Domestic Product at Market Price (GDPMP) and Factor cost (GDPFC)**

**1.3.2 Net Domestic Product at Market Price (NDPMP) and at Factor Cost (NDPFC)**

**1.3.3 Gross National Product at Market Price (GNPMP) and Factor Cost (GNPFC)**

**1.3.4 Net National Product at Market Price (NNPMP) and Factor Cost (NNPFC)**

**1.3.5 Net Value Added at Market Price (NVAMP) and Factor Cost (NVAFC)**

**1.3.6 Private Income and Personal Income**

**1.3.7 Personal and National Disposable Income**

**1.3.8 Nominal GDP and Real GDP**

**1.3.9 GDP deflator**

**1.4 Basic Differences between the domestic Income and National Income at Factor Cost**

**1.5 Basic Differences between the domestic Product and National Income at Market Price**

**1.6 Basic Differences between National Income and Private Income**

**1.7 Methods to Measure National Income**

**1.7.1 Product Method**

### **1.7.2 Income Method**

### **1.7.3 Expenditure Method**

### **1.8 Difference between Final Goods and Intermediate Goods**

### **1.9 Difficulties Faced by Underdeveloped Countries in Measuring National Income**

### **1.10 Summary**

### **1.11 Questions for Practice**

### **1.12 Suggested Readings**

## **1.0 Learning Objectives**

After completion of this, learner will be able to:

- Know the concepts of National Income
- Understand the related aggregates of National Income
- Know about methods of measuring National income
- Define the difficulties faced by underdeveloped countries in measuring National Income
- Understand the difference between various aggregates of National income.

## **1.1 Introduction**

In an economy, the people are engaged in productive activities, whereby they earn income and spend their income on goods and services to satisfy their unlimited wants. The growth and progress of an economy can be estimated from how much they are able to produce and spend, i.e. the total output, income and expenditure during the specified period of time. These 'aggregates' of the economy are considered as different perspectives to its national income. National income is the income of a nation and the assessment of money value of all the goods and services provided by a nation during the specified period of time. Generally, it is taken by aggregate of income earned by all the individuals of a nation. National income helps the nation to determine the growth of that nation with respect to its basic requirement. National income can be defined as the total net value of all goods as well as services produced within a nation over the period of time.

In brief, national income is an important concept of macroeconomics. There are various aggregates or variants of national income. Each aggregate is composed of a

specific meaning and measurement.

## **1.2 Meaning and Definition of National Income**

The term national income can be interchangeably used with national output, national dividend and national expenditure. All the three terms are synonymous to the term national income as they provide the true picture of the condition of particular economy in terms of growth and development. Many economists have defined national income in different terms. It has two types of definitions as explained below:

### **1. Traditional Definition**

This is provided by the classical economists like Marshall, Pigou and Fisher. All three had used different concepts to define national income and led to different conclusions. These concepts are explained as below:

#### **A. Marshallian Definition**

-The labour and capital of a country acting on its natural resources produce annually a certain net aggregate of commodities, material and immaterial including services of all kinds. This is the true net annual income or revenue of the country or national dividend. Thus, the Marshallian definition defines the importance of the factors of production like labour and capital which uses natural resources of the country to produce goods and services which contribute to the value of the national income of that country. But this definition has some flaws such as it is not possible to correctly estimate the total goods and services produced in an economy in the present world as there are so many varieties available. Also, there is possibility of double counting in the economy.

#### **B. Pigouvian Definition:**

-National income is that part of objective income of the community, including income derived from abroad which can be measured in terms of money. Thus, Pigouvian definition is better than the Marshall's definition as it corrected the problem of double counting by including only the money value of the goods and services in the accounting. But this definition is not fully correct as it also has some defects inhabited in it. Some of them are that this includes only the money value of the goods and



services which can be done in developed countries only. In under developed countries barter system still prevails in some sectors and also proper accounts are not maintained.

### **C. Fisher's Definition:**

This definition included consumption as the criterion to calculate the national income of a particular economy. This definition is better than the other definitions on the part that it provides the estimation of the standard of living of the economy on the basis of the consumption pattern. But this definition is not without defects as it includes the value of the goods or services used in the particular year on the basis of their estimated shelf life. But, what will happen if the estimation may increase or decrease. This will lead to wrong conclusions and the national income accounting may go wrong. Thus, this definition is not completely perfect in defining national income.

## **2. Modern Definition**

This definition includes the current time definition of the national income which is being practically used in all the economies to estimate. Some of the definitions are given below:

### **A. Simon Kuznet's Definition:**

-National income is defined as the net output of commodities and services flowing during the year from the country's productive system in the hands of ultimate consumers.

This definition is the most acceptable definition as it includes the estimation of the value of goods and services which directly or indirectly reach the end users i.e. consumers in the monetary terms.

### **B. United Nations Definition:**

-National income has been defined as national product, as addition to the shares of different factors and as net national expenditure in a country in a year's time.

This definition is also mostly acceptable as it involves the concept of national income as national product and national expenditure which are always equal while calculating and mostly used interchangeably.

### **Check Your Progress-I**

Q1. Define Pigouvian definition of national income.

Ans. ....  
-----

Q2. Write Simon Kuznet's definition of national income.

Ans. ....  
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### **1.3 Basic Aggregates of National Income**

Generally known, an economy produces various goods and services during a period of one year. These goods and services cannot be added together in terms of quantity. Thus, these are represented in terms of money. Basic aggregates of National Income are given below.

#### **1.3.1 Gross Domestic Product at Market Price (GDPMP) and Factor cost (GDPFC)**

##### **Gross Domestic Product at Market Price (GDPMP):**

It implies the gross market value of all final goods and services produced within a nation during one accounting year. It is the income earned by the nationals of the country within the domestic country and excludes the income earned from the foreign country. Dernburg defines GDP at market price as –the market value of the output of final goods and services produced in the domestic territory of a country during an accounting year.¶

$$\text{GDPMP} = \text{Value of output in domestic territory} - \text{value of intermediate consumption}$$

In the definition of GDP, some terms which are explained as:

- Gross in GDPMP refers to include the depreciation.
- Domestic in GDPMP implies that all goods and services produced within a nation.
- Product in GDPMP underlines that only final goods and services are included.
- Market Price in GDPMP underlines the amount of indirect taxes paid and excludes the amount of subsidy received.
- Final goods and services in the definition involve all the finished goods which are being produced in the country.

##### **Gross Domestic Product at Factor Cost (GDPFC):**

It includes the gross money value of all the final goods and services produced within the boundary during a one period. It involves the income earned by all the factors of production like labour, capital, land and entrepreneur in a given year within the domestic territory of the country.

$GDPFC = GDPMP - \text{Net Indirect Taxes Or}$

$GDPFC = GDPMP - \text{Indirect Taxes} +$   
subsidies

This involves the factor income being earned by the factors of production in the economy which the producing sector provides to the household sector. The basic difference among GDP at market price and factor cost is that GDPFC includes all the elements of GDP at market price except net direct taxes.

### **1.3.2 Net Domestic Product at Market Price (NDPMP) and at Factor Cost (NDPFC)**

#### **Net Domestic Product at Market Price (NDPMP):**

According to Dernburg, –Net Domestic product at market price is the market value of net output of final goods and services produced in the domestic territory of a country by its normal residents and no-residents during an accounting year. The term net refers to the value of goods and services deducted after the wear and tear and some of the expenses made by the business house.

$NDPMP = GDPMP - \text{Depreciation}$

#### **Net Domestic Product at Factor Cost (NDPFC):**

It refers to net money value of all the goods and services produced within the country generally during one year. This also involves the factor prices provided by the business sector to the household sector but exclude the fixed capital consumption allowance (depreciation).

$NDPFC = GDPMP - \text{Net Indirect Taxes}$

$\text{Depreciation or } NDPFC = GDPFC - \text{Depreciation}$

or

$NDPFC = NDPMP - \text{Net Indirect Taxes}$

NDPFC is also known as Domestic Income or Domestic Factor Income. It should be noted here that the entire component either domestic or net, mainly attributed output and services produced within the nation not outside the nation. Now we will consider the national level concepts.

### **1.3.3 Gross National Product at Market Price (GNPMP) and Factor Cost (GNPFC)**

#### **Gross National Product at Market Price (GNPMP):**

According to Dernburg, –The GNP at market price is defined as the market value of all the final goods and services produced in an economy during an accounting year including net factor income from abroad. Therefore, it includes all the income earned by the nationals of the country both within the domestic boundary and outside it. The income earned from the foreign sector is known as the net factor income from abroad.

$$\text{GNPMP} = \text{GDPMP} + \text{Net Factor Income from abroad (NFIA)}$$

#### **Gross National Product at Factor Cost (GNPFC):**

According to Peterson, –Gross national product at factor cost is the sum of factor cost of the gross product attribute to the factors of production supplied by the normal residents of the country during a year and net factor income from abroad.

$$\text{GNPFC} = \text{GNPMP} - \text{Net Indirect Taxes}$$

### **1.3.4 Net National Product at Market Price (NNPMP) and Factor Cost**

#### **(NNPFC) Net National Product at Market Price (NNPMP):**

It considers the net money value of all the final goods and services produced by the normal residents of a nation during one year. It is also known as National income at market price.

$$\text{NNPMP} = \text{GNPMP} - \text{Depreciation}$$

**Net National Product at Factor Cost (NNPFC):**

It refers to net money value of all the final goods and services produced by the normal residents of a country during a period of one year. It is known as the national income. It refers to the cost that the individuals of the economy face in terms of resources of the economy to produce the net output.

$$\text{NNPFC} = \text{GNPMP} - \text{Net Indirect Taxes} - \text{Depreciation}$$

It should be noted here that production of only normal residents of the country is to be included even if they are outside the nation.

**Check Your Progress-II**

Q1. Define Gross Domestic Product at Factor Cost (GDPFC)

Ans. ....  
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Q2. Write the formula of Gross National Product at Market Price (GNPMP).

Ans. ....  
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**1.3.5 Net Value Added at Market Price (NVAMP) and Factor Cost (NVAFC)****Net Value Added at Market Price (NVAMP):**

The term that is used to denote the net contribution made by a firm is called value added. It is the difference between the value of output and input or raw material or intermediate product at each stage of production. The net value added at market price refers to the net domestic product at market price which is the difference of gross value added and the depreciation.

$$\text{NVAMP} = \text{GVAMP} - \text{Depreciation}$$

**Net Value Added at Factor Cost (NVAFC):**

It gives the net value added by all the productive enterprises of an industry or sector at factor cost. By adding up the net factor income from abroad to it there will be the total national income of the economy.

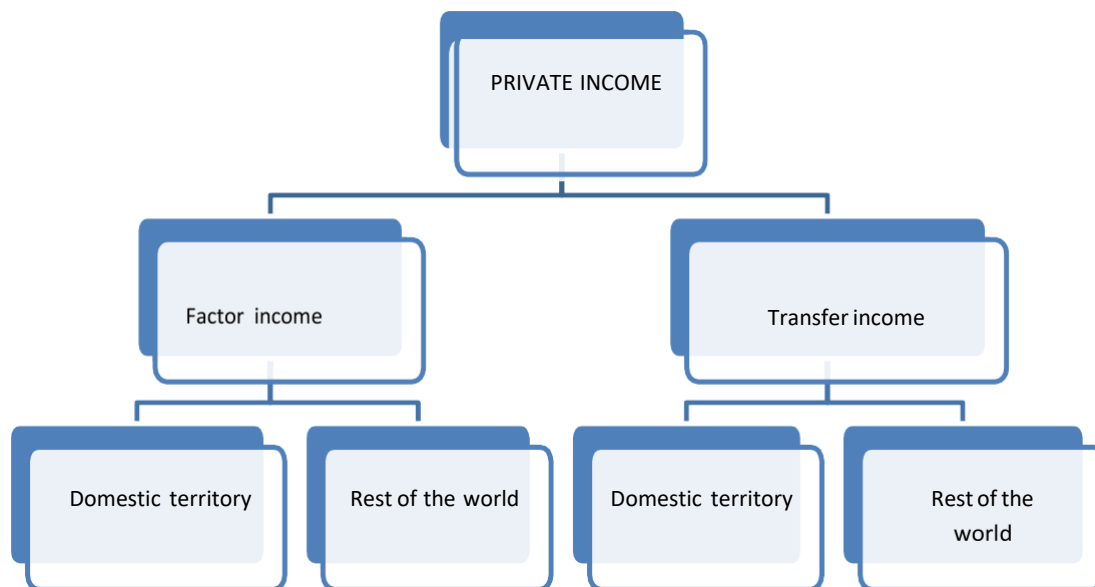
### 1.3.6 Private Income and Personal Income

It involves the income earned by the private sector of the economy from both the domestic and foreign market. This includes following two parts:

- A. Factor income or the earned income
- B. Transfer income or unearned income

Private Income = Income from domestic product of private sector + Net factor income from abroad + interest on National Debt + net transfer from government + transfer payments

from the rest of the world



Personal income involves the income earned by the household sector of the economy from both the domestic and the foreign market from all the sources. It also includes factor income and transfer income.

Personal Income = Private income – corporate tax – saving of private enterprises (retained earnings of foreign companies)

### 1.3.7 Personal and National Disposable Income

This includes the income that is available to the household sector for consumption after the payment of taxes, fees and other miscellaneous receipts of the government.

Personal Disposable Income = Personal income – personal/direct taxes –

miscellaneous receipts of the government

National disposable income includes the money income that is available to the whole economy for consumption purpose. This involves two terms, i.e.

- A. Net National Disposable Income: It is the total income that is available to the whole economy for consumption or saving. It is written as NNDY.

$$\text{NNDY} = \text{National consumption expenditure} + \text{National Savings or}$$

$$\text{NNDY} = \text{National Income} + \text{Net indirect taxes} + \text{Net current transfers from the rest of the world}$$

- B. Gross National Disposable Income: When depreciation is added to the net national disposable income, the result will be the gross national disposable income.

$$\text{GNDY} = \text{Net National Disposable Income} + \text{Depreciation}$$

### **1.3.8 Nominal GDP and Real GDP**

This refers to the market value of all the final goods and services produced in the domestic territory of the country during an accounting year calculated on the basis of current year prices. It is also known as monetary GDP or GDP at current prices.

Real GDP refers to the market value of all the goods and services produced in an accounting year in the domestic territory of the country calculated on the basis of the base year prices. It is also known as GDP at constant prices.

### **1.3.9 GDP Deflator**

It is the ratio of the nominal GDP and real GDP which shows the change in the value of the GDP due to the change in the prices of the economy.

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

## **1.4 Basic Differences Between the Domestic Income and National Income at Factor Cost**

Basis	Domestic Income	National Income

Nature of Concept	It reflects the value of output and services produced within nation.	It is a national level concept represented the value of goods and services produced in the entire world.
Category of Producers	It is related to those producers that are associated to the goods and services within nation.	It relates to all producers who are normal residents of the nation.
Net Factor Income Abroad (NFIA)	It excludes the NFIA	It includes the NFIA



### **1.5 Basic Differences Between the GDP and National Income at Market Price**

<b>Basis</b>	<b>GDP at Market Price (GDPMP)</b>	<b>National Income NNPFC</b>
Nature of concept	It reflects the value of final goods and services produced within nation.	It is associated to national concept involves the value of final goods and services produces in the entire world.
Category of producers	All the producers within nation.	All the producers who are normal residents of the nation.
Net Indirect Taxes	It is a market price i.e, it included net indirect taxes.	It is a factor cost, i.e, it excludes net indirect taxes.
Depreciation	Inclusive of depreciation	Exclusive of depreciation

### **1.6 Basic Difference between National Income and Private Income**

<b>Basis of Difference</b>	<b>National Income</b>	<b>Private Income</b>
Public and private sector	It includes the income earned by both the public and private sector	It includes the income earned by only private sector
Factor and transfer income	It involves only the factor income	It involves the income earned in terms of both the factor and transfer income
Public sector income	It includes the public sector income	It does not include the public sector income

Interest on National Debt	It does not include interest on national debt while its calculation	It involves interest on debt incalculation
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### **Check Your Progress-III**

Q1. What are the basic differences between the domestic product and national income at marketprice?

Ans. ....  
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Q2. Define Private Income.

Ans. ....  
-----

### **1.7 Methods to Measure National Income**

National income is the most important measure to compute the performance of the economy. The Calculation of the national income is very complicated and it reveals that because of the ways of the flow of resources the national income can be computed in three ways. These are termed as:

- A. Product method
- B. Income method
- C. Expenditure method

These can be explained in detail as follows:

#### **1.7.1 Product Method**

This method measures the value of national income in terms of the products being produced in the economy in an accounting year. This method is also known as value added method or output method. Value added is defined as the difference between the final goods as they are being produced and the cost of goods that entered that stage.

#### **I) Steps to Measure National Income Under Value Added Method**

**1. Identification of the Productive Units:** firstly, to calculate the national income there is need to identify the producing sectors of the economy. There are mainly three

sectors of the economy which are being contributing to the production of the economy.  
These are:

- A. Primary sector: It involves the agricultural sector of the economy. Along with agriculture there are also allied activities like animal husbandry, horticulture, bee-keeping, etc. are being involved. Thus, the goods and services produced by them are included in the calculation of national income.



- B. Secondary sector: It involves the goods and services produced by the industrial sector of the economy. Along with industrial sector it also includes the construction, manufacturing etc. Here the products are being produced with the help of men, machine, material etc.
- C. Tertiary sector: It involves the services provided to the other sectors of the economy. It includes transportation, banking, real estate, information technology, etc.

**2. Calculation of the Value Added:** The value added of the economy can be calculated by adding the value of output being produced by all the sectors and then subtracting the intermediate consumption from it. It is also known as GDP at market price.

$$\text{Value Added} = \text{Value of output (Primary + Secondary + Tertiary)} - \text{Intermediate goods}$$

**3. Calculation of the national income:** For calculation of the national income, the depreciation and net indirect taxes are to be subtracted from the value added and then net factor income from abroad is added to this.

$$\text{National Income (NDPFC)} = \text{GDPMP} - \text{Depreciation} - \text{Net Indirect Taxes} + \text{Net Factor Income from Abroad}$$

## **II) Precautions of Product Method**

- A. Double counting should be avoided.
- B. Production for self-consumption should be included.
- C. Sale of second-hand goods is not to be included.
- D. Production from illegal activities should not be included.
- E. Value of services rendered by housewives/family members should not be included.

### **1.7.2 Income Method**

Under this method, the factor incomes being earned by all the factors of production are calculated and added to derive national income. This method is also known as factor income method or income consumption method.

#### **I) Steps Involved in Calculation of National Income:**

- 1. Compensation of Employees:** it involves the income being paid by the employers to

the workers or employees in the business house. It involves following points:

- A. Wages and salary in cash: it includes the money income being paid by the employers to the workers for the work being done by them in the production of the commodity.
- B. Wages and salary in kind: it includes non-monetary benefits provided to the workers to stay in the business house, such as free cab service, free houses, educational facilities to their child, etc.
- C. Employer's contribution to social security scheme: it includes the contribution made by the employer for the benefit of the workers.

**2. Operating Surplus:** it involves the income earned by the factors other than labour for their contribution in the production of the commodity. It involves following points:

- A. Rent and Royalty: rent is provided on the land privately used by the entrepreneur for the business purpose. It is the payment made for the use of land. Royalty is the amount paid for the leasing of the sub-soil land to the government officials.
- B. Interest: it is the payment made by the government on public debt or by one firm to the other on the funds provided for the productive purposes.
- C. Profit: it is the reward provided to the entrepreneur for incurring risk in the production of goods and services. It is used by the entrepreneur for mainly three purposes, i.e., to pay corporate tax, to pay dividend and to retain earnings for business purposes.

**3. Mixed Income:** it involves the imputed value of the self-employed work being done by the normal resident of the economy. It includes the value of rent from owned land, wages of owned work, etc. e.g., Farmers, retail traders, etc. it involves a service of doctor running his clinic at the residence.

**4. Net Factor Income from Abroad:** the net factor income from abroad involves the income earned by factors of production by working outside of the domestic territory. It involves the net value of the payment made to the foreign world and receipts from them to the domestic economy.

$$\text{NFIA} = \text{Net income earned from abroad} - \text{Net income paid to abroad}$$

Now, the National income can be calculated by adding all the four parts of the income method,

i.e.  $NDP_{fc} = \text{Compensation of employees} + \text{Operating Surplus} + \text{Mixed income} + \text{Net factor income from abroad}$ .

## **II) Precautions Regarding Income Method:**

- 1) Transfer payments like old age pension, unemployment allowance are not included in estimating national income.
- 2) Imputed rent of self-occupied houses and imputed value of production of goods for self-consumption are to be included in calculating national income. But value of self-consumed services is not to be included.
- 3) Illegal money through smuggling, theft etc. is not included in national income.
- 4) Windfall gains are not included in this method.
- 5) Death duties, gift tax, tax on lotteries etc. are paid from past saving or wealth are not a part of current income. So, they should not be treated as a part of national income of that year.
- 6) The receipts from sale of second-hand goods should not be treated as a part of national income because second-hand goods do not create new flows of goods and services in the current year.
- 7) Sales proceeds of second-hand goods are not included in national income.
- 8) Indirect taxes are not included while estimating national income at factor cost.

### **1.7.3 Expenditure Method**

It is a method of computing GDP that measures the amount spent on all final goods during a given period. Expenditure method is the method which measures final expenditure on gross domestic product at market price during an accounting year. Final expenditure refers to expenditure on final goods and services in an accounting year. The main problem is to find out whether the expenditure is on final good or intermediate good. Only final expenditure is added in this method. If goods and services are purchased for final consumption or capital formation, the expenditure on them is final expenditure.

## **D) Steps Involved in the Calculation of The National Income:**

**1. Consumption Expenditure:** It involves the expenditure being incurred on the purchase of goods and services. There are many types of goods being available in the economy. Some of these types are as follows:

- A. Durable/Non-perishable goods: refrigerators, air conditioner, cooler, furniture, etc.
- B. Semi-durable goods: Clothes, food items like sugar, salt, etc.
- C. Non-durable/Perishable good: vegetables, fruits, etc.

The expenditure is being done by both the government officials (government final consumption expenditure) and private individuals (private final consumption expenditure) on the purchase of these goods.

**2. Investment Expenditure:** it involves the expenditure being done by the individuals or the government in the use of funds for further capital formation.

- A. Gross Private domestic investment: This is also known as business investment as it is done by the business houses for their capital formation. This investment is done mainly in the purchase of plant/machinery, furniture, land etc. for business purposes.
- B. Government investment: it is also known as development expenditure as the investment done by the government is mainly for the purpose of the development of the economy. This involves the expenditure being incurred on the construction of roads, dams, bridges, etc.

**3. Net Exports:** Net exports the difference between exports and imports of the country during one year.

$$\text{Net Exports} = \text{Exports} - \text{Imports}$$

Exports refer to goods and non-factor services from one country to rest of the world, and Imports refer to purchase of goods and non-factor services of one country to rest of the world.

Now, the calculation of national income can be done by adding all these items which lead to the calculation of GDPMP and then subtracting depreciation and net indirect taxes from it with adding net factor income from abroad.



$$\text{GDPMP} = C + I + G + (X - M)$$

National Income = GDPMP – Depreciation – Net indirect taxes + Net factor income from abroad

## II) Precautions Regarding Income Method

- 1) Since the production value of final goods is included, the expenses for any intermediate goods are not considered. Otherwise, a single expense will be counted twice, causing the national income to inflate inaccurately.
- 2) The transfer payments do not add value to the economy of a nation; hence, they should not be included.
- 3) The purchase of second-hand goods is not included since they do not affect the total value of produced goods and services.
- 4) Buying and selling of bonds and shares signifies a change in ownership and does not affect the value of goods and services. These transactions are not included in national income. However, the brokerage paid for the transfer of shares is considered while using the expenditure method.
- 5) Services provided by the government and non-profit organizations and the expenses incurred for the production of any good that is used for self-consumption are considered in the national income calculation.

## Identity among National Product, National Income and National Expenditure

In the economy, there are final goods and services which are being produced in the accounting year and also the income earned by the factors of production which are being producing these goods and the expenditure incurred on them are identical. Value of final goods is equal to the factor cost which is identical to the expenditure on the final product. Thus, it can be concluded that the national income calculated with the help of product method, income method and expenditure method are all equal.

National Product = National income = National Expenditure

### **1.8 Difference Between Final Goods and Intermediate Goods**

Basis of Difference	Final Goods	Intermediate Goods
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Definition	Those goods which are produced to be directly consumed by the consumer are known as final goods	Those goods which are used for producing other goods are known as intermediate goods
Nature	These are finished goods	These can be semi-finished or non-finished goods
Processing needed	There is no need of further processing as they are ready to be consumed.	There is need of further processing as they are refined to make goods for final consumption
Impact on National Income	These goods form the part of national income	These goods do not form part of national income
Demand for goods	These goods have inherent or direct demand	These goods do not have natural demand as they are based on the preferences of the users and have derived demand

### **1.9 Difficulties Faced by Underdeveloped Countries in Measuring National Income:**

- 1) **Value of Goods Not Included:** In underdeveloped countries, when the transactions are mainly in the form of barter system, they are not included in national income calculation. Also, many of the goods are for self-consumption and are not properly measured in monetary terms. It creates problem in calculation of national income.
- 2) **Illiteracy:** underdeveloped countries have massive illiteracy and backwardness. Most of the entrepreneurs are illiterate in the economy and does not maintain proper accounts for the goods and services which mislead the calculation of national income.
- 3) **Little Specialization:** There is no or very little specialization in the underdeveloped economies due to which products are not of good quality and do not have proper industrial base.

- 4) **Statistical Availability:** There is no proper availability of the reliable statistical data in underdeveloped countries.
- 5) **Method to Calculate:** Because of lack of proper and reliable availability of the data, the method to calculate national income is not proper. There is combined method being used to calculate national income in many countries which lead to misleading results.
- 6) **Economic Stage:** The most important problem in the calculation of national income here is at what economic stage is the income being included. If the aim of the computation is the progress of the economy, then the production is to be included. But, if the aim is to compute the welfare of the economy, then the consumption stage is more effective.

#### **Check Your Progress- IV**

Q1. Mention the names of methods to measure national income.

Ans. ....  
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Q2. What do you mean by consumer expenditure?

Ans. ....  
-----

#### **1.10 Summary**

In general, national income means the value of goods and services produced by a country during the financial period. It is concerned with the economic activities of a country during a particular year. National income useful to estimate the growth of the nation with respect to the basic requirement. According to –National income is defined as the net output of commodities and services flowing during the year from the country’s productive system in the hands of ultimate consumers.¶ There are various concepts or aggregates available related to national income. These are gross domestic product, gross national product, net national product, net domestic product (are at market price and factor cost). Personal and disposable income and private income.

There are three methods available to measure the national income. These are income method, expenditure method and value-added method. Income method is based on income generated by the production factors (i.e., land and labour). However, expenditure method is based on investment and consumption of a country. Value-added

method consists of value added of product during the period of manufacturing process.

### **1.11 Questions for Practice**

#### **A. Short Answer Type Questions**

- Q1. Define gross domestic product at market price
- .Q2. What is meant by gross national product?
- Q3. Define net domestic product at market price
- Q4. Define net domestic product at factor cost
- Q5. What do you mean by Private income?
- Q6. What do you mean by Private income?
- Q7. What do you mean by Personal income?
- Q8. What do you mean by Disposable income?
- Q9. What is consumption of fixed capital or depreciation?
- Q10. Explain the difference between personal income and personal disposable income.

#### **B. Long Answer Type Questions**

- Q1.Explain the concept of domestic product. Distinguish between gross domestic product and gross national product
- Q2.Explain the various aggregates related to national income. Explain the inter-relationship between them with the help of equations and chart.
- Q3.Explain the concepts of
  - a) National disposable income and national income
  - b) Factor income and transfer income
  - c) Private income and personal income
- Q4. Distinguish between the following concepts of national income
  - a) Gross domestic product and gross national product
  - b) Net national product at market price and net national product at factor cost
- Q5. Define national income. Explain the different methods of measuring national Income.
- Q6. Explain income method of measuring the national income
- Q7 .Explain expenditure method of measuring the national income
- Q8. Explain the precautions to be taken while measuring the national income by

Expenditure method.

Q9. Explain the precautions to be taken while measuring the national income by income method.

### **1.12 Suggested Readings**

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**M.A (ECONOMICS)**

**SEMESTER –II**

**COURSE: MACRO ECONOMICS I**

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**UNIT 2: DETERMINATION OF INCOME, OUTPUT AND EMPLOYMENT  
(CLASSICAL AND KEYNESIAN APPROACHES)**

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**STRUCTURE**

**2.0 Learning Objectives**

**2.1 Introduction**

**2.2 Basic Concepts**

**2.3 Determination of Income, Output and Employment: Classical Approach**

**2.3.1 Assumptions**

**2.3.2 Say's Law**

**2.3.3 Interest Rate Flexibility**

**2.3.4 Wage Rate Flexibility**

**2.3.5 Determination of Output and Employment**

**2.3.6 Criticism of Classical Economics**

**2.4 Determination of Income, Output and Employment: Keynesian Approach**

**2.4.1 Assumptions**

**2.4.2 Aggregate Demand and Aggregate Supply Framework**

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**2.4.4 Saving-Investment Approach**

**2.5 Differences in the Views of Classical Economists and Keynes**

**2.6 Summary**

**2.7 Questions for Practice**

**2.8 Suggested Readings**

## **2.0 Learning Objectives**

After studying this unit, learner will be able to:

- Know the basic features of Classical and Keynesian school of thought.
- Understand the Determination of the income, output and employment.
- Differentiate between Classical and Keynesian ideas.

### **2.1 Introduction**

The task of economists is to build theories and apply them to understand the working of economy. In Macroeconomics, there have been two primary groups known as Classical Economists and Keynesians. The term –Classical Approach was used by John Maynard Keynes for the ideas of economists like Adam Smith, David Ricardo, Thomas Malthus and J.S. Mill. Although classical economists had not propounded any coherent theory of macroeconomics but it should not be taken as classical economists had not given any views on output or employment determination. Classical economists had made certain assumptions about the working of economy and their ideas were dominating the macroeconomic theory till early 1900s. In 1936, John Maynard Keynes published his book *The General Theory of Employment, Interest and Money*. He challenged the view of classical economists because thoughts of classical economists were failed to explain the reasons behind unemployment during Great Depression of 1930. The basic difference between classical and Keynesian perspectives is whether market economies, if left to themselves, adjust to full employment or not.

In this unit, we will discuss classical views, criticism of classical views by Keynesians and Keynesian views regarding determination of income, output and employment.

### **2.2 Basic Concepts**

- A. Aggregate Demand (AD):** Aggregate demand is the quantity demanded by households, businesses, the government and rest of the world at the aggregate price level.
- B. Aggregate Supply (AS):** Aggregate Supply is the quantity of aggregate output supplied in the economy at aggregate price level.
- C. Aggregate Expenditure:** Aggregate expenditure is the sum of all expenditures undertaken by the households, business firms and government during a specific time

period.

**D. Effective Demand:** Effective demand is the willingness and ability of consumers to purchase goods at different prices.

**E. Real Wages:** Real wage is nominal wage divided by price level.

### **2.3 Determination of Income, Output and Employment: Classical Approach**

Let's start with the classical school of thought. The classical school of thought believed that wages and prices adjust quickly to changes in supply and demand. The economy is self-regulating i.e. if the economy is not at full employment then it can move itself to this position. Let us begin with a brief review of the classical postulates.

#### **2.3.1 Assumptions**

The classical system is based on certain assumptions. Let's now discuss about what these assumptions are. These are as follows:

**Laissez-faire:** The classical assumed that economy works on the principles of laissez- faire. It means there is no government intervention (except to ensure free competition) and there is perfect competition in the market.

**Full Employment:** The classical economists assumed that there is full employment in the economy. If economy is not at full employment there, then there is a tendency towards full employment if government does not intervene. However, there is possibility of frictional and voluntary unemployment in the state of full employment.

**Say's Law:** A firm hires factors of production (land, labor, capital, and entrepreneur) to produce goods and services and the production of goods and services creates income for owners of these inputs, which in turn creates a demand for goods. Thus supply of goods and services itself generates sufficient income to generate a demand equal to the supply of goods. This is what is known as Say's Law, stated by French economist J.B. Says as –supply creates its own demand. This law is regarded as the central part of 'classical' macroeconomic thought.

**Stable Equilibrium:** According to Say's law, the owners of inputs, who earn income through the process of production, spend their entire income on purchase of goods and services. Thus, the entire output of goods and services is sold out. There



is no general overproduction and underproduction over a period of production and the economy remains in stable equilibrium.

**Money as Medium of Exchange:** The classical economists focus on medium of exchange function of money. According to classical approach, money is used only to facilitate the transactions and it does not play any significant role in determining the output and employment. The classical economists emphasized the role of real factors in output and employment determination.

We can understand the classical views on income, output and employment determination by studying the working of product market, labour market and credit market. The classical views on all three markets can be derived from Say's law of market, wage price flexibility and interest rate flexibility.

### **2.3.2 Say's Law**

According to Say's law, in market economy whatever produced is sold out. It means that production of goods and services requires factors of production. These factors of production get income (rent, wages, interest and profits) in return. This income is further spent on purchase of goods and services and demand for goods and services is created. Thus, supply of goods and services creates its own demand.

Production of goods and services  $\square$  generates income  $\square$  generates demand

Therefore, in classical system, since value of output or income is equal to expenditure, there is equality between demand and supply hence aggregate demand (AD) equals to aggregate supply (AS). The classical economists believe that output level is maximum at full employment level. The classical economists did not differentiate between long-run and short-run supply curve. The only aggregate supply curve in classical system is long-run aggregate supply curve which is vertical.

**Aggregate Supply (AS):** In the classical system, there is state of full employment and output is maximum. Therefore, aggregate supply does not change with change in price level and aggregate supply curve is vertical line (parallel to Y-axis) as in figure 1.

**Aggregate Demand (AD):** The relationship between aggregate demand and price

level is usual inverse relationship. Therefore, aggregate demand curve slopes downwards from left to right as in figure 2.

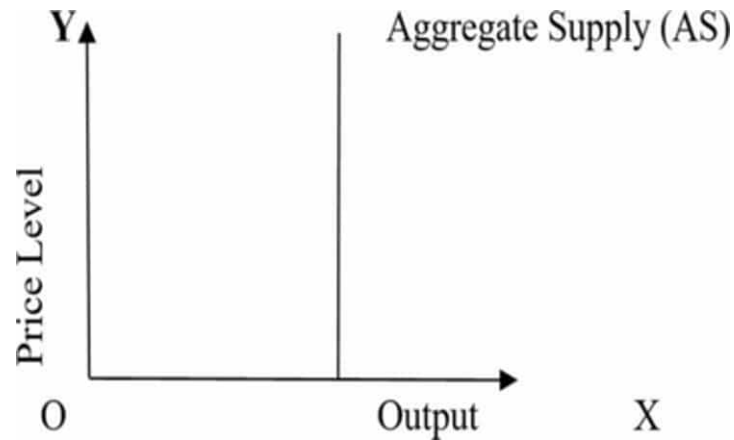


Figure 1

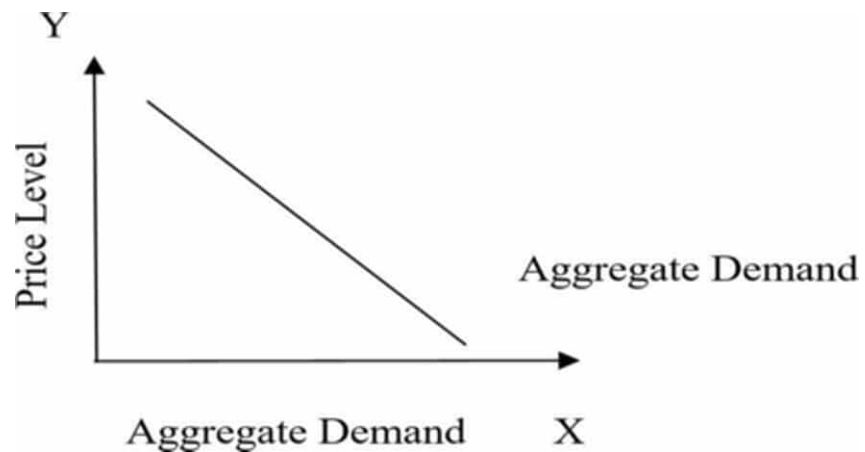


Figure 2

**Equilibrium Level of Output:** In the classical system focuses on full employment and based on Say's law of market. Thus, classical economists assumed that prices are flexible and determined by market forces of demand and supply, hence aggregate demand equals to aggregate supply. Therefore, output produced at full employment is equilibrium level of output. In diagram (Figure 3) AS is aggregate supply curve, AD1 is initial aggregate demand and E is point of equilibrium where  $AD=AS$ . Equilibrium output is  $OQ_1$  and price level is  $OP_1$ .

Now let us suppose that if individual do not spend his entire income (due to savings) and there is fall in aggregate demand. Due to fall in aggregate demand, the equality of aggregate demand and aggregate supply is disturbed. This fall in aggregate demand could cause economy to move towards point A, where resources would be unemployed. The unemployment of inputs would cause fall in input prices and economy will adjust to new price level P<sub>2</sub>.

Similarly, if there is an increase in aggregate demand (aggregate demand curve shifts to AD<sub>3</sub>), economy could move to point B which is beyond full employment level. The input suppliers bid up input prices and the economy quickly adjust to the new price level at P<sub>3</sub>. Thus, due to flexibility of prices equilibrium is restored if disturbed due to fall in or increase in aggregate demand.

The classical economists believed in Say's law. Therefore, according to classical economists, production creates demand sufficient to purchase all goods and services produced. This law can be easily understood in barter system. Suppose a farmer produces wheat. Some part of the wheat produced will be consumed by the farmer and with the remaining surplus of wheat farmer is thinking of goods and services he can obtain in exchange of it. Thus, production of wheat by farmer creates demand for other products.

But in money economy, farmer may not spend his entire income because he may choose to save some money. Thus, farmer's demand for goods and services does not necessarily match

the income of the farmer and it is difficult to believe that Say's law does hold in money economy. But classical economists argued that Say's law still holds in money economy where individuals may spend less than their entire income. They explain their argument on the basis of Interest rate flexibility.

### **Check Your Progress-I**

Q1. Define Say's law

Ans. ....

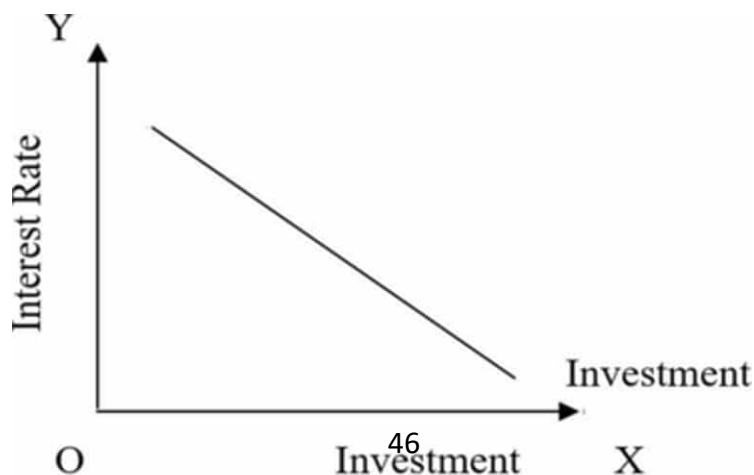
Q2. How to determine Equilibrium level of output?

Ans. ....

### **2.3.3 Interest Rate Flexibility**

The classical economists argued that if an individual is not spending his entire income, he will save. Saving is the leakage out of spending stream and savings are injected back in spending stream through investment. In the classical model, saving is matched by an equal amount of investment because of interest rate flexibility in the credit market.

**Investment (I):** According to classical economists, investment is interest-elastic and there is inverse relationship between investment and rate of interest because rate of interest is cost of borrowing. The higher the rate of interest is, the fewer the borrowings of the firm. Hence the curve showing relationship between investment and rate of interest is downward sloping.



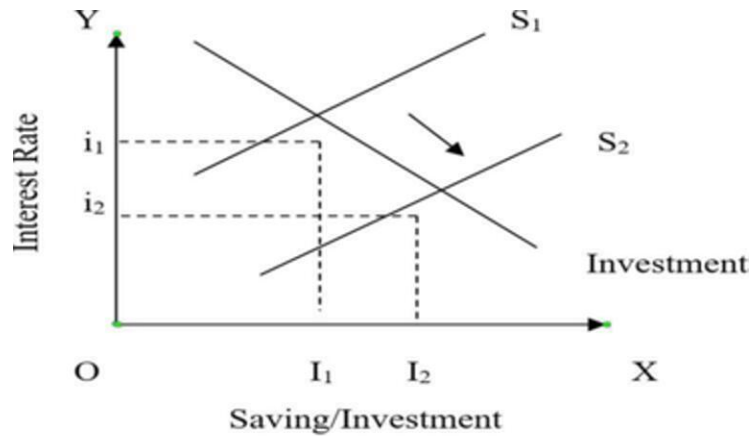
**Figure 4**

**Savings (S):** According to classical economists, savings of households are also interest- elastic and relationship between savings and interest rate is positive. The higher the reward for savings (rate of interest) is, higher the savings of households since opportunity cost of consuming is high. Hence the curve showing this relationship is upward rising.



**Figure 5**

**Equilibrium in Credit Market:** According to classical economists, the interest rate is flexible and adjusts so that savings equals investment. Thus, if savings increase (from  $S_1$  to  $S_2$ ), interest rate falls (from  $i_1$  to  $i_2$ ) and hence investment increases (from  $I_1$  to  $I_2$ ) and saving investment equality restored since increase in saving would result in equivalent cut in consumption and investment increase by same amount as drop in consumption (as shown in figure 6).



**Figure 6**

Therefore, saving and investment will always be brought into line by interest rate flexibility. Hence savings will always equal to investment in classical system and economy will always be in equilibrium. Such equilibrium will be at full employment level due to wage flexibility.

#### **2.3.4 Wage Rate Flexibility**

The classical economists believe that markets are competitive and forces of demand and supply operate in all market. Hence in labour market, wage rate flexibility would cause the equality of quantity supplied of labour and the quantity demanded of labour.

**A. Demand for Labour:** A competitive, profit maximizing firm would hire an additional unit of labour by comparing extra revenue generated by additional unit of labour (from increased production) is greater than extra cost of hiring additional unit of labour.

Here, Extra revenue generated by additional unit of labour =  $MPL \times P$  and extra cost of hiring additional unit of labour =  $W$

Where  $MPL$  is marginal product of labour,  $P$  is price of output and  $W$  is wage.

Now, if  $MPL \times P > W$  i.e. extra revenue exceeds the extra cost, an extra unit of labour increases the profit. Therefore, firm continue to hire labour until the next unit would no longer be profitable. It means,

$$MPL \times P = W$$

or

$$MPL = \frac{W}{P}$$

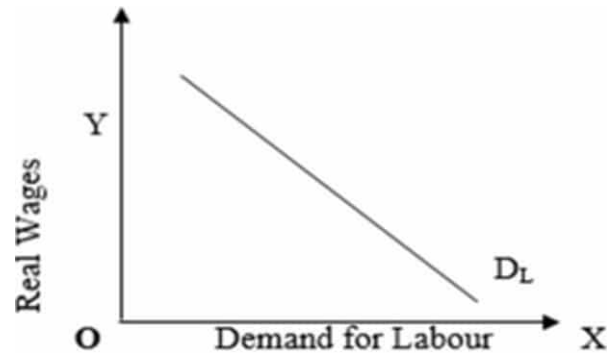


Figure 7

Thus, to maximize profit, the firm hires upto the point where marginal product of labour is equal to real wage. Since marginal product of labour decreases as the amount of labour increases so labour demand curve ( $D_L$ ) is downward sloping. Therefore, labour demanded increases with decrease in real wage rate as shown in figure 7.

- B. Supply of Labour:** The supply of labour is positively related to real wage because to get employment worker have to sacrifice leisure. So, employer has to offer additional wage to put worker on additional labour. Therefore, supply of labour increases with increase in the real wage rate as shown by supply curve ( $S_L$  in figure 8). But this relationship holds only till the point of work-leisure trade-off i.e after a point, further increase in

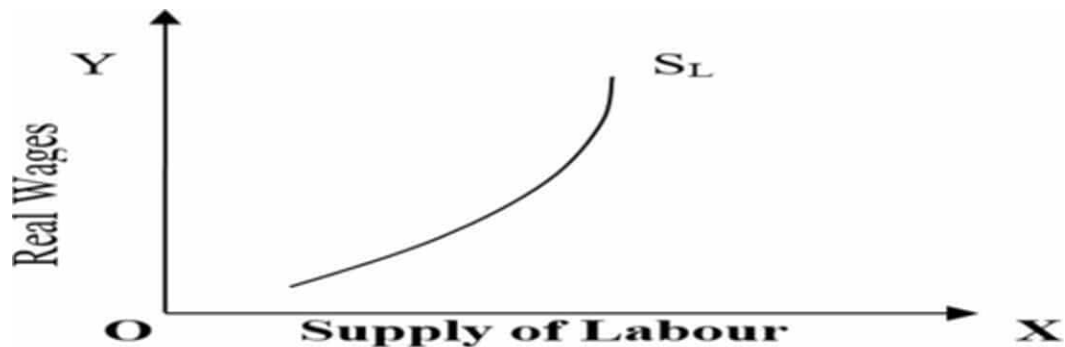
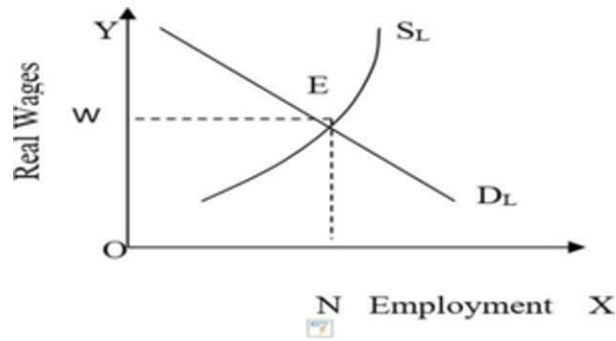


Figure 8

wage rate would induce workers to prefer leisure to work hence supply of labour would fall with increase in wage rate.

- C. Equilibrium in Labour Market:** The point of intersection of labour demand curve and labour supply curve determines the equilibrium in labour market (figure 9) hence the level of employment ( $ON$ ) and wage rate ( $OW$ ) is determined.



**Figure 9**

According to classical economists, there is always full employment in the economy. If there is unemployment i.e. demand for labour is less than supply of labour, money wages would fall and full employment level will be restored. Similarly, if there is a shortage in the labor market, the wage rate will rise, and the quantity supplied will equal the quantity demanded. We can understand this process as follows:

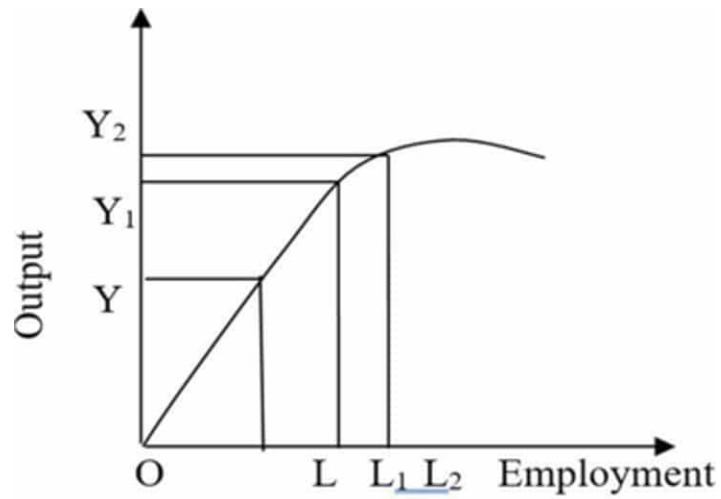
Unemployment  $\rightarrow$  fall in money wages  $\rightarrow$  fall in cost of production  $\rightarrow$  fall in product prices  $\rightarrow$  increase in demand for product  $\rightarrow$  increase in sales  $\rightarrow$  increase in production  $\rightarrow$  increase in employment.

Thus, full employment will be attained. This is known as wage-price flexibility in classical system.

### **2.3.5 Determination of Output and Employment**

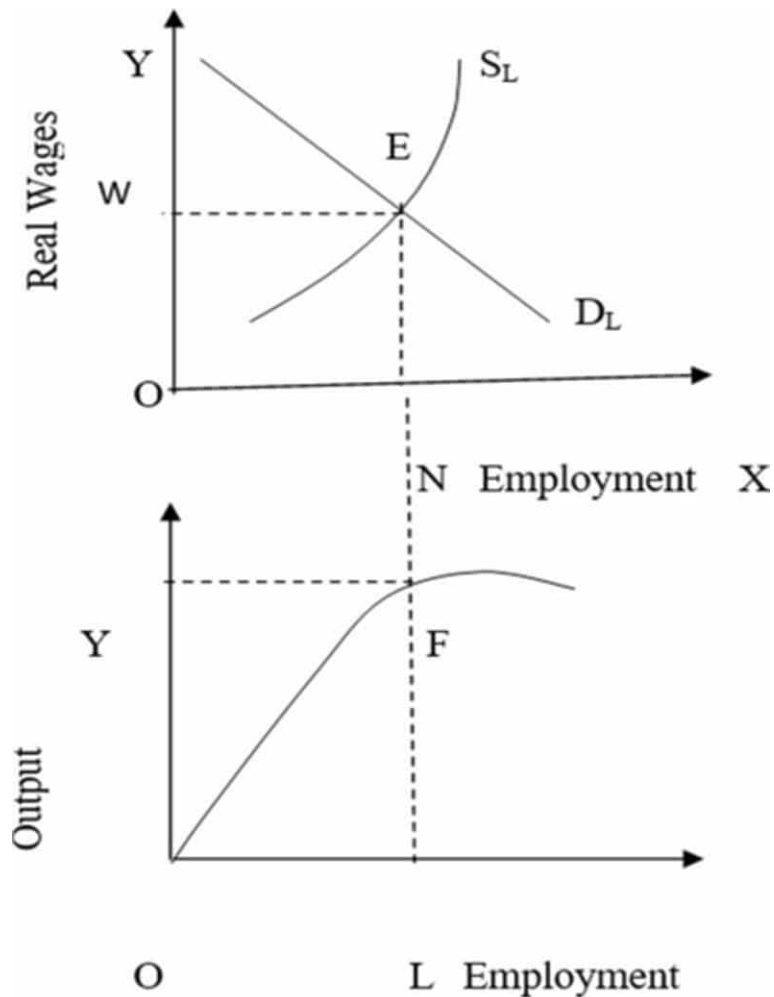
The level of output and employment in classical system is determined by production function and equilibrium in labour market. According to classical economists, output depends on the labour and capital employed. The classical production function assumed that capital is fixed hence labour is only variable factor and application of labour is subject to the law of diminishing returns i.e. marginal productivity of labour decreases with increase in employment. The figure 10 shows that marginal product of labour goes on decreasing as labour employment increases. The level of output increases as employment increases but less than proportionate.





**Figure 10**

The equilibrium level of employment is determined by equating demand for and supply of labour and determination of output can be shown by putting together the production function with labour market equilibrium (Figure 11).



**Figure 11**

In labour market, the level of employment (ON) and wage rate (OW) is determined. The line ON extended downward to the production function which intersect the production function at point F. A line drawn from point F to Y-axis determines the equilibrium level of output at OY. Thus, employment and output are simultaneously determined in the classical model.

According to classical thoughts there is full employment in economy and prolonged unemployment is impossible in the long run because quick adjustments in prices, wages and interest rates keeps resources fully employed.

### **2.3.6 Criticism of Classical Economics**

With the occurrence of Great Depression in 1930, the basic postulates of classical economics were proved wrong. Keynes challenged the classical thinking in 1936 on following grounds:

- 1) Keynes criticized the classical postulate of state of equilibrium and full employment in the economy. During Great Depression, economies suffered a long-run disequilibrium and a prolonged state of involuntary unemployment.
- 2) Another postulate of classical economics is Say's law i.e. aggregate demand is always equal to aggregate supply in classical system. In the US, due to depression, the supply of labour as well as goods and services was there but demand lagged far behind.
- 3) According to Keynes, increase in savings due to decrease in consumption may not matched by equal increase in investment. Thus, with decrease in total expenditure aggregate demand will fall.
- 4) Keynes challenged the classical economist's belief that saving and investment depend on the interest rate. According to Keynes there are number of factors such as income and business expectations that determines the level of savings and investment.
- 5) Keynes believed in government intervention to influence the level of output and employment.

Thus, classical economics was failed to explain the causes of unemployment and disequilibrium in economy during Great Depression. Hence classical system collapsed and it gave rise to Keynesian economics.

### **Check Your Progress- II**

Q1. Which type of adjustments keeps resources fully employed in classical framework?

Ans. ....  
-----

Q2. How Keynes challenged classical thinking?

Ans. ....  
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## **2.4 Determination of Income, Output and Employment: Keynesian Approach**

After discussing the classical theory, we now move to Keynesian theory of income, output and employment determination. Keynes had developed his theory of income and employment determination in contrast to classical model. He criticized the Say's law and emphasized the role of demand in the determination of output and employment. He also challenged the classical postulates of Laissez faire, self-regulating economy and wage, price and interest rate flexibility.

### **2.4.1 Assumptions**

Before we start the Keynesian theory, let us go through the assumptions on which Keynesian theory is based.

- 1) In Keynesian theory prices are assumed to remain constant even if aggregate demand or aggregate supply change.
- 2) Keynesian theory holds good in short period because Keynes believed that, –in the long run we are all dead.!
- 3) According to Keynes, medium of exchange is not the only function of money. It also performs store of value function.
- 4) In contrast to classical economists, Keynes believed that interest is monetary phenomenon and it is determined by demand for and supply of money.
- 5) There is no foreign trade.

Given these assumptions, we can now study the determination of income, output and employment in Keynesian economics. Before discussing the output and employment determination we need to know the views of Keynesian on wage, price and interest rate flexibility.

In contrast to classical economists, many economists believe that wages and prices are slow in adjusting, especially downwards. This tendency for wages and prices to adjust slowly downward to change in economy is known as wage-price inflexibility. Empirical evidences support the wages and prices to be sticky downwards. Due to long-term labour contracts and efficiency wages (higher wages attract productive workers); firm may not be able to cut wages

which causes downward stickiness of wages. Prices could also be inflexible due to menu cost i.e. cost of printing new catalogs and new advertisement etc.

Keynes also argued that wages and prices are inflexible downward. Wages could be sticky due to long-term labour contracts, trade unions and minimum wage laws. Due to stickiness of wages, price-level will not fall (because some firms adjust price slowly) in response to reduction in aggregate demand. Further Keynes argued that internal structure of economy is not always competitive enough to allow prices to fall. The monopolistic elements in economy sometimes prevent prices from falling.

This stickiness of wages and prices causes the sufficient excess capacity in economy and therefore short run aggregate supply curve is flat. Keynes believed that the time required for wages and prices to adjust downward is long enough to say that the economy is not self-regulating.

#### **2.4.2 Aggregate Demand and Aggregate Supply Framework**

According to Keynes, equilibrium level of output is determined by the equality of aggregate demand and aggregate supply.

**A. Aggregate Demand:** Since there is no foreign trade, aggregate demand consists of consumption, investment and government expenditure. Any change in these variables can cause shift in aggregate demand. For example, rise in autonomous consumption will raise consumption expenditure and hence there would be increase in aggregate demand depending on the multiplier. According to multiplier process, consumption of one person would increase with an initial rise in autonomous consumption level. This increased consumption generates additional income for another person leading to additional consumption spending by that person and so on. The value of multiplier is calculated by following formula.

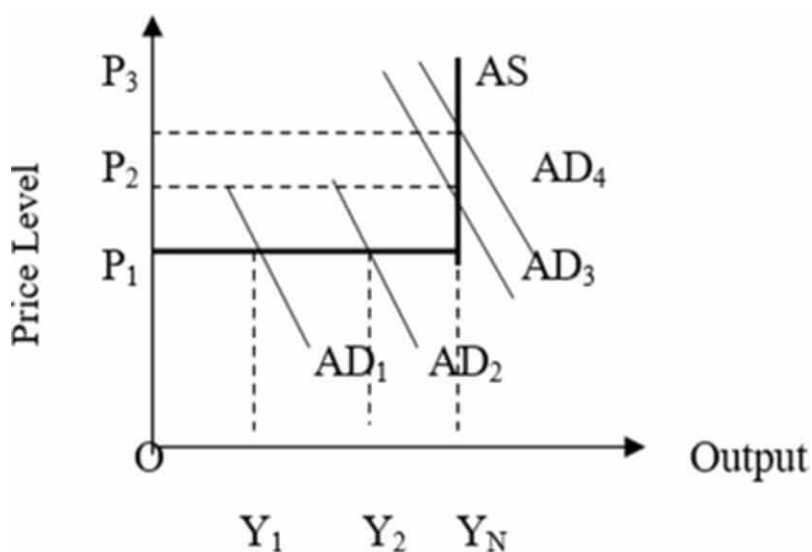
$$\text{Multiplier} = \frac{1}{1-MPC}$$

Where, MPC is marginal propensity to consume i.e. change in consumption expenditure with change in income.

**B. Aggregate Supply:** Since the price level is assumed to be constant until the economy reaches full employment, the aggregate supply curve must be horizontal. The Keynesian aggregate supply curve is horizontal until the economy reaches full employment.

Now we can observe the effects of change in aggregate demand given the aggregate supply curve in the Keynesian model (Figure 12). An increase in aggregate demand (from  $AD_1$  to  $AD_2$ ) before the full employment level raises output but the price remains the same. Once the economy has reached full employment level, an increase in aggregate demand (from  $AD_3$  to  $AD_4$ ) raises the price level (from  $P_1$  to  $P_3$ ).

Therefore, changes in aggregate demand before full employment (in the horizontal section of the aggregate supply curve) do not change any price level, but changes in aggregate demand after full employment (in the vertical section of the aggregate supply curve) do change the price level.



**Figure 12**

According to classical economists, disequilibrium in the economy is a temporary state. But Keynes believed that the economy could get stuck in a recessionary gap because consumption and investment would not rise enough to shift the aggregate demand curve. Keynes argued that investment spending does not always respond to the change in interest rate. The pessimistic business expectations may resist people to invest more at a lower interest rate.

Therefore, Keynes believed that the economy is not self-regulating and economic instability is possible. Hence government intervention can help to shift aggregate demand.

### **Check Your Progress- III**

Q1. What are the views of Keynes on wage-price flexibility?

Ans. ....  
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Q2. What is the shape of aggregate supply curve in Keynesian framework?

Ans. ....  
-----

#### **2.4.3 Aggregate Expenditure and Output Framework**

**1. Aggregate Expenditure:** In two-sector model, there is no government taxes or subsidies. Hence, aggregate expenditure (aggregate demand) consists of two elements i.e. consumption expenditure and investment expenditure. That is,

$$\text{Aggregate Expenditure (AE)} = C + I$$

Where, C is consumption Expenditure and I is Investment

**A. Consumption Expenditure:** Consumption Expenditure is positive function of current absolute income. That is, if income increases, consumption expenditure also increases but less than proportionately.

$$C = f(Y)$$

The value of marginal propensity to consume lies between zero and one i.e.  $0 < \text{MPC} < 1$ . Marginal propensity to consume is the change in consumption expenditure with rise or fall in disposable income. The consumption function can be written as:

$$C = a + bY$$

Where, C is consumption expenditure,

a is autonomous consumption and b is  $\text{MPC} = \frac{\Delta C}{\Delta Y}$

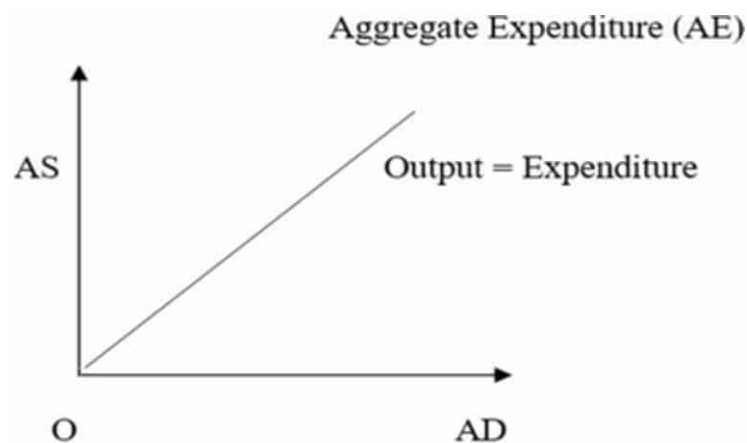
**B. Investment:** To simplify things, investment is assumed to be constant and the investment curve is horizontal.  $I = \bar{I}$



**Figure 14**

**2. Aggregate Supply:** Aggregate supply refers to the total supply of goods and services in an economy. Keynes used the classical production function to derive aggregate supply function where short run output depends on level of employment. It means aggregate demand is always equal to aggregate supply ( $AD = AS$  i.e.  $C + I = C + S$ ).

Keynes form aggregate supply function on basis of this relationship between AD and AS. In diagram (figure 15) the relationship between aggregate demand and aggregate supply is shown by  $45^\circ$  line. At each point of this line output and aggregate expenditure are equal.



**Figure 15**



The concepts of aggregate supply and aggregate demand were first used by Malthus. Malthus, in contrast to classical, argued that aggregate demand might fall short of the aggregate supply leading to overproduction, but could not prove it. Keynes used this idea to develop his theory of income and employment determination.

**3. Equilibrium:** According to Keynes, equilibrium level of output is determined at a point where aggregate demand (C+ I) is equal to aggregate supply (C + S). That is,

$$AD = AS$$

$$C + I = C + S$$

But Keynes argued that aggregate demand and aggregate supply are not always equal. Because aggregate demand depends on households' plan to consume and to save and invest and aggregate supply depends on producers plan to produce goods and services. Therefore, if households' plan coincides with producers' plan only then aggregate demand could be equal to aggregate supply. Thus, national income is in equilibrium at unique level of output and income at which aggregate demand equals to aggregate supply, hence equilibrium condition is:

$$S = I$$

#### **2.4.4 Saving-Investment Approach**

Saving investment approach can be derived directly from aggregate demand-aggregate supply approach. The equilibrium condition is

$$AD = AS$$

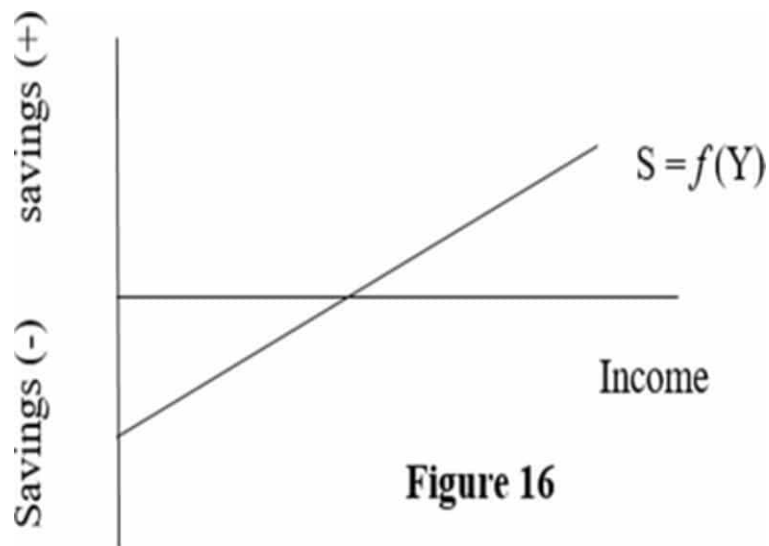
or

$$C + I = C + S$$

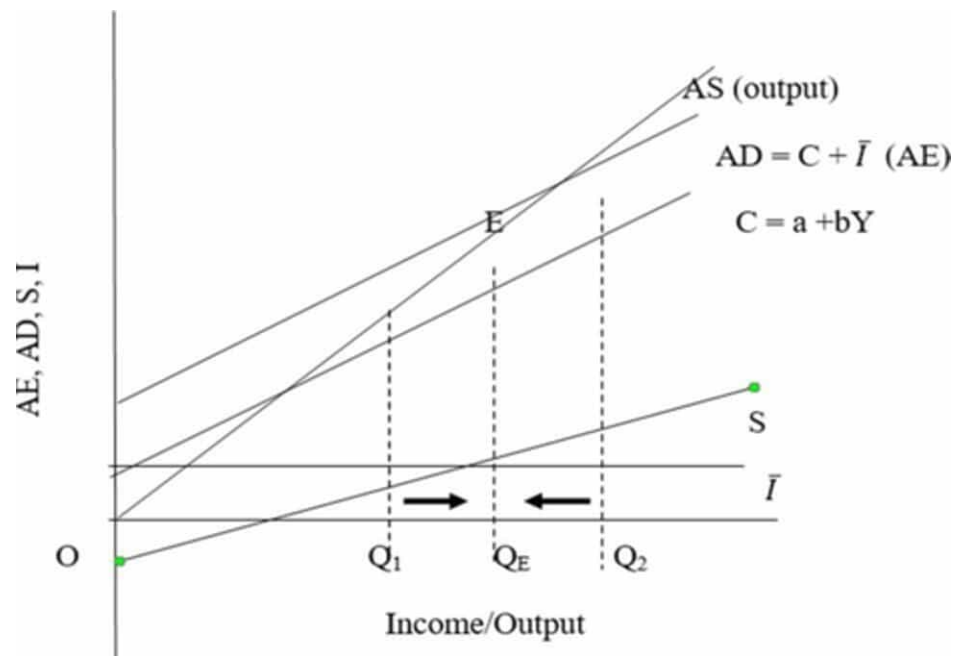
or

$$I = S$$

That is, savings equals to investment. Where investment is assumed to be constant and saving is function of income. Since people spends something on consumption at zero level of income, therefore savings are negative till individual is unable to meet his consumption requirements out of his income. When income rises above the consumption expenditure, positive savings takes place and after that savings increase with increase in income.



Saving investment approach determines the same equilibrium level of the national income as determined by the aggregate demand and aggregate supply approach as shown in figure 17.



The point of intersection of AD curve and AS curve (i.e.  $AD = AS$ ) is the point (shown by point E in the diagram) of equilibrium of national income. This point of intersection is called the Keynesian cross. The output level other than  $Q_E$  when aggregate demand, the amount the

people want to buy, is not equal to output produced shows disequilibrium in the economy and this disequilibrium is corrected through change in inventories. Inventory is the stock of goods that a business firm hold to meet unexpected change in demand. For example,

- At output level Q1, aggregate expenditure (AE) > Output produced □ unexpected decrease in inventories since firm have to meet this rise in demand from stock held □ firm will realize underproduction □ increase in production □ output move to QE.
- At output level Q2, aggregate expenditure (AE) < output □ firm has produced more than demand □ difference is added to inventories □ unexpected increase in inventories □ firm will realize overproduction □ production cut □ output move to QE.

Therefore, we can say that any change in aggregate expenditure (AD) will shift equilibrium from one point to other and accordingly output level will change. For example, increase in aggregate demand will cause an upward shift in aggregate demand curve, hence shift equilibrium point towards right will cause output to increase. We can further note that change in aggregate demand could be due to change in consumption or change in investment or both. Consumption is a stable function of income. On the other hand, investment is determined by business expectations, innovations, rate of interest etc and how national income changes with change investment depends on investment multiplier.

## **2.5 Differences in the Views of Classical Economists and Keynes**

After discussing the classical and Keynesian approach of output and employment determination, we can easily differentiate the views of both schools of thought.

- 1) Classical economists believed Say's law of market. That is according to classical economists, supply creates its own demand. But Keynes believed that overproduction is possible due to lack of aggregate demand.
- 2) Classical school of thought focused on supply side while Keynes emphasized the role of aggregate demand.
- 3) According to classical economists, savings are directly related to rate of interest. But Keynes believed that it depends on savings goals of savers.
- 4) In classical system, investment is inversely related to interest rate. But in Keynesian economics, if business expectations are pessimistic investor may invest less at lower rate of interest.

- 5) Savings are leakages and investment is injection in the spending stream. So savings are equal to investment in classical system. But according to Keynes, income can be hoarded (in cash or banks) to avoid risky lending of money. In such situation savings will exceed investment.
- 6) Classical economists believed in wage price flexibility. According to Keynes, wages and prices may be inflexible downwards.

### **Check Your Progress- IV**

Q1. Which side Keynes focused upon?

Ans.....

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Q2. Does saving investment approach determines the same equilibrium level of the national income as determined by the aggregate demand and aggregate supply approach?

Ans.....-

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## **2.6 Summary**

The classical economists believed that economy is always in equilibrium given the perfect competition in the market. If there is disequilibrium caused by external forces, the market forces of demand and supply bring it back to equilibrium. The classical economics is based on Say's law which states that aggregate demand is always equal to aggregate supply. The classical economics was dominating the macroeconomic ideas until the Great Depression, when ideas of classical economists were challenged by Keynes. Keynes argued that classical economics is failed to explain the phenomenon of US economy during the Great Depression. He criticized the Say's law and emphasized the role of aggregate demand. Keynes believed that there is possibility of overproduction due to deficiency of aggregate demand. He also questioned the classical economists' postulate of wage-price flexibility and argued that wages and prices may be inflexible downwards.

## **2.7 Question for Practice**

### **A. Short Answer Type Questions**

Q1. Define aggregate demand and aggregate supply.

- Q2. What is principle of laissez-faire?
- Q3. Do Keynes believe in laissez-faire?
- Q4. Explain wage-price flexibility.
- Q5. What is interest rate flexibility?
- Q6. Derive Keynesian aggregate supply curve.
- Q7. Why wages and prices are sticky?
- Q8. Differentiate between classical and Keynesian views.

## **B. Long Answer Type Questions**

- Q1. Explain in detail the classical theory of output and employment.
- Q2. Explain in detail the Keynesian theory of output and employment.
- Q3. Critically examine the classical approach to income, output and employment determination.
- Q4. How equilibrium level of output is determined under AD-AS framework of Keynes.

## **2.8 Suggested Readings**

- Arnold, R.A. (2008). *Macroeconomics*. South-Western Cengage Learning.
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**M.A (ECONOMICS)**

**SEMESTER–II**

**COURSE: MACRO ECONOMICS**

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**UNIT 3: KEYNES' PSYCHOLOGICAL LAW OF CONSUMPTION, DETERMINANTS OF PROPENSITY TO CONSUME, ABSOLUTE AND RELATIVE INCOME HYPOTHESIS**

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**STRUCTURE**

**3.0 Learning Objectives**

**3.1 Introduction**

**3.2 Basic Concepts of Consumption**

**3.3 Keynes' Psychological Law of Consumption:**

**3.3.1 Assumptions**

**3.3.2 The Fundamental Psychological Law**

**3.3.3 Determinants of Propensity to Consume**

**3.3.4 Subjective Factors**

**3.3.5 Objective Factors**

**3.3.6 Habits of Consumer**

**3.4 Absolute Income Hypothesis**

**3.4.1 Short Run Consumption Function**

**3.4.2 Long Run Consumption Function**

**3.4.3 Criticism**

**3.5 Relative Income Hypothesis**

**3.5.1 Assumptions**

**3.5.2 Demonstration Effect:**

**3.5.3 Ratchet Effect**

**3.5.4 Criticism**

**3.6 Summary**

**3.7 Questions for Practice**

**3.8 Suggested Readings**

### **3.0 Learning Objectives**

After reading this unit, learner will be able to:

- Know the concept of consumption function.
- Describe Keynesian consumption function.
- Describe Relative Income Hypothesis.
- Identify the factors influencing consumption decisions.

### **3.1 Introduction**

The consumption decisions of households, i.e. how much to consume and how much to save, are crucial. The classical school of thought tends to view consumption in negative sense because in their perspective, consumption spending is unproductive. The classical economists, based on Say's law, focused on supply side. Keynes, on the other hand, emphasized on demand side. He rejected the view of classical economists and appreciates the central role of consumption expenditure in determining effective demand. Keynes focused on propensity to consume in his theory to explain aggregate consumption expenditure.

### **3.2 Basic Concepts of Consumption**

In the unit, we are going to discuss the consumption behavior of individual household. While studying the consumption behavior of individual household, we will go through Keynes' Psychological Law of Consumption, Determinants of Propensity to Consume, Absolute and Relative Income Hypothesis. Before we discuss these laws related to consumption expenditure, we need to have some idea of the concepts related to these laws such as consumption function, propensity to consume, propensity to save etc. Let us discuss these concepts first.

- A. Disposable Income:** All personal income is not disposable. Individuals have to pay taxes and they are free to spend left over income after payment of taxes. Thus, Disposal income is the income after receipt of government transfers and payment of taxes.

Personal Disposal Income = Personal Income – (Payable Taxes + Other Deductions)

We can observe from our daily life that people with high disposable income on an average

Spend more than people with lower disposable incomes.

**B. Consumption Function:** A functional statement showing relationship between consumption expenditure and its determinants is known as Consumption Function. Consumption expenditure of an individual or household depends on many factors such as income, wealth, expected future income, consumption of other people, age etc. Income is the primary determinant of consumption out of these factors, hence general form of consumption function shows the relationship between consumption expenditure and disposable income. It can be written as:

$$C = f(Y)$$

Where, C – Consumption Expenditure, and Y – Disposable Income.

**C. Propensity to Consume:** Propensity to consume is a functional relationship between given level of income and consumption expenditure out of that level of income.

i) **Average Propensity to Consume (APC):** The proportion of disposable income which is spent on consumption expenditure is called average propensity to consume.

$$APC = \frac{C}{Y}$$

ii) **Marginal Propensity to Consume (MPC):** The change in consumption expenditure with rise or fall in disposable income is called marginal propensity to consume. It is the amount consumed out of additional rupee of income and calculated by dividing change in consumer spending by change in disposal income.

$$MPC = \frac{\Delta C}{\Delta Y}$$

Where,  $\Delta C$  – change in consumption expenditure and  $\Delta Y$ - change in disposable income

**D. Saving Function:** As we know that income is either consumed or saved therefore

$$Y = C + S$$

$$S = Y - C$$

Where S- Savings,

Therefore, saving function is counterpart of consumption function and it shows the relationship between savings and disposable income.



1. **Average Propensity to Save (APS):** The proportion of disposable income which is not spent on consumption expenditure or saved is called average propensity to save.

$$APS = \frac{S}{Y}$$

2. **Marginal Propensity to Save (MPS):** It is the amount saved out of additional rupee of income and calculated by dividing change in savings by change in disposal income.

$$MPS = \frac{\Delta S}{\Delta Y}$$

Where,  $\Delta S$  – change in savings and  $\Delta Y$ - change in disposable income

**E. Relationship between Marginal Propensity to Consume (MPC) and Marginal Propensity to Save (MPS):** We know that that part of income which is not spent on consumption expenditure is saved i.e.

$$Y = C + S$$

$$S = Y - C$$

$$\Delta S = \Delta Y - \Delta C$$

Divide both sides by  $\Delta Y$

$$\frac{\Delta S}{\Delta Y} = \frac{\Delta Y}{\Delta Y} - \frac{\Delta C}{\Delta Y}$$

$$MPS = 1 - MPC$$

Or

$$MPS + MPC = 1$$

Therefore, total of marginal propensity to consume or marginal propensity to save is equal to one.

**F. Autonomous Consumption Expenditure:** Till now we have studied that consumption expenditure of a household depends on disposable income. But we can imagine a situation, when disposable income of household is nil. What would be the consumption expenditure of a household with zero disposable income? A household with zero disposable income would fund some consumption using its savings or by borrowing from someone. So, the expenditure of a household on consumption if it had zero disposable income is called autonomous consumption expenditure and the level of consumption independent of disposable income is called autonomous consumption.

### **3.3 Keynes' Psychological Law of Consumption**

When we think about consumption function, some mathematical functional relationship comes to our mind. The economists, who study the consumption behavior, rely on data collected on income and consumption expenditure to analyze the behavior of households. However, Keynes, who wrote his book in 1936, made certain assumptions about consumption function based on introspection and observations.

#### **3.3.1 Assumptions**

Keynes' Psychological law of consumption is based on following assumptions:

- 1) Households decide their current consumption expenditure on the basis of their current income.
- 2) The marginal propensity to consume (MPC) is between zero and one.
- 3) The average propensity to consume (APC) falls as income rises.

Based on above assumptions Keynes developed a theory of aggregate consumption.

#### **3.3.2 The Fundamental Psychological Law**

Keynes' theory of aggregate consumption, what he calls a fundamental psychological law, is based on the concept of propensity to consume.

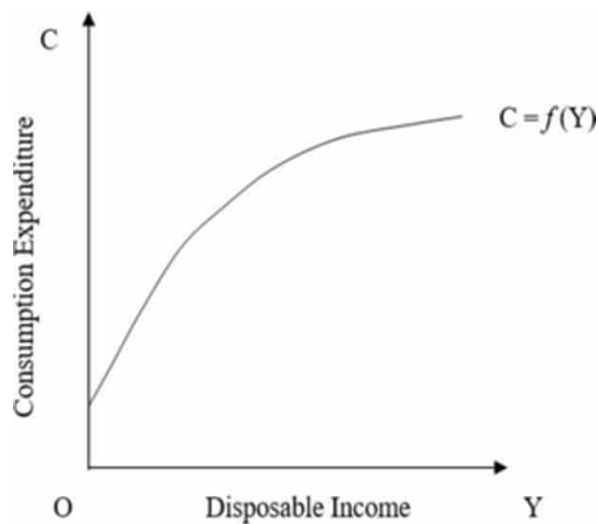
Keynes' defined this law as –the fundamental psychological law, upon which we are entitled to depend with great confidence, both a priori from the knowledge of human nature and from the detailed facts of experience, is that men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income.“

In the opinion of Keynes, when a person earns an extra unit of income (say rupee), he typically spends some part of it and saves remaining part of it. But as income increases, people spend less and less proportion of marginal income on consumption i.e. marginal propensity to consume decreases with increase in income. Thus, Keynes talked about non-linear consumption function. We can see from table below that marginal propensity to consume do not remains

constant. It decreased as income increases. This relationship is also shown with the help of Table 1 and the diagram (Figure 1).

**Table 1**

Income (Y)	Consumption (C)	Savings (S)	$MPC = \frac{\Delta C}{\Delta Y}$
0	50	-50	-
100	130	-30	0.8
200	200	0	0.7
300	250	50	0.5
400	275	125	0.25



**Figure 1**

The consumption function produced by Keynesian theory is relevant for individual household's consumption behavior not for the economy as a whole or at the aggregate level. However, Keynesian economists empirically estimated the consumption function for economy of US and found that the relationship of income and consumption expenditure is linear i.e. marginal propensity to consume remains constant. Thus, propensity to consume is central to the consumption theory of Keynes and Keynesian economists.

### **Check Your Progress- I**

Q1. Define consumption function.

Ans .....

Q2. What do you mean by propensity to consume?

Ans .....

Q3. Define saving function.

Ans .....

### **3.3.3 Determinants of Propensity to Consume**

The propensity to consume out of disposable income is centre-piece of Keynes' theory of aggregate consumption. Although income is the main determinant of consumption spending, but there is other which determine the value of propensity to consume. These are subjective, objective and habitual factors.

### **3.3.4 Subjective Factors**

The subjective factors consist of such factors which motivate people to consume more or which put pressure on people to save more. These motivations may be different in different societies and depends on culture, history and beliefs of the society. We can broadly categorize the subjective factors into two types of motivations.

- A) Motivation to Consume:** If a community believes in enjoyment and extravagance, it shows that subjective motivations to consume are strong in that society. Hence the propensity to consume out of given income will increase.
- B) Motivation to Save:** If in a society, there are subjective motivations to refrain from consumption, people will believe in precaution, greed and saving. Hence subjective motivations to save are strong and propensity to consume out of given income will fall.

Keynes believed that subjective factors are unlikely to influence propensity to consume in short period. According to Keynes, subjective factors will only occur over long period of time.

### **3.3.5 Objective Factors**

Keynes also identified some objective factors which can influence propensity to consume. These factors are:

- 1) **Windfall Gain and Loss:** Windfall gains and losses are unexpected. Therefore,

Propensity to consume increases with windfall gains and it falls with windfall losses.

- 2) **Expected Future Change in Rate of Interest:** The propensity to consume is likely to increase with low rate of interest. But according to Keynes, propensity to consume is not responsive to small changes in interest rate.
- 3) **Change in Distribution of Income:** If the distribution of income moves towards poor people of the society, propensity to consume will increase.
- 4) **Change in Fiscal Policy:** Due to change in taxation policy, if the distribution of income changes, then it can influence the value of propensity to consume.
- 5) **Change in Aggregate Net Income:** Entrepreneurs set aside financial provision to cover supplementary costs. If aggregate net income falls due to increase in these supplementary costs, propensity to consume will fall.

#### **3.3.6 Habits of Consumer**

According to Keynes, another factor along with income, objective factors and subjective factors that can influence the propensity to consume is the habits of consumers. Due to short-period changes in level of income, the habits of consumers do not adjust to the changes instantly. This can cause value of the propensity to consume to fluctuate. However, if the change in income is sustained then eventually the consumer's habits will adjust to the changes.

However, Keynes assumed these subjective, objective and habitual factors remained constant and hence propensity to consume is a reasonably stable function.

#### **3.4 Absolute Income Hypothesis**

Keynesian fundamental law of consumption was the first systematic theory of consumption expenditure. However, Keynes' theory of consumption was challenged on the basis of argument that consumption expenditure depends not only on current income but also on other factors like wealth, expectations, income distribution etc. Although the economists have the view that consumption expenditure is function of income but different economists have different concept of income like absolute income, relative income, current income, expected income and permanent income etc. The main theories of consumption are- Absolute Income Hypothesis, Relative Income hypothesis, Permanent Income Hypothesis and Life-cycle hypothesis.

In this unit, we are going to discuss first two theories viz. Absolute Income Hypothesis and Relative Income Hypothesis. This sub-section deals with absolute income hypothesis.

Based on the psychological law of consumption, the absolute income hypothesis states that the current consumption expenditure is function of current and absolute level of income. That is

$$C = f(Y)$$

Where, C- current consumption and Y – Current income

### **3.4.1 Short-Run Consumption Function**

Keynesian theory deals in short-run. Therefore, theory of consumption is also treated as short-run theory.

- Change in income leads to change in consumption as well as change in savings. That is,

$$\bullet \quad \Delta Y = \Delta C + \Delta S$$

- Consumption Expenditure is positive function of current absolute income. There is positive relationship between consumption and income. That is, if income increases, consumption expenditure also increases.

$$\circ \quad \begin{array}{c} \blacksquare \\ \blacksquare \end{array} \quad C = f(Y) \text{ and } \frac{\Delta C}{\Delta Y} > 0$$

- Consumption income relationship is reversible i.e., if income decreases, consumption expenditure also decreases.
- Consumption expenditure of individual household does not depend on consumption expenditure of other consumer.
- Relationship between consumption and income is non-proportional in nature. That is if income increases, consumption expenditure will increase less than proportionately.
- The value of marginal propensity to consume lies between zero and one i.e.  $0 < MPC < 1$ .
- The marginal propensity to consume is less than average propensity to consume i.e.
 
$$\frac{\Delta C}{\Delta Y} < \frac{C}{Y} \text{ or } MPC < APC$$
- There is negative relationship between average propensity to consume (APC) and income (Y).
- The marginal propensity to consume declines as income increases.

Therefore, according to absolute income hypothesis, marginal propensity to consume decreases with increase in income. That is, households with lower income have higher marginal propensity to consume than households with higher income. However, Keynesian economists, on basis of empirical data, found that marginal propensity to consume is stable in nature and relationship between consumption and income is linear.

Thus, in absolute income hypothesis, consumption function can be written as:

$$C = a + bY$$

Where, C is consumption expenditure,

a is autonomous consumption and

$$b \text{ is MPC} = \frac{\Delta C}{\Delta Y}$$

Example: Keynesian economist's consumption function with constant MPC can be shown (Table 2) as follows (hypothetical example):

**Table 2**

<b>Income (Y)</b>	<b>Consumption (C)</b>	<b><math>MPC = \frac{\Delta C}{\Delta Y}</math></b>
0	100	0.65
100	165	0.65
200	230	0.65
300	295	0.65
400	360	0.65

The equation of consumption function representing above example can be written as:

$$C = 100 + 0.65 Y$$

Where, C is consumption expenditure and the value 100 shows the autonomous consumption i.e. level of consumption at zero level of income. Y is income and marginal propensity to consume is 0.65. We can note here that although MPC is less than one but it remained constant with increase in income. This consumption function can also be shown with the help of figure 2.

Thus, based on postulates of absolute income hypothesis, short run consumption function reflects that as income increases, people tend to spend a decreasing percentage of income or tend to save an increasing percentage of income. Therefore, marginal propensity to consume is less than average propensity to consume. If with increase in income, the ratio of consumption to income (APC) falls then the ratio of increment to consumption to increment to income (MPC) must be smaller than APC.

### **3.4.2 Long-Run Consumption Function**

In long-run, consumption is determined by income, objective factors and subjective factors.

$$C = f(Y, O, S)$$

Where, C is consumption expenditure, Y is income, O is objective factors and S is subjective factors.

In 1946, Simon Kuznet studied the consumption and saving behavior. The study showed that average propensity to consume does not fall with increase in income and it is equal to marginal propensity to consume over the long run. Therefore, by late 1940s, it was observed that

Cross-sectional budget studies and business cycle or short run data show that  $MPC < APC$ .

Long-run trend data show that  $MPC = APC$ .

### **3.4.3 Criticisms**

The Keynesian consumption function is criticized on following grounds:

Keynes' absolute income hypothesis is based more on 'introspection' than on observed facts.

Concept of income used by Keynes is wrong. Current consumption not only depends on current income but also on past savings.

Role of wealth is not fully integrated into this theory.

Keynesian consumption function is unable to explain the long run constancy of APC.

It has ignored the role of expectations in consumption decisions.

Role of relative income in determining consumption expenditure is also ignored in absolute income hypothesis.



In spite of these criticisms, Keynesian theory is the first theory of consumption and other theories are improvements of this theory. This theory is able to explain the cross-section consumption function.

### **Check Your Progress- II**

Q1. Define absolute income hypothesis.

Ans .....

Q2. Define long run consumption function of propensity to consume.

Ans .....

### **3.5 Relative Income Hypothesis**

We have noted that Keynes' consumption theory could not be supported by empirical data. Therefore, economists tried to develop a consumption theory based on empirical data. The model developed by Duesenberry in 1949 differs from absolute income hypothesis. Duesenberry by using income-consumption data propounded the theory of consumption based on two Relative Income Hypotheses.

- A) According to first hypothesis, consumers are not so much concerned about their absolute level of consumption as they are with their consumption relative to that of the rest of the population.
- B) Duesenberry's second hypothesis is that present consumption is not only influenced by present levels of absolute and relative income but also by levels of consumption attained in previous period.

#### **3.5.1 Assumptions**

Relative income hypothesis of consumption is based on following assumptions:

Consumption decisions of households are interdependent.

The interdependence of consumption decisions is based on strong demonstration effect i.e. imitation of consumption decisions of other households in the same relative income group.

Consumption habits are irreversible. Once acquired cannot be changed easily.

### **3.5.2 Demonstration Effect**

According to relative income hypothesis, the consumption expenditure of a household does not depend on its absolute income but on the level of its income in relation to the households with which it identifies itself. That is households having a relatively lower income and living in the community of higher incomes tend to spend a higher proportion of their income than the households with higher incomes. This is called demonstration effect on consumption.

This hypothesis is particularly based on social pattern of consumption. Consumption is not independent. Consumption behavior of a person is affected by consumption of society. A statement showing social pattern of consumption, known as *Joneses Effect* is:

- To keep up with Joneses

The statement indicates that middle class people try to keep their standard according to high standard families

Therefore, implications of the relative income hypothesis are:

- MPC remains the same for all the households if their income changes by the same amount.
- If the income of other households remains same, MPC remains same with increase in absolute income of household.
- If the income of other households of the group increases, then MPC of the household with constant income increases.
- If a household moves up from a lower income-group to a higher income-group then its MPC decreases.

The proposition of fall in MPC as household move to higher income group is same as Keynes' propositions. However, the relative income hypothesis makes a significant deviation from the absolute income hypothesis.

While absolute income hypothesis holds that relationship between consumption expenditure and absolute income is positive, the relative income hypothesis holds that consumption does not decrease in proportion to decrease in income. Duesenberry explained it in the form of so called, the Ratchet Effect.

### **3.5.3 Ratchet Effect**

According to Duesenberry it is much more difficult for a family to reduce consumption level once attained than to reduce savings. Thus, previous income put forth its influence on current consumption. Duesenberry maintains that basic consumption-income relationship is proportional. During expansion, the higher current income tends to raise consumption in proportion to it. But the depressant pull of previous lower income permits it to rise only less than proportionately and APC falls with a rise in income. On the other hand, decline in current income tends to reduce consumption in proportion to it. But as the people had become used to a higher consumption standard, the ascendant pull of previous higher income restrains people to cut consumption only less than proportionately and APC goes on rising with fall in income.

This type of consumption behavior gives us the Ratchet Effect. During period of recovery, as income increases, consumption increases slowly because of two reasons:

- Due to depressant pull of low level of income of previous period.
- People will like to compensate for decline in their savings due to previous decline in income. As soon as the previous dissavings are made good, consumption starts rising in long run in proportionate relation with income.

Thus, this hypothesis points out that consumer find it much easier to increase consumption than to reduce it. This is called the Ratchet Effect. It can be shown with the help of following diagram example and diagram.

**Table 3**

Income(Y)	Consumption (C)	$MPC = \frac{\Delta C}{\Delta Y}$	$APC = \frac{C}{Y}$	Relation between MPC and APC
Increase in Income				
100	80	0.8	0.8	MPC = APC
110	88			
Fall in Income				
100	80	0.5	0.83	MPC < APC
90	75			

As income increases (from Rs. 100 to Rs. 110), consumption also increases (from Rs. 80 to Rs. 88) along the long run function with constant APC. But let us suppose at point C<sub>1</sub>, there is recession in the economy and income falls off (from Rs. 100 to Rs. 90) then consumption expenditure decreases (from Rs. 80 to Rs. 75) along a short run function C<sub>1</sub>C<sub>1</sub> not along long run (i.e. from Rs. 80 to Rs. 72). Ratchet effect keeps consumption at Rs. 75. Recovery of income take consumption back to previous level trend growth resumes along the long-run function.

Thus, Duesenberry's model implies a ratchet effect is that when income falls off, fall in consumption is less than it rises as income grows. Hence consumption-income relationship is not reversible.

#### **3.5.4 Criticisms**

The economists have pointed out following shortcomings in the relative income hypothesis:

- 1) This theory ignores the role of absolute income and wealth in consumer decisions.
- 2) Role of expectations has also been ignored.
- 3) This hypothesis is silent about the role of non-income determinants viz. subjective and objective factors in consumption decisions.
- 4) Consumer decisions are not only based on imitations but also on preferences.
- 5) This theory does not tally with latter empirical evidences. The empirical evidence however suggests that with unexpected increase in incomes, consumption increases less than

proportionately.

- 6) Consumption standards are reversible in long run. Because If there is a continuous fall in income, people cannot go on dissaving in the long run to maintain their earlier living standards. However, the relative income hypothesis does admit the reversibility of consumption expenditure with decrease in income but less than proportionately.

Thus, we can say that, despite its criticism, Duesenberry's relative income hypothesis is regarded as a significant improvement over the absolute income hypothesis as it taken into account the role of demonstration effect and past consumption habits in consumption decisions.

### **Check Your Progress- III**

Q1. Explain the statement *To keep up with Joneses*.

Ans .....

Q2. Define Ratchet effect.

Ans .....

### **3.6 Summary**

The consumption behavior of household is important in determining aggregate demand. Consumption expenditure of an individual or household depends on many factors such as income, wealth, expected future income, consumption of other people, age etc. but income is the primary determinant out of these factors. Therefore, functional statement showing relationship between consumption expenditure and its determinants is known as Consumption Function. The change in consumption expenditure with change in income is shown by marginal propensity to consume. According to Keynes, current consumption expenditure depends on current income and marginal propensity to consume lies between zero and one. In his Fundamental psychological law, Keynes stated that as income increases, people spend less and less proportion of marginal income on consumption i.e. marginal propensity to consume decreases with increase in income. However, Keynesian economists based on empirical findings argued that marginal propensity to consume

although less than one but remains constant with increase in income. According to Keynes, along with income there are some objective factors, subjective factors and habitual factors which may influence the consumption behavior of individual. On the other hand, Duesen berry by using income-consumption data propounded the theory of consumption based on two Relative Income Hypotheses. According to Duesen berry, consumers are very much concerned about their consumption relative to rest of the population. He also highlighted the role of consumption attained in previous period in determining consumption levels.

### **3.7 Questions for Practice**

#### **A. Short Answer Type Questions**

- Q1. Explain briefly the concept of APC and MPC.
- Q2. What is the relationship between APC and MPC?
- Q3. What is autonomous consumption?
- Q4. What do you mean by non-linear consumption function of Keynes?
- Q5. Explain Demonstration Effect.
- Q6. What is Ratchet Effect on consumption?
- Q7. What are the subjective factors influencing consumption behavior?

#### **B. Long Answer Type Questions**

- Q1. Explain in detail the Fundamental Psychological Law of Consumption.
- Q2. What is Absolute Income Hypothesis?
- Q3. Explain in detail the theory of consumption based on Relative Income Hypothesis.
- Q4. How demonstration effect and Ratchet Effect influence the consumption behavior of individual?
- Q5. What is propensity to consume? What are the determinants of propensity to consume?

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**M.A (ECONOMICS)**

**SEMESTER –II**

**COURSE: MACRO ECONOMICS**

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**UNIT 4 A : INVESTMENT FUNCTION AND MARGINAL EFFICIENCY OF CAPITAL**

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**STRUCTURE**

**4.0 Learning Objectives**

**4.1 Introduction**

**4.2 Basic Concepts of Investment**

**4.3 Types of Investment**

**4.3.1 Autonomous and Induced Investment**

**4.3.2 Gross and Net Investment**

**4.3.3 Ex-ante and Ex-post Investment**

**4.4 Investment Function**

**4.5 Factors Affecting Investment Decisions**

**4.5.1 Marginal Efficiency of Capital**

**4.5.2 Marginal Efficiency to Investment**

**4.5.3 Market Rate of Interest**

**4.6 Investment Demand Schedule**

**4.7 Relationship between MEC, Rate of Interest and Investment**

**4.8 Decision Rule for the Entrepreneur**

**4.9 Summary**

**4.10 Questions for Practice**

**4.11 Suggested Readings**

**4.0 Learning Objectives**

After going through this unit, learner will be able to:

- Describe the concept of Investment function
- Differentiate between different types of investment
- Identify the factors affecting the investment decisions
- Interpret the concept of marginal efficiency of capital



- Illustrate the investment demand schedule
- Recognise the relationship between MEC, rate of interest and investment.

#### **4.1 Introduction**

Term investment is a very common phrase and it usually refers to the addition in the existing stock of capital. In macroeconomics literature, investment has always been an important factor. This importance has been enjoyed not only in the Keynesian and post-Keynesian theories but also in the pre-Keynesian business cycle theories. This is so because aggregate investment expenditure is an important and volatile component of the aggregate demand function. Investment expenditure is found to be at higher levels in course of prosperity due to high rates of profitability, whereas it is found to be at lower levels in times of depression due to very low rates of return. In course of depression, investors become risk-aversers and even reluctant to incur expenditure even for replacing the depreciated capital equipment. Therefore, we can say that investment plays a crucial role in determining the level of national income/output/employment in the country. Moreover, higher level of investment provides a push factor to productive capacity and hence assists in generating higher level of aggregate demand and supply, which will further help in achieving the goal of full employment in the economy.

In the light of above introduction, this unit will first of all provides the meaning of investment concept, then we will differentiate between different types of investment- gross and net; induced and autonomous and ex-ante and ex-post investment. After this, unit will focus on the determining factors of investment decision. From this, you shall be able to derive the meaning and determinants of the MEC. Finally, in the last sections of the unit, you will be able to analyse that how the investment decisions are undertaken by the investors in particular capital asset or project.

#### **4.2 Basic Concepts of Investment**

In common parlance investment is considered as the purchase of the existing stocks, shares, debentures and securities. But this is not generating or adding any increment to the productive capacity of the economy, which is regarded as the general

outcome of the investment. So, in economics, such kind of expenditure on the purchase of stocks, shares, bonds and other financial instruments is not regarded as the investment, rather it is referred to as the financial investment, in which money merely transferred from one hand to another. In economics, investment is usually defined as the addition in the existing stock of capital.

In Keynesian economics, there is difference between real and financial investment. Real investment means, the investment undertaken in the purchase of new machines, construction of new factory buildings, roads, bridges and other forms of productive capital stock of the community, including the increase in inventories. On the other hand, financial investment refers to purchase of financial instruments (stocks, bonds, debentures, securities etc.), which comprises a transfer of money from one party to another party involved in the transaction. Financial investment does not lead to any change in the employment level in the economy. It is the real investment, which leads to change in the employment in the economy. An increase in the real investment will result in increase in demand for labour as well as for other physical resources and hence increasing the employment in the economy. Therefore, investment plays a strategic role in achieving the major goals of the economy. From above discussion it is clear that in economics, we are concerned with the Keynesian sense of investment.

Different economists have defined the term investment differently. In the words of J.M. Keynes, 'investment refers to the increment of the capital equipment.' According to Edward Shapiro, 'investment is that part of the economy's output for any time period that takes the form of new structures, new producer's durable equipment and change in inventories.' According to Rosalind and Rebmann, 'Investment refers to the accumulation over time by firms of real capital goods, which will yield a future flow of services. Real capital goods can be subdivided into two types- fixed capital and working capital. Fixed capital comprised of plant, machinery, buildings and transport infrastructures, which keep their particular physical form throughout their working life. Working capital consists of stocks of raw materials, manufactured inputs and final goods.'

In simple terms, investment refers to the addition in the existing physical stock of capital in a given time period.

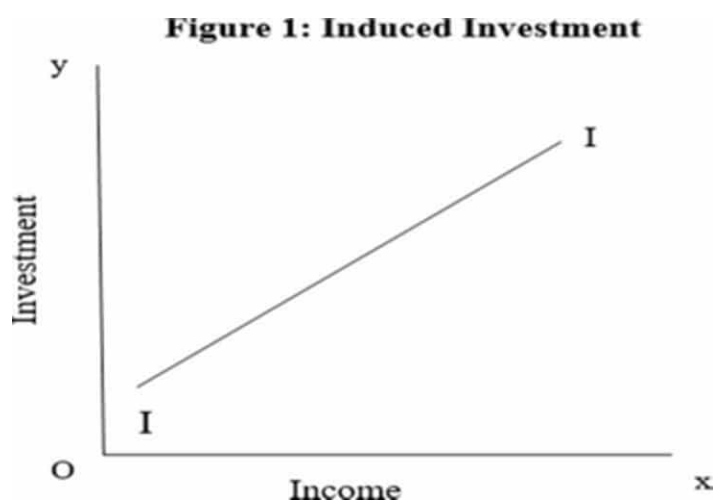
### **4.3 Types Of Investment**

There are different types of investment and their classification is based on the purpose, which they are solving. In this unit, we have emphasised on the following types of the investment-

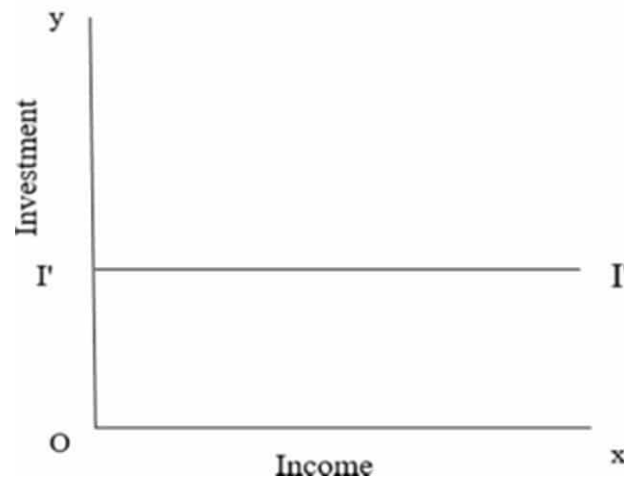
1. Autonomous and Induced investment
2. Gross and Net Investment
3. Ex-ante and ex-post investment

#### **4.3.1 Autonomous And Induced Investment**

On the basis of returns from investment, it can be classified into two categories autonomous or induced type. Induced investment is usually associated with private sector and autonomous is associated with public sector. Induced investment, as its name suggest, is induced by the profit motive, this type of investment is determined by the changes in the income i.e. induced investment increases as income increases. The functional relationship between the investment and the income, indicating the induced investment in the economy can be illustrated with the help of Figure 1. On the x-axis income is measured and along with y-axis corresponding changes in the investment level are measured. It is the induced investment curve having positive slope. It is clearly shown in the figure that induced investment curve is upward sloping, implying the increase in investment level as a result of increase in the income level.



**Figure 2: Autonomous Investment**



Autonomous investment is not motivated by the profits. Autonomous investment is independent of the fluctuations in the output/income/profits level. Such type of investment is usually undertaken by the government- either central or state level or both. In simple words, autonomous investment is the expenditure incurred on the capital formation exclusively by the government, and which is independent of the change in income, output, rate of interest (profit rate) etc. The curve of autonomous curve is shown in the Figure 2. Figure is depicting the relationship between the investment and the income variables in the economy.  $I'$  is the autonomous investment curve. Shape of autonomous investment curve is horizontal, parallel to x-axis, representing income-inelasticity. Thus, we can say that autonomous investment is independent of economic activity. During the period of depression, government tries to boost the economic system by increasing the level of autonomous investment. Therefore, autonomous investment is one of the components of the welfare state.

#### **4.3.2 Gross and Net Investment**

Gross investment is defined as, the expenditure incurred on purchase of new fixed capital goods and on the maintenance of the existing stock of capital, in a given time period. Expenses incurred on the maintenance of the existing stock of capital are known as the replacement investment. Replacement investment is undertaken to offset the depreciation, wear and tear and obsolescence in the existing stock of capital. On the other hand, net investment can be obtained by subtracting the replacement investment from the gross investment. Thus, net investment actually shows the net addition to the

stock of capital in a given year. It is the change in net investment, which leads to changes in the income, output and employment level in the economy. We can show the relationship between gross and net investment symbolically also-

$$I_g = I_n + I_r$$

$I_g$  refers to the gross investment taking place in the economy in a given period;  $I_n$  refers to net investment- net addition to stock of capital and  $I_r$  shows the replacement investment in a given year. From the above equation three possibilities can be drawn regarding addition in the productive capacity of the economy

$I_g > I_r$ : If in the given period value of  $I_g$  is more than  $I_r$ , it means  $I_n$  is positive and there is actual increase in the stock of capital in that year and hence increase in the productive capacity of the economy.

$I_g < I_r$ : If in the given period, value of  $I_r$  is more than  $I_g$ , then  $I_n$  would be negative for that year, indicating decline in the productive capacity of the economy on account of depreciation and obsolescence expenses.

$I_g = I_r$ : When the value of gross investment is equal to the value of replacement investment, then the value of net investment is found to be zero, indicating zero addition to the productive capacity of the economy.

Therefore, net investment is an addition to the stock of capital in a given time period and the gross investment is made up of new structures and new producers' durable equipment and allowance for the wear and tear and obsolescence of the existing stock of capital. Shapiro (2001) has classified the gross investment into three components- non-residential investment (which is essentially business fixed investment); residential investment (largest component of which is single unit houses) and the inventory investment (non-fixed component, change in the business inventories).

#### **4.3.3 Ex-Ante and Ex-Post Investment**

Ex-ante investment, also known as planned or intended investment, is usually undertaken by the firms in a planned way so that pre-determined targets can be achieved. The reason behind such type of investment by the firms is that- firstly, firms

have anticipation that there will be increase in demand, so in order to earn profits, firms make planned investment. Secondly, ex-ante investment is required when the government want to achieve the goal of certain level of employment in the economy. On the other hand, ex-post investment is also termed as unplanned or unintended investment. As the name suggest, it is not planned investment, it takes place due to unexpected changes in the economic activity (demand in particular) in the economy. Simply, such type of investment is not intended or anticipated by the firms and the firms increase the stock of capital all of sudden in order to offset the fall in demand.

### **Check Your Progress- I**

Q1. What do you understand from autonomous investment?

Ans. ....  
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Q2. Differentiate between gross and net investment.

Ans. ....  
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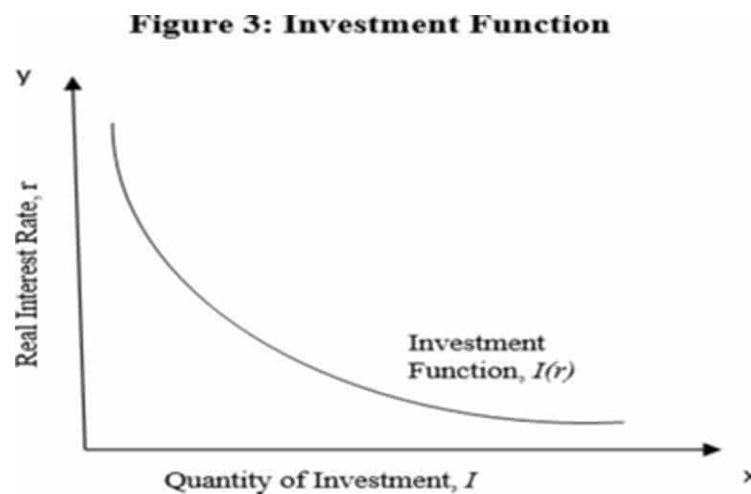
## **4.4 Investment Function**

Investment function refers to the functional relationship between the level of investment and the real interest rate. In any economy volume of investment depends on the rate of interest. Interest rate reflects the cost of the borrowed funds, utilised for the investment purpose. Investment in profitable manner will take place only when the returns from the investment are more than the cost of borrowing the funds. In the context of interest rate, it is essential to distinguish between two types of interest rates i.e. nominal and real interest rate. Nominal interest rate is that interest rate, which is usually reported and investors pay in order to borrow money. Real interest rate, on the other hand, is that rate of interest which is corrected for the effects of inflation (Mankiw, 2008). For example if in year 2020, the nominal interest was found to be 6 per cent and the inflation rate was 2.6 per cent, in that case our real interest rate would have been 3.4 per cent. From the above distinction it is clear the real interest rate is most important because it helps us in calculating the actual cost of borrowing. Therefore, real interest rate is an important determinant of the investment decision.

We can depict the investment function in the functional form as-

$$I=I(r)$$

This equation shows that investment ( $I$ ) is function of the real rate of interest (cost of borrowing). Further this functional relationship between investment and real rate of interest can be illustrated with the help of figure. Figure 3, shows the investment function.  $I(r)$  curve shows the change in quantum of investment due to changes in the real rate of interest. Real interest rate ( $r$ ) and quantity of investment is measured along y-axis and x-axis respectively.



From the figure it is clear that, slope of the investment function is negative (downward) implying inverse relationship between the interest rate and quantity of investment. When the interest rate is lower, more quantity of investment will be demanded and vice-versa. If there is change in interest rate then it will be depicted on the same investment demand curve. But if interest rate remaining the constant and there is change in other factors such as technological progress, future expectations, change in cost etc. then it will be shown by shift in investment demand curve either rightward or leftwards depending upon the direction of change in other variables.

#### **4.5 Factors Affecting Investment Decisions**

As it is known fact that capital goods are useful for long time, so producers or firms usually take the decision to invest after considering returns from the investment. Decision to invest is affected by the cost of borrowing funds and expected returns out of this particular investment. Entrepreneur's estimate of the profit or loss that will accrue

from any particular investment is based on the relationship among three components- the expected income flow from the capital good, purchase of price of the capital good and the prevailing market rate of interest. Although, there are several factors influencing the investment decision of the entrepreneur but Keynes has focused on two major determinants namely, market rate of interest and marginal efficiency of capital. Usually, entrepreneurs compare the marginal efficiency of capital with the market rate of interest; decision to investment will be taken only when the former is more than the later. If the rate of interest comes out be more than the marginal efficiency of the capital, then no investment will be undertaken by the entrepreneurs. In the following section we will elaborate the case of marginal efficiency of capital and rate of interest and their relationship with investment.

#### **4.5.1 Marginal Efficiency of Capital (MEC)**

This is an important variable in the Keynesian theory of investment. Marginal efficiency of capital is also termed as Internal Rate of Return (IRR). Keynes has defined the MEC as, that rate of discount which makes the present value of the series of annuities given by returns expected from the capital asset during its life just equal to its supply price. So, MEC can be considered as that rate of discount which makes the discounted present value of expected income stream equal to the cost of capital. Keynes has termed the expected rate of return from capital asset as the prospective yield and cost of capital as supply price. Therefore, marginal efficiency of capital is determined by these two factors i.e. prospective yield and supply price of capital asset.

**A. Prospective Yield:** It actually shows the net return which is expected from the capital asset, over its whole life. In order to find out the net return, all costs like maintenance, wear and tear expenditure, depreciation or obsolescence cost etc. are deducted from gross returns. If the expected life of the capital asset can be segregated into number of series of years, then the returns per annum can be converted into series of annuities. Here the term annuity refers to the returns of a fixed amount at uniform intervals of time. Let us assume that series of annuities is shown by-

$$R_1, R_2, R_3, \dots, R_n,$$



where  $R_1$  refers to returns in 1<sup>st</sup> year,  $R_2$  as returns in 2<sup>nd</sup> year and similarly,  $R_n$  means returns in the  $n$ th year of the capital asset. By adding these annual returns over the life time of capital asset, we will be having prospective yield of the asset.

**B. Supply Price:** Supply price is also known as replacement cost. Supply price reflects the cost of the asset, particularly of new asset not the existing one. In simple words, supply price is the purchase price of the new capital asset.

After discussing the relevance of prospective yield and supply price, we can focus on the MEC. According to Kurihara, marginal efficiency of capital can also be represented in the form of ratio of prospective to the supply price, symbolically  $i=y/p$ ,  $i$  is the marginal efficiency of capital;  $y$  is perspective yield and  $p$  is the supply price of the capital asset. For example, cost of new capital asset to investor is Rs. 10 lakhs, further, suppose that net return from this asset over its life time is expected to be Rs. 5000 per annum. So, MEC of this capital asset can be calculated by the ratio of annual return to its supply price, i.e.

$$MEC = (5000/100000) * 100 = 5\%.$$

So the value of MEC, in this project is found to be 5 per cent, which is actually showing expected annual return on the investment of Rs 10 lakhs. From this result, it is clear that any increase or decline in supply price of asset will reduce or increase the MEC, given the value of prospective yield. So, it can be stated that MEC is having a direct relationship with the prospective yield and inverse relationship with supply price.

But in this uncertain or dynamic world, it is not so easy to calculate the expected return with so much accuracy. So, there is need to calculate the discounted value of returns with respect to future. Therefore, Keynes has considered the MEC as that rate of discount, which will equate the discounted present value of the expected income with the supply price of cost of capital asset. Accordingly, the formula for estimating the MEC will be,

$$MEC = R/I + r = C$$

In above equation,  $r$  is the rate of discount which makes the discounted value of expected returns ( $R$ ) equal to the supply price of the asset ( $C$ ). So,  $r$  actually shows

the marginal efficiency of capital or internal rate of return. The value of  $r$  can be obtained from the above equation, i.e.

$$r = (R/C) - 1$$

In order to illustrate, we can take an example, let us assume that an entrepreneur undertake an investment in capital asset having life of one year, which costs Rs 100 million and the expected returns from investment are Rs 125 million at the end of one year. Putting these values in the above-mentioned formula, we will get the value of MEC as,

$$MEC = r = (125/100) - 1 = 0.25 \text{ or } 25 \text{ per cent}$$

If the same capital asset is having life of two years and expected return at the end of second year is Rs 144 (it is expected to give no return in first year), then the MEC would be-

$$MEC = 144/(1+r)^2 - 1 = 0.20 \text{ or } 20 \text{ per cent}$$

Similarly, if the life of the capital asset is extending to  $n$  number of years, in that case MEC can be estimated with the help of following formula-

$$MEC = R_1/(1+r) + R_2/(1+r)^2 + R_3/(1+r)^3 + \dots + R_n/(1+r)^n = C$$

For any investment, value of discount rate can be estimated only if we are having the information regarding  $C$  and  $R_1, R_2, R_3, \dots, R_n$  variables.

### **Check Your Progress- II**

Q1. Define investment function.

Ans. ....  
-----

Q2. What is the meaning of supply price of capital asset?

Ans. \_\_\_\_\_  
-----

#### **4.5.2 Marginal Efficiency of Investment (MEI)**

This concept is general form of the marginal efficiency of capital. Difference between the two is, MEI is related to particular project, whereas, MEC is related to particular capital asset. Marginal efficiency of investment (MEI) is that rate of discount which will make the present value of expected returns from the given investment to the cost of financing that project. Symbolically-

$$C = R_1/(1+d) + R_2/(1+d)^2 + R_3/(1+d)^3 + \dots R_n/(1+d)^n$$

Here  $C$  is the cost of financing the given investment project,  $R$  is the expected returns or prospective yield from the given amount of investment and  $d$  implies the rate of discount or marginal efficiency of investment, which makes the expected yields equal to the costs. Importance of this concept is that it assists us in ranking the investment projects or making the choice among different investment projects. If the value of the MEI is found to be high, then obviously ranking of that investment project would be higher and vice-versa.

#### **Difference Between the MEC and MEI**

Marginal efficiency of capital is related to the most gainful capital asset, on the contrary, marginal efficiency of investment is related a fixed amount of investment in particular project.

Marginal efficiency of capital is a stock concept, whereas marginal efficiency of investment is a flow concept.

Under marginal efficiency of capital, supply price is important variable, while under marginal efficiency of investment, cost of financing the project is determining factor.

#### **4.5.3 Market Rate of Interest**

Assessment of the decision to investment cannot be done on the basis of MEC or MEI alone. Market rate of interest also plays a determining role in the investment

decision of the firms. If the investment decision is undertaken solely on the basis of MEC, then in that case it is presumed that market rate of interest is zero and funds are easily available. But in reality, this is not the case. We have to pay a positive price for using the borrowed funds. Therefore, entrepreneur or firms considers both the MEC i.e. expected returns from the investment and the market rate of interest i.e. cost of borrowing funds for investment purpose.

Market rate of interest is defined as the rate at which the funds are borrowed. The relationship between level of investment and rate of interest is inverse type i.e. higher rate of interest implies the higher cost of borrowing the funds and it will discourage the investments. On the other hand, if the rate of interest is lower, then it will encourage the investments in the economy.

#### **4.6 Investment Demand Schedule**

This is also known as schedule of marginal efficiency of capital. Investment demand schedule depicts a functional relationship between the marginal efficiency of capital and amount of investment/stock of capital. According to this relationship, demand for capital asset/investment is inversely related to the marginal efficiency of capital. That is MEC diminishes with the increase in investment in capital assets and vice-versa. Causes for such diminishing nature of MEC are as- firstly, due to increase in the investment in capital asset during a given period, prospective yields will decline. The reason being that more assets are produced and ultimately, they will give competition to each other in order to meet the demand for product, subsequently, prospective returns from the investment will decline. Secondly, supply price of capital asset will rise as more capital assets are produced. Thus, we can say that MEC diminishes with an increase in investment level, either due to falling prospective yield or rising supply price of the capital asset.

Investment demand schedule can be illustrated with the help of an example, described in the following Table 1. Table depicts the relationship between stock of capital and marginal efficiency of capital. We can observe from the table that when the investment was of Rs 20 millions, MEC was the highest. As the quantity of investment increased to 100 millions, marginal efficiency of capital reduced to 7 per cent only.

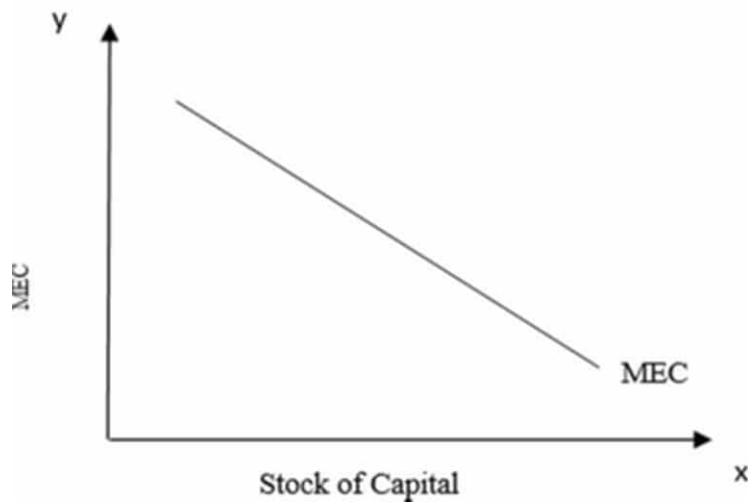
**Table 1: Marginal Efficiency of Capital and Quantity of Investment**

Investment (in Million Rs.)	Marginal Efficiency of Capital (%)
20	25
40	18
60	13
80	10
100	7

Investment demand schedule can be illustrated with the help of a diagram, as shown in Figure

4. On vertical axis MEC is measured and on horizontal axis stock of capital is measured.

**Figure 4: Investment Demand Schedule**



It is clearly depicted in the diagram that investment demand schedule is downward sloping showing inverse relationship between MEC and stock of capital. Investment demand schedule can shift rightwards or leftwards depending upon the changes in MEC. If at the given market rate of interest, there is expectation that expected returns on investment will increase then subsequently, MEC schedule will shift rightwards. On the other hand, in times of depression, due to lesser business confidence, there are expectations of falling expected returns on investments and hence MEC schedule will shift leftwards.

#### **4.7 Relationship Between MEC, Rate of Interest and Investment**

From the above discussion, it is clear that marginal efficiency of capital and market rate of interest are two determining factors in investment decision. Interest rate shows the cost of borrowing the funds, which is determined by the demand for and supply of funds. Marginal efficiency of capital is the anticipated rate of profitability on the investment/capital asset. For taking a wise decision i.e., whether to undertake the investment in new project or not, an entrepreneur usually compares the value of MEC with rate of interest. Investor will be interested in undertaking the investment in new capital stocks as long as the value of MEC is more than market rate of interest, as it indicates the excess of expected returns over the cost of borrowing the funds. If the value of MEC is found to be equal to market rate of interest then investor can be neutral in this situation. If the value of MEC is less than interest rate then no investment will take place because cost of borrowing funds is more than expected return from this particular investment. This relationship between MEC, rate of interest and investment can be depicted with the help of an illustration, shown in Table 2.

**Table 2: Relationship Between MEC And Rate of Interest and Investment Decision**

Supply Price(C) (in Rs)	Expected Annual Returns (R) (in Rs)	MEC(r) (in %)	Rate of Interest (i) (in %)	Investment Decision
25000	1000	4	4	Neutral
25000	1000	5	4	Profitable to undertake investment
25000	1000	2	4	Unfavourable

From the above table it is clear that supply price of capital asset is Rs. 25,000, having annual return of Rs. 1,000. Now the decision of the investor will depend on the cost of borrowing the funds and the corresponding returns on that investment. In the three different scenarios, investment seems to be profitable when the  $MEC > i$ , i.e. in second case where the MEC is 5 per cent and rate of interest is 4 per cent, clearly indicating

the positive difference.

#### **4.8 Decision Rule for the Entrepreneur**

After estimating the marginal efficiency of capital and market rate of interest, entrepreneur can take decision about the investment. There are rules of thumb in this context-

- A. If value of  $MEC > i$ , then investment project is acceptable to the entrepreneur
- B. If value of  $MEC = i$ , then the project is acceptable to entrepreneur only on the non-profit basis.
- C. If value of  $MEC < i$ , then the investment project is rejected by the entrepreneur

#### **Check Your Progress- III**

Q1. Define Marginal Efficiency of Capital.

Ans. ....  
-----

Q2. Explain market rate of interest.

Ans. ....  
-----

Q2. What are the different rules of thumb for investment decision?

Ans. ....  
-----

#### **4.9 Summary**

Investment refers to the addition in the existing physical stock of capital in a given time period. Investment can be classified in to different types, like- gross and net investment, autonomous and induced investment, ex-ante and ex-post investment. Gross investment is sum of net investment and replacement investment, whereas net investment refers to the net addition in the existing stock of capital. Autonomous investment undertaken usually by government on non-profit considerations, whereas, induced investment is intended by the profit motive. There are two main determinants which affect the investment decision- marginal efficiency of capital and market rate of interest. MEC is that rate of discount which makes the discounted present value of

expected returns equal to the cost of capital. Investment decision will be undertaken when the marginal efficiency of capital is more than the market rate of interest.

#### **4.10 Questions For Practice**

##### **A. Short Answer Type Questions**

- Q1. What is an investment function?
- Q2. Differentiate between induced and autonomous investment.
- Q3. Explain the followings:
- a) Gross and net investment
  - b) Ex-ante and Ex-post investment
- Q4. Explain Marginal Efficiency of Capital.
- Q5. Define Marginal Efficiency of Investment.
- Q6. Difference between the MEC and MEI.
- Q7. Explain the decision rules of the entrepreneur.

##### **B. Long Answer Type Questions**

- Q1. Elaborate the factors affecting investment decision
- Q2. What do you mean by investment? Briefly explain its types.
- Q3. Explain MEC, also discuss the relationship between MEC, rate of interest and investment decision.

#### **4.11 Suggested Readings**

- Abel, A.B.; Bernanke, B.S. & Croushore, D. (2014). Macroeconomics. New York: Pearson Publishers, 8<sup>th</sup> edition.
- Dornbusch, R.; Fischer, S. & Startz, R. (2011). Macroeconomics. New York: McGraw Hill, 11<sup>th</sup> edition.
- Dwivedi, D.N. (2015). Macroeconomics: Theory and Policy. New Delhi: McGrawHill Education, 4<sup>th</sup> edition.
- Gupta, R.D. & Lekhi, R.K. (2013). Post-Keynesian Economics. New Delhi: Kalyani Publishers.
- Mankiw, N.G. (2010). Macroeconomics. Worth Publishers, 7<sup>th</sup> edition.



- Rosalind, L & Rebmann, A. (1986). Macro-economics: An Introduction to Keynesian – Neoclassical controversies. Hampshire, London: Macmillan Education Ltd. 2<sup>nd</sup> edition.
- Shapiro, E. (2001). Macroeconomic Analysis. New Deli: Galgotia Publications Pvt.Ltd., 5<sup>th</sup> edition.

**M.A(ECONOMICS)**

**SEMESTER –II COURSE:**

**MACRO ECONOMICS**

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**UNIT4B: STATICS AND DYNAMIC MULTIPLIER AND ACCELERATION THEORY**

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**STRUCTURE**

**4.0 Learning Objectives**

**4.1 Introduction**

**4.2 Basic Concept of Multiplier**

**4.3 Multiplier Theorem: Derivation of Investment Multiplier**

**4.4 Operation or Working of Multiplier**

**4.5 Static and Dynamic Multiplier**

**4.5.1 Static Multiplier**

**4.5.2 Dynamic Multiplier**

**4.6 Limitations of Multiplier**

**4.6.1 Leakages from income stream**

**4.6.2 Non-availability of consumer goods and services**

**4.6.3 Full employment**

**4.7 Multiplier and LDCs: Keynes' MPC and Multiplier Paradox**

**4.8 Acceleration Theory and Its Working**

**4.9 Assumptions of Acceleration Theory**

**4.10 Working of Acceleration Principle**

**4.11 Limitations of Acceleration Theory**

**4.12 Summary**

**4.13 Questions for Practice**

**4.14 Suggested Readings**

**4.0 Learning Objectives**

After reading this unit, learner will be able to:

- Define the concept of multiplier
- Differentiate between static and dynamic multiplier
- Derive the working of multiplier
- Interpret the accelerator principle
- Illustrate the operation of accelerator principle

#### **4.1 Introduction**

In general, equilibrium level of income and output is determined by the aggregate spending level in the economy. Any change in aggregate spending will consequently affect the income and output level and this will further result in either unemployment or full employment depending upon the direction of change. Increase in the aggregate spending or consumption expenditure leads to multiple times increase in the income and output level and vice-versa. Ratio of this change in income and output to the change in consumption expenditure is known as the multiplier. So, the analysis of multiplier mechanism helps us in understanding, the change in circular flow of economic activity due to change in any component of aggregate spending/demand (consumption, investment, government spending or net exports).

Concept of multiplier was first embraced to macroeconomics analysis in the 1930s, when Keynes used it in his analysis of income determination for explaining the Great Depression of 1930s. However, this concept was introduced by FA Kahn in early 1930s and later on refined by Keynes. Kahn has focused on the employment multiplier, whereas Keynes has emphasised on investment multiplier. Employment multiplier indicates that for any increase in employment, there will be multiple times increase in aggregate employment level. Similarly, investment multiplier refers to manifold increase in income/output/employment due to initial increase in investment level in economy. Another concept related to multiplier is the accelerator, which is opposite to multiplier. Accelerator refers to the change in investment level due to change in aggregate spending/consumption expenditure.

#### **4.2 Basic Concepts of Multiplier**

In Keynesian approach to income/output determination, multiplier occupies an important position. Not only this, it is an important variable in the business cycle

theories too. Keynes believed that in any economy employment relies on the effective demand, which is, further determined by the consumption and investment expenditure. Since, consumption remains constant in the short-run, it is the investment which led to change in income/output level in economy. According to Keynes, it is the initial increase in the investment which plays a significant role in income determination process. So, this relationship in investment and change in income or employment or output can be expressed in terms of multiplier.

An injection to circular flow of economic activity leads to an increment in national income, this increment is usually larger than the extent of the injection. The ratio of incremental increase in income to the quantum of fresh injection is referred to as multiplier. The injection to circular flow of economic activity can take any form, such as- investment, government spending and exports. These forms of injection, results in upward shifts in the national income/output. For example, if the economy is injected with the investment of Rs.1 crore, consequently national income of the economy boost up by Rs.3 crores. In this illustration income has increased by three times, simply implying that increase in investment has resulted in multiple times increase in the national income/output level in the economy.

We are concerned with the autonomous investment expenditure incurred by the government which will take the form of injection to circular flow of economic activity. In short, investment multiplier can be described as the ratio of change in income to the change in autonomous investment expenditure.

#### **4.3 Multiplier Theorem: Derivation of Investment Multiplier**

Investment multiplier can be derived with the help of aggregate spending function in the two-sector economy. We know that in the equilibrium position, aggregate spending function is composed of consumption function and investment function. In simple terms, income is either consumed or saved (=investments under equilibrium), accordingly the income expenditure is sum of consumption expenditure and investment expenditure in the economy. In algebraic form, we can define the above relationship as-

$$Y=C+I \quad \dots(1)$$

Where,  $Y$ , is initial income level;  $C$ , is the consumption expenditure and  $I$ , is the autonomous investment expenditure. Equation 1, shows the initial equilibrium in the economy.

Suppose that investment expenditure increased in the economy from  $I$  to  $\Delta I$  and this leads to increase in the  $Y$  and  $C$  as well. So the 1 equation becomes,

$$\Delta Y = \Delta C + \Delta I \quad \dots(2)$$

$\Delta Y$ , shows the change in income;  $\Delta C$ , change in consumption and  $\Delta I$ , change in investment spending. Rearranging the above equation, we will get-

$$I = \Delta C / \Delta Y + \Delta I / \Delta Y \quad \dots(3)$$

Here the ratio of change in consumption expenditure ( $\Delta C$ ) due to change in income level ( $\Delta Y$ ) is known as the marginal propensity to consume (MPC). Using this identity in equation 3, we will obtain-

$$I = MPC + \Delta I / \Delta Y \quad \dots(4)$$

$$\Delta I / \Delta Y = I - MPC \quad \dots(5)$$

Taking reciprocal of equation 5 on both sides,

$$\Delta Y / \Delta I = 1 / (I - MPC) \quad \dots(6)$$

By putting  $\Delta Y / \Delta I = k$ , which is actually our multiplier's coefficient, so equation 6 becomes-

$$k = 1 / (I - MPC) \quad \dots(7)$$

Since, we know that  $MPC + MPS = 1$  (sum of marginal propensity to consume and marginal propensity to save is equal to unity), so  $I - MPC = MPS$ , by using this identity in above equation,

$$k = 1 / MPS \quad \dots(8)$$

Finally, value of multiplier coefficient can be determined either with the help of MPC or MPS. Equation 7 and 8 are describing the value of multiplier and also the relationship between  $k$  and MPC and  $k$  and MPS. Following are the major results of this functional relationship-

- 1) As the value of MPC varies between zero and unity, similarly, the value of

multiplier lies between 1 and  $\infty$ .

- 2) There is a positive relationship between MPC and  $k$ . If the value of MPC is higher/lower, value of multiplier will be also higher/lower.
- 3) There is negative relationship between MPS and  $k$ . If the value of MPS is higher, then value of multiplier ( $k$ ) will be lower and vice-versa.

For example, if the value of MPC = 1, then putting this in above formula,

$$k = 1/(1-MPC) = 1/(1-1) = 1/0 = \infty$$

Similarly if the value of MPC = 0.5, then value of multiplier will be,

$$k = 1/(1-0.5) = 1/0.5 = 2$$

On the other hand, if the value of MPS = 0.3, multiplier will be equal to-

$$k = 1/MPS = 1/0.3 = 3.33$$

for the value of MPS = 0.7, value of multiplier would be,  $k = 1.43$ .

#### **4.4 Operation of Multiplier or Working of Multiplier**

As discussed earlier, multiplier is the process through which income gets multiplied as an outcome of initial investment in the economy. How the operation of multiplier goes on? can be well explained with the help of working of multiplier. Let us assume that economy is in the position of equilibrium and government undertake an autonomous investment of Rs. 1000 crores. So, in the first period/round, this will raise the income by Rs. 1000 crores in the economy, particularly to those engaged in the investment goods sector. Further, assume that marginal propensity to consume is worked out to be 0.8, which implies that out of every increase in income, 80 per cent is spent on consumer goods. Accordingly, 80 per cent of Rs. 1000 i.e. Rs. 800 crores, will be our consumption expenditure in the first round. This expenditure on consumer goods will form the income to consumer goods producers. This idea is based on the assumption that one person's consumption expenditure is forming another person's income. Therefore, those who received Rs 800 crores as income in second round, they will spend 80 per cent of this income on the consumption activity, i.e. Rs. 640 crores as consumption expenditure in this period. Similarly in third round, income of Rs 640 crores will be generated. Important point to mention here is that, this increases

in income in each successive round will go on declining and this process will continue till additional increase in income tends to zero. Ultimately, this process will end up when additional income becomes equal to 5000 ( $k=1/(1-0.8)=5$ , which means income will increase five times of initial increment in investment).

Illustration of working of multiplier is depicted in Table 1, which clearly shows the process of income generation by an additional investment of Rs. 1000 crores in the system.

From table no.1 it is clear that injection in the circular flow of income will lead to multiple times increase in the income of the economy. It is generally perceived that it will take around two-three months' time to actualise the expenditure incurred in each period. This gap in realisation of consumption expenditure is termed as the multiplier period or propagation period.

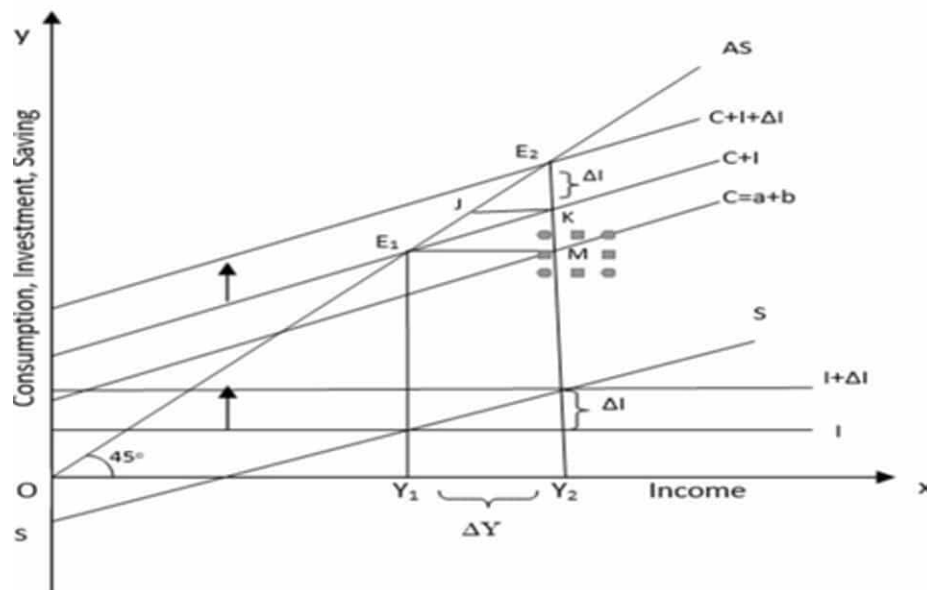
**Table 1: Working of Multiplier**

Period/Rounds	Change in investment ( $\Delta I$ )	Income Generation or Change in income ( $\Delta Y$ )	Change in Consumption Expenditure ( $\Delta C$ )( $MPC=0.8$ )
1	1000	1000	800
2	--	800	640
3	--	640	512
4	--	512	409.6
5	--	409.6	327.68
.....	--	....	....
.....	--	....	....
.....	--	....	....
Last round	--	0	....
Total	1000	5000	4000

So, multiplier period can be defined as the mean/average time which will be involved in conversion of income-consumption-income, i.e. when income received is converted into consumption and this consumption expenditure becomes someone else's income. Shift from one round to another round, will leads to gradual fall in the consecutive additions in the income.

The working of multiplier is illustrated graphically in the figure 1. Consumption expenditure and savings are measured along y-axis and income/output measured along x-axis. It is assumed that economy is in equilibrium and it is indicated by consumption function  $C=a+bY$  and initial investment given by the line  $I$ , which is parallel to horizontal axis. Further, with the given consumption function and investment level, aggregate spending/demand is indicated by  $C+I$ . Equilibrium level of income is determined at  $Y_1$ , where aggregate demand ( $C+I$ ) curve intersects with the aggregate supply curve ( $AS$ ). Aggregate supply is equal to addition of consumption expenditure and savings ( $AS=C+S$ )

**Figure 1: Working of Multiplier**



With the injection of autonomous investment in the system, original investment curve ) shifted upward to  $I+\Delta I$  curve. This upward shift in the investment schedule results in shift in aggregate demand curve from  $C+I$  to  $C+I+\Delta I$ . The new AD (Aggregate



Demand) demand curve intersects the  $AS$  (Aggregate Supply) curve at point  $E_2$ , hence equilibrium level of income shifts rightwards from  $Y_1$  point to  $Y_2$  point. So, increase in national income ( $\Delta Y$ ) can be expressed as-

$$\Delta Y = Y_2 - Y_1 = \frac{Y_1}{Y_2} = \frac{E_1}{M}$$

This increment in income is the outcome of change in investment ( $\Delta I$ ). If we look at the figure, we can notice that increase in income is more than the increase in investment level

i.e.  $\Delta Y > \Delta I$ , which implies that there will be multiple times increase in the income due to initial injection of investment. So, the multiplier can be expressed as the ratio of change in income due to change in investment level, algebraically,

$$m = \Delta Y / \Delta I, \text{ here } m \text{ is the investment multiplier.}$$

### **Check Your Progress- I**

Q1. If the value of  $MPC=0.5$ , what would be value of multiplier.

Ans. ....  
-----

Q2. What is the relationship between multiplier and  $MPC$  and  $MPS$ ?

Ans. ....  
-----

## **4.5 Static and Dynamic Multiplier**

On the basis of time lag involved in consumption function, multiplier is considered as static and dynamic. Under static multiplier, no time lag is involved, whereas, dynamic multiplier considers the time involved in consumption response.

### **4.5.1 Static Multiplier**

Actually, static multiplier is independent of time, this is the reason that static multiplier is also known as comparative static multiplier, simultaneous multiplier, logical multiplier, timeless multiplier and instant multiplier. According to static multiplier, if there is change in the investment in the economy, then it will cause immediate change in the income levels, means no time lag is involved in response. In

simple terms, static multiplier entails that change in investment results in instantaneous change in income. For example, if government injected the investment of Re 1 in the system, it will instantly increase the society's income by multiple of Re 1. Working of static multiplier is explained in the earlier section and the illustration shown in Table 1 is an example of static multiplier.

In real world, we are not dealing with timeless economic activities, we are living in dynamic world. So, time lag is involved in initial autonomous investment and final change in income, moreover, series of successive rounds happen in order to complete the working of multiplier. Therefore, limitation of static multiplier is that it does not consider the course of time involved in completion of the multiplier process.

#### **4.5.2 Dynamic Multiplier**

It is also termed as period multiplier or sequence multiplier. In contrary to static multiplier, dynamic multiplier, considers the time lag involved in working of multiplier. According to dynamic multiplier, change in investment will not cause immediate/instant change in income of the economy rather it is a gradual process through which the income will change. So, this multiplier is fundamentally a stage-by stage calculation of change in income due to change in initial investment and this process will continue till the full potential of multiplier is comprehended.

Let us assume that initially, our economy is in equilibrium position. Government injected the system with the autonomous investment of Rs 1000 crores. Suppose further that this investment is undertaken on the purchase of capital goods and labour, which leads to increment in income of capital goods producers and labourers by Rs 1000 crores in the period 1, denoting this by  $\Delta Y_1$ . If the marginal propensity to consume is found to be 0.8 of the society, then it implies that who received this income (Rs 1000 crores), will make consumption expenditure of Rs 800 crores. Consequently, in next period, income of the consumer goods producers rises by Rs 800 crores, denoting it as  $\Delta Y_2$ . Further, 80 per cent of this Rs 800 crores i.e. Rs 640 crores, will be increment in income in period 3, denoted by  $\Delta Y_3$ . This procedure will go on until the increment in income and consumption expenditure is reduced to zero. This illustration is pre-assuming that there is one period

lag in the change in consumption expenditure due to change in income of the economy, i.e. change in consumption expenditure to be incurred in t time period is the function of change in income in t-1 time period.

This exercise of dynamic multiplier can be summed up in the following expression-

$$\Delta Y = \Delta Y_1 + \Delta Y_2 + \Delta Y_3 + \Delta Y_4 + \dots + \Delta Y_{n-1} \dots (1)$$

So the aggregate change in income ( $\Delta Y$ ) due to initial investment of Rs 1000 crores, will be-

$$\Delta Y = 1000 + 1000(0.8)^1 + 1000(0.8)^2 + 1000(0.8)^3 + 1000(0.8)^4 + \dots + 1000(0.8)^{n-1}$$

$$\Delta Y = 1000 + 800 + 640 + 512 + 327.7 + \dots + \rightarrow 0 = 5000$$

In order to match this aggregate increase in income, we can compute the value of multiplier as, ratio of proportionate change in income to proportionate change in investment i.e.

$$\Delta Y / \Delta I = 5000 / 1000 = 5$$

Since in period 1, increase in income is equal to the autonomous investment, so it can be written like this,  $\Delta Y_1 = \Delta I$  and dynamic multiplier can be generalised as-

$$\Delta Y = \Delta I + \Delta I(c)^1 + \Delta I(c)^2 + \Delta I(c)^3 + \Delta I(c)^4 + \dots + \Delta I(c)^{n-1} \dots (2)$$

$$\Delta Y = \Delta I(1 + c^1 + c^2 + c^3 + c^4 + \dots + c^{n-1}) \dots (3)$$

In equation 3,  $c$  is the marginal propensity to consume, replacing the sum of an infinite geometric series by  $1/(1-c)$ , we will get-

$$\Delta Y = \Delta I(1/(1-c)) \dots (4)$$

By putting the values of  $\Delta I = \text{Rs } 1000$  crores and  $c = 0.8$ , we get

$$\Delta Y = 1000 * (1/(1-0.8)) = 1000 * (1/0.2) = 1000 * 5 = \text{Rs } 5000 \text{ crores}$$

From equation 4, it is clear that cumulative change in aggregate income is equal to a multiple of increase in autonomous investment expenditure. The term  $1/(1-c)$ , is termed as multiplier, whereas equation 2, implies the working of dynamic multiplier in the economy.

#### **4.6 Limitations of Multiplier**

Although, it has been realised that investment multiplier plays a determining role in economy and helps in bringing about desired results in income/output/employment. Still, it is not free from limitations. It has been seen that in order to achieve the target growth rate, nation just need to measure the exact requirement of investment, given the value of MPC. But in reality, we can't compute the quantum of investment required to push the economy, with so much exactness. So, the limitations of working of multiplier can be classified into three main categories-

**4.6.1**      Leakages from income stream

**4.6.2**      Non-availability of consumer goods and services

**4.6.3**      Full employment situation

#### **4.6.1 Leakages From Income Stream or Leakages in the Working of Multiplier**

It is clear from the above discussion that value of multiplier is neither one nor infinity. We never spent the whole amount of increase in income and never saved the whole increased portion of income. Reason behind such behaviour is that there are many leakages under income stream, which reduced the speed of income propagation process and hence the working of multiplier gets affected. Moreover, under theory of multiplier it is assumed that certain portion of increased income will be spent on the consumer and capital goods. But in reality, society tends to spend on the various non-consumption and non-capital goods. These types of expenses are termed as leakages from income stream in the process of multiplier. These leakages include, like savings, debt cancellation, imports, hoardings, purchase of existing wealth etc. Detailed discussion on different types of leakages from income stream follows as-

- 1) Payment of Past Debts:** If the increase in income is used for payment of loans purpose, then it will lead to fall in marginal propensity to consume. This decline in MPC, further, reduces the value of multiplier.

- 2) **Savings and Hoardings:** Savings are considered as an important leakage in the multiplier process. As we know that there is inverse relationship between marginal propensity to save and value of multiplier, therefore, more the share of additional income goes for savings; less effective will be the multiplier. On the other hand, activity of hoarding i.e. high liquidity preferences also restricts the value of multiplier.
- 3) **Purchase of Existing Wealth:** This is also an important type of leakage in the working of multiplier. If the society have a tendency to spend the increased portion of their income on the purchase of existing stock of wealth and property such as real estate, second-hand consumer durables, purchase of shares, bonds, stocks and securities etc. then it will inhibit the process of income propagation because such types of expenses never come back in consumption stream, hence affecting the working of multiplier.
- 4) **Imports:** If the economy is open economy, then inflow of foreign products and services, negatively affect income propagation process of the economy. This is so because, income spent on the imported goods and services will flows out of the country and having the lesser chances to come back to income stream of the nation.

#### **4.6.2 Non-Availability of Consumer Goods and Services**

The theory of multiplier is based on the pre-assumption that there is efficient and instantaneous supply of consumer goods and services in the system. But in practice, this is not the case. Supply of consumer goods and services does not respond instantaneously to the increased demand, time lag is always there. So, time dimension involved in adjustment process has been ignored. In course of lag period, increased income generates additional demand for goods and services which in turn generates the demand pressure and thus resulting in rise in prices (inflation). These rise in prices reduce the consumption expenditure in real terms, which restraint the multiplier effect.

#### **4.6.3 Full Employment**

Working of multiplier is not compatible with full employment. If the economy is in full employment or close to full employment situation, then further

increase in production capacity is not possible. Thus, increase in autonomous investment will only result in inflation, not the generation of additional real income in the economy.

#### **4.7 Multiplier And LDCs: Keynes' MPC And Multiplier Paradox**

As per the multiplier theory, higher the value of MPC, more effective will be the multiplier and vice-versa. Further, lower the income, higher proportion will be spent (higher

MPC). In context of less developed countries (LDCs), it was found that income, saving and investment rates were low as compared to developed countries scenario. In the LDCs, usually the saving rates are lower, which implies relatively higher MPC. It is perceived under the multiplier theory that higher the value of MPC, higher will be the size of multiplier. Therefore, in LDCs, higher value of MPC should accommodate higher values of multiplier and hence given quantum of autonomous investment should result in higher employment and output and consequently high economic growth rates. But in practice, this whole scenario does not hold true in case of less developed countries. Generally, in LDCs value of multiplier and rate of economic growth are lower, despite the larger size of MPC. This shows a paradoxical situation in context of multiplier theory and is termed as Keynes' MPC and multiplier paradox. So, we can say that Keynesian investment multiplier is not compatible with the less developed countries.

The reasons behind, non-applicability of multiplier principle to less developed countries are the assumption taken by this principle. These assumptions are not fulfilled by the LDCs.

#### **Assumptions:**

- 1) High level of industrial development in the economy
- 2) Existence of involuntary unemployment
- 3) Existence of excess productive capacity
- 4) Price-elastic supply of goods and services
- 5) Absence of dynamic changes i.e. technological progress, capital formation and accumulation, factor supplies etc. remains constant

- 6) Based on the closed economy model
- 7) Instantaneous changes in consumption expenditure as a result of change in income

Many of the above-mentioned assumptions do not hold in case of LDCs. According to V.K.R.V. Rao (1952), there are certain other reasons (along with these assumptions) behind this inapplicability of multiplier theory to LDCs. Other reasons include, the circumstances prevailing under LDCs, such as- pre-dominancy of agriculture sector, substantial portion of disguised unemployment, shortage of capital, outdated technology, existence of non-monetised sector (barter system) and production for self-consumption purpose. Due to these features of LDCs, multiplier does not work effectively in LDCs.

### **Check Your Progress- II**

Q1. What do you mean by static multiplier?

Ans. ....  
-----

Q2. What are the leakages in the process of multiplier?

Ans. ....  
-----

### **4.8 Acceleration Theory and Its Working**

In the previous sections related to principle of multiplier, we have seen that investment is treated as the autonomous and most important variable in income determination process. However, the post-Keynesian refinements in the investment theory has realised the interdependency of the investment and income on each other. That is level of investment relies on the national income and national income in turn depends on the level of investment. This interdependent correlation among income and investment is explained by super multiplier and accelerator principle. We are here concerned mainly with the acceleration principle, popularly known as accelerator theory of investment. Principle of acceleration was developed by A. Aftalion (1909), Hawtrey (1913) and C.F. Bickerdike (1914) and J.M. Clark (1917). The main idea of this theory is that accelerator is related to quantum of desired or optimum stock of capital rather than

change in autonomous investment. So, the basic relationship with which we are concerned, i.e. relationship between change in level of output and volume of investment spending, is known as the acceleration principle. As we know that ratio of capital stock to output is termed as capital-output ratio, this ratio is known as accelerator under this theory.

#### **4.9 Assumptions of Acceleration Theory**

This theory is based on some assumptions, which are as follows-

- 1) Capital to output ratio or accelerator coefficient is assumed to remain fixed.  
This fixed ratio, further, implies that there is absence of technological progress in the economy.
- 2) Capital goods in the economy are fully utilised.
- 3) Absence of excess capacity.
- 4) There is no upper limit on investment, which implies that supply function is perfectly elastic.
- 5) There is absence of time lag between demand and production, i.e. instantaneous adjustment in demand for and supply of product.
- 6) Net investment will increase instantaneously with the increase in output in the economy.
- 7) Supply of funds is elastic i.e. no financial restriction on availability of funds.

#### **4.10 Working of Acceleration Principle**

According to acceleration principle, investment enlarges the stock of capital as more capital is required to produce more output. Increase in output can be brought with the help of technological advancements also, but for simplifications we have assumed that capital-output ratio remains constant in the system.

Let us assume that the output of firms in the economy is measured by  $Y$  and the stock of capital required to produce it be measured by  $K$ . Capital-output ratio ( $K/Y$ ) is indicated by  $v$ . So, the formal relationship between capital stock and the output can be articulated as-

$$K = vY$$

Or



$$v = K/Y$$

Here value of  $v$  is assumed to be more than unity i.e.  $v > 1$ .

With fixed capital-output ratio over time, the desired stock of capital will change over successive time periods only with the changes in output levels. Considering the some particular time frame as  $t$ , preceding time periods as  $t-1$  and  $t-2$  and subsequent time periods as  $t+1$  and  $t+2$ ; according to this we can assume that in period  $t-1$ , desired stock of capital was required to produce the particular level of output in period  $t-1$ . Symbolically,

$$K_{t-1} = v Y_{t-1} \quad \dots(1)$$

When there is increase in output level from  $Y_{t-1}$  to  $Y_t$ , it will lead to change in desired stock of capital also, from  $K_{t-1}$  to  $K_t$ , i.e.

$$K_t = v Y_t \quad \dots(2)$$

If there is rise in desired stock of capital, then it is measured by  $K_t - K_{t-1}$ . In order to raise the stock of capital, net investment expenditure ( $I_t$ ) is required, which is equal to the difference between the capital stock in  $t$  and  $t-1$  time period. In equation terms-

$$I_t = K_t - K_{t-1} \quad \dots(3)$$

By using 1st and 2nd equations in 3<sup>rd</sup> equation, net investment can be expressed as-

$$I_t = vY_t - vY_{t-1} = v(Y_t - Y_{t-1}) \quad \dots(4)$$

This equation implies that net investment during  $t$  period relies on the change in output from  $t-1$  to  $t$  period multiplied by capital-output ratio  $v$ . Possible outcomes related to net investment-

- A. if  $Y_t > Y_{t-1}$ , then net investment would be positive in period  $t$ ;
- B. if  $Y_t < Y_{t-1}$ , then net investment turns out to be negative or disinvestment has taken place in the economy in  $t$  period and
- C. if  $Y_t = Y_{t-1}$ , then there will be zero net investment in the economy. In simple terms, given the value of  $v$ , any change in output level from  $t-1$  to  $t$  period is responsible for the change in net investment, which could be either positive or negative.

In order to check out the importance of gross investment under the acceleration principle, we can make addition of replacement investment in the equation system. As we have learned in the previous unit that gross investment is equal to the sum of net and replacement investment, thereby adding the replacement investment component in both sides of the 4<sup>th</sup> equation, we get,

$$I_t + R_t = v(Y_t - Y_{t-1}) + R_t \quad \dots(5)$$

Since gross investment ( $I_{gt}$ , gross investment in t period in economy.) is sum of net and replacement investment, so equation 5 can be represented as-

$$I_{gt} = v(Y_t - Y_{t-1}) + R_t \quad \dots(6)$$

This is the final equation of the accelerator theory, here  $v$  is the accelerator coefficient. It is clear from the above equation that value of accelerator coefficient,  $v$ , depends on the output level also along with the capital-output ratio. Further, if the value of  $v$  is found to be more than one, then the required increase in capital stock must outweigh the increase in output.

Working of the acceleration theory can be better understood with the help of numerical example exhibited in Table 2. This example is based on certain assumptions, i.e. capital-output ratio is considered as two and rate of depreciation or replacement investment is considered as five per cent of the initial capital stock (in period 1).

**Table 2: Working of the Acceleration Principle, With N=2 And RT=5%**

Period	Output	Required/Desired Capital Stock	Actual Capital Stock	Replacement Investment	Net Investment	Gross Investment
1	200	400	400	20	0	20
2	210	420	420	20	20	40
3	220	440	440	20	20	40
4	250	500	500	20	60	80
5	270	540	540	20	40	60
6	260	520	520	20	-20	0
7	256	512	512	20	-8	12
8	250	500	500	20	-12	8

9	230	460	460	20	-40	20
10	200	400	400	20	-60	40

In this table column 1 refers to the time periods under consideration, column 2 provides us the information regarding output level in the economy in each period. Since capital to output ratio is taken as two, so we can estimate the required stock of capital by simply multiplying the output level with two, which is shown in column 3. Actual stock of capital is given in column 4 and in column 5, replacement investment is given, which is assumed to be five per cent of initial stock of capital. In our example, stock of capital in first period is given as Rs 400 crores, so replacement investment is Rs 20 crores (5 per cent of 400). Further, column 6 deals with net investment, which is estimated by subtracting the actual capital stock in t-1 period from actual capital stock in t period. In last column 7, gross investment is computed by simply adding column 5 and 6. The acceleration or deceleration in net investment can be seen from column 6. Upto period 5, there is acceleration in net investment, after that process of deceleration has started.

On the basis of above illustration, we can measure the change in output in period 1 and 2, i.e. 10 units increment in output level has been registered. Provided the value of  $v$  as two, gross investment required in order to achieve this increment of 10 units in output level can be estimated as-

$$I_{gt} = v(Y_t - Y_{t-1})$$

$$I_{gt} = 2(210 - 200) = 2 * 10 = \text{Rs. } 20 \text{ crores.}$$

Similar calculation can be worked for other periods as well.

#### **4.11 Limitations Or Criticism of The Accelerator Theory**

Accelerator theory suffers from serious defects and these defects are mainly based on the rigid assumptions taken by this theory. Some of the points of criticism are as follows-

- 1) **Constancy of Capital-Output Ratio:** Acceleration principle is based on fixed value of capital-output ratio. Under the dynamic and uncertain situations, we can't retain this constancy. Moreover, in reality this ratio is found to be

determined by changes in technology, expectations, uncertainty, changes in composition of output etc. factors.

- 2) **Absence of Excess Capacity:** It has been assumed that there is inexistence of excess capacity in consumer goods industries, which is totally wrong. In practice, firms always maintain reserve capacity in order to capture the sudden increase in demand. In such circumstances, acceleration principle becomes less effective or ineffective.
- 3) **Financial Limitation:** According to this theory there is no ceiling on availability of funds. But in practice, there are financial limitations on meeting the additional capital requirements.
- 4) **Time Lag:** It has been assumed that there is no time lag between demand and production process. In reality, existence of discontinuities and indivisibilities in the production function hampers the production process and prevents smooth and instant adjustments.
- 5) **Profitability Considerations:** According to this principle major objective of firms is to maximise their profits. Business firms do not always focus on profit maximisation goal, there are many other goals along with this goal. Such as, sales maximisation goal, securing certain market share, building reputation etc.
- 6) **Lacks Practical Utility:** This principle lacks practical utility. According to this principle, for acceleration coefficient to work in effective manner, full capacity is a pre-condition. Statistical evidences have shown that full capacity rarely exists.

Although, this theory is less practicable, still it can be used along with other factors by economists to explain the oscillations, which are observed in investment in the economy from time to time.

### **Check Your Progress- III**

Q1. Define Accelerator

Ans. ....

Q2. Discuss any two limitations of the acceleration theory.

Ans. ....  
-----

#### **4.12 Summary**

Investment multiplier can be described as the ratio of change in income to the change in autonomous investment expenditure. The value of multiplier depends upon the marginal propensity to consume and save. On the basis of time dimension, distinction is made between static and dynamic multiplier. Further, according to static multiplier, if there is change in the investment in the economy, then it will cause immediate change in the income levels, means no time lag is involved in response. According to dynamic multiplier, change in investment will not cause immediate or instant change in income of the economy rather it is a gradual process through which the income will change. Accelerator is related to quantum of desired or optimum stock of capital rather than change in autonomous investment. Relationship between change in level of output and volume of investment spending, is known as the acceleration principle. Theory of acceleration principle is criticised on the basis of rigid nature of its assumptions.

#### **4.13 Questions for Practice**

##### **A. Short Answer Type Questions**

- Q1. Describe the meaning of investment multiplier.
- Q2. Define dynamic multiplier with the help of example
- Q3. Explain the concept of MPC and multiplier paradox.
- Q4. Give assumptions of acceleration theory.
- Q5. Discuss the leakages in the working of multiplier
- Q6. Briefly explain the working of acceleration principle

##### **B. Long Answer Type Questions**

- Q1. What do you mean by multiplier? Derive investment multiplier.
- Q2. Differentiate static and dynamic multiplier and discuss in detail the working of multiplier.
- Q3. Explain the limitations of multiplier in detail.
- Q4. Critically examine the theory of acceleration.

#### **4.14 Suggested Readings**

Abel, A.B.; Bernanke, B.S. & Croushore, D. (2014). Macroeconomics. New York:Pearson Publishers, 8<sup>th</sup> edition.

Dornbusch, R.; Fischer, S. & Startz, R. (2011). Macroeconomics. New York:McGraw Hill, 11<sup>th</sup> edition.

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**M.A (ECONOMICS)**  
**SEMESTER –II**  
**COURSE: MACRO ECONOMICS**

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**UNIT 5: BUSINESS CYCLES AND INFLATION: MEANING, PHASES AND TYPES**

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**STRUCTURE**

**5.0 Learning Objectives**

**5.1 Introduction**

**5.2 Meaning and Basic Concepts of Business Cycle**

**5.3 Phases of Business Cycle**

**5.3.1 Prosperity**

**5.3.2 Recession**

**5.3.3 Depression**

**5.3.4 Recovery**

**5.4 Meaning of Inflation**

**5.5 Types of Inflation**

**5.5.1 Types of Inflation by Level of Employment in the Economy**

**5.5.2 Types of Inflation by the rate of Increase in Price**

**5.5.3 Types of Inflation by the Causes**

**5.5.3.1 Demand Pull Inflation**

**5.5.3.2 Cost Push Inflation**

**5.6 Effects of Inflation**

**5.7 Summary**

**5.8 Questions for Practice**

**5.9 Suggested Readings**

**5.0 Learning Objectives**

After reading this unit, learner will be able to:

- Know about the meaning of the business cycles
- Describe the different phases of business cycles
- Define the concept of the inflation
- Know about the different types of inflation
- Identify the causes and the effects of inflation

## **5.1 Introduction**

This unit throws light on the concepts and types of business cycles as well as inflation. Most of the classical economic theories are based on the assumption that the economy is always in equilibrium. Any deviation from that is only for the short period and in the long run, the economy automatically reaches the full employment level, where the supply creates its own demand (Say, 1834) and aggregate demand is equal to aggregate supply. These theories also assume that the savings are passive in nature which means that they adjust themselves according to the demand for investment. Hence, there is no need of government intervention. But in real life, we find gaps in aggregate demand and aggregate supply along with the gaps in savings and investment. If government does not intervene, then these gaps continue to exist for a long period. This leads to inflationary or deflationary tendencies in the economy. Keynes (1936), too, has pointed out that underemployment equilibrium is the general condition of the economy. He tried to show the gaps in aggregate demand and supply through his psychological law of consumption. He said that a marginal propensity to consume being less than one, causes the turning points in any business cycle. Schumpeter (1961) says that the innovations are the causes of cyclical fluctuations in the economy while according to Samuelson (1948), the business cycles are caused by the interaction of accelerator and the multiplier. All these theoreticians' emphasis that any market economy goes through several fluctuations. Therefore, it is important to know about the concept, types and causes of business cycles in general and inflation, in particular.

## **5.2 Meaning and Basic Concepts of Business Cycles**

Business cycles, trade cycles, cyclical fluctuations are being identified by many economists since 19th century. In economic literature, Clement Juglar is supposed to be the first economists to talk about it in his writings. Some also call these cycles as Juglars after his name. Mitchell and Burns define a business cycle as a cycle which consists of expansions and contractions in various sectors of the economy at the same time or at different time periods,



giving an overall picture of expansion or contraction. This sequence of change is recurrent not periodic. The durations of the cycles may differ from sector to sector or from economy to economy, depending upon the macro economic policies. In short, a business cycle exhibits a wave-like fluctuation in economic activity which expansion or prosperity is followed by contraction and vice-versa. Some trade cycles are of shorter duration and may last for two to three years while others may last for longer period, of say 8-10 years or even larger. The experience of various economies has displayed that there is no fixed duration of a complete cycle. Even the cyclical movements within a single cycle may not be symmetrical, e.g., movement towards the peak can be gradual while to that of the trough can be sudden or vice-versa.

### **5.3 Phases of A Cycle**

In economic theory, a trade cycle has four phases, which are mentioned below:

#### **5.3.1 Prosperity**

It is a phase that is characterized by rising income, employment and output, there are no unemployed resources, wages and consumption levels are high, prices are rising and profitability is also very high. Thus, during this phase, most of the economic activities are moving towards their peak levels. This period is also called as a period of inflation. General optimism prevails in the economy. This phase also witnesses the cumulative growth of consumption of durables as well as non-durable items, giving a boost to agriculture, industry as well as services. The confidence in future is so strong that people are increasing investments in financial and non-financial instruments and real estate. But this trend cannot go for ever. The forces of expansion get weaker with time. Marginal propensity to consume being lower than one leads to slower growth in consumption than income which results in overproduction, further causing a stagnation in prices, profits, additional investments, employment etc. before they move to a declining phase.

#### **5.3.2 Recession**

As we have seen above that the slowdown starts in the period of prosperity itself and after all the economic activities reach their peak level, declining tendencies are set in. Since the optimism of the earlier phase did not bring the desired results, the investors, producers as well as

the households become skeptical in making new investments. The projects are halted, flow of credit to existing projects/ventures slows down or stops. This lead to declining prices, lower wages, higher rate of unemployment etc. The level of investment cannot be increased by reducing the rate of interest as the marginal efficiency of capital is declining during this phase. Thus, this phase is characterized by contraction of every economic activity, yet the real economic variables remain above the equilibrium path.

### **5.3.3 Depression**

Depression is a dismal condition of the recessionary tendencies. This is the phase when all the economic variable attains a value below the equilibrium path. During this phase, the production, investment, employment, prices, profitability etc. undergo a substantial decline. The rate of interest remains at the lowest level, still the investors are not willing to make any investments. They rather prefer to keep the money with themselves. This phase experiences a liquidity trap and all sectors of the economy like manufacturing, construction and services experience a substantial fall in investment and many enterprises just shut down due to extremely pessimistic economic conditions. This phase is also termed as a phase of deflation. Bearish tendencies prevail in the financial sector, people lose money on the value of their securities, shares or other financial instruments. Unemployment is also at its highest level and there is a sharp fall in demand despite the fact that the prices are falling. However, this phase is also not permanent. After, many weaker enterprises have left the market, the gap in demand and supply narrows down. Though, the fall in income and employment leads to a fall in consumption but the fall in consumption is not as sharp as that of the income. This further leads to fall in gap in demand and supply. As a result, the fall in prices, profitability and employment is checked and the economy starts gaining some relief from the declining tendencies. Some sectors start gaining some confidence in the economy which lead the economy to the path of recovery.

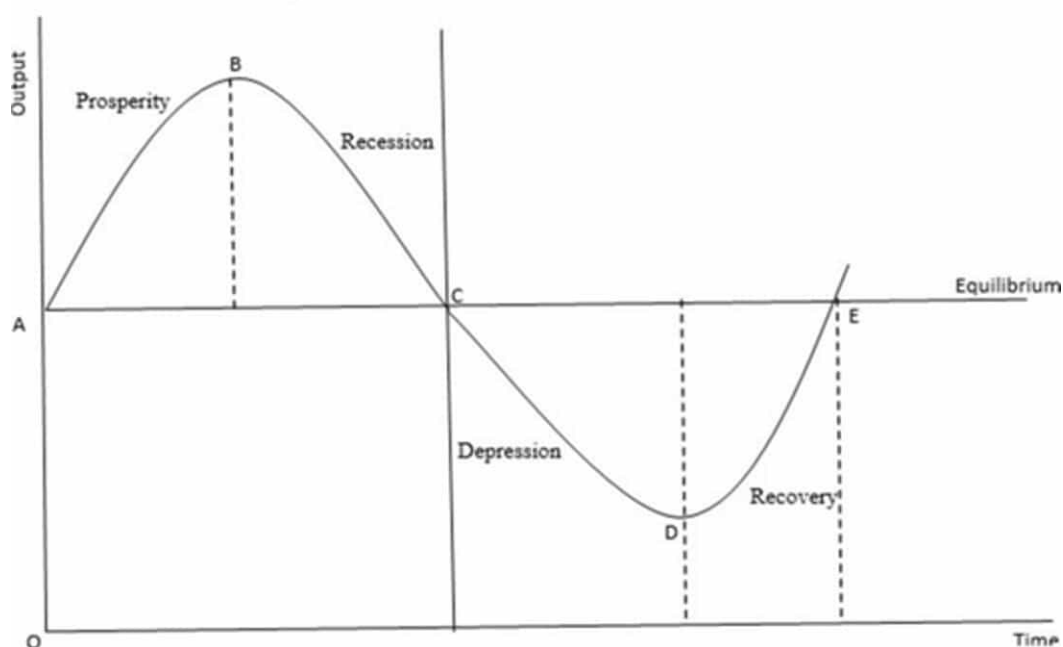
### **5.3.4 Recovery**

This phase begins by the lower turning point from the period of depression and ends at the point of equilibrium from where, the prosperity starts. This phase shows the signs of restoring the business confidence and every economic activity starts improving. The level of income, output and employment starts increasing. The investors start making new investments, the stalled projects may restart during this phase. An increase in wages, profits and interest also leads to

increase in demand which further increases prices, profitability, rate of investment and hence, employment. The financial sector also regains the confidence of the investors as securities and shares start showing increase in their values. Thus, money starts flowing in, giving a renewed life to the economic activities, which leads to fading away of general pessimism that was prevailing in the economy during the preceding phase. But the economy still remains below the equilibrium level. The shorter this phase is, the quicker will be the transformation of the economy to the path of prosperity.

Above mentioned four phases of a business cycle can be observed from figure 1. In figure, the cycle starts from point A, where the economy was in original equilibrium. From A to B, we can see the prosperity phase which starts declining after the economy reaches its peak at point B. Then from point B to C, the economy witnesses the period of recession. This phase continues until the economy reaches the equilibrium level. But as the declining tendencies do not stop, the economy slips below the equilibrium level and enters the phase of depression which ranges from point C to D. Finally, the economy recovers from the declining tendencies and a turning point at the trough, marked by D leads the economy back to the point of equilibrium. This is known as the recovery phase. In figure, it is marked by the movement of the economy from point D to E.

**Figure 1: Four Phases of a Business Cycle**



### **Check Your Progress-I**

Q1. What do you mean by recession?

Ans. ....  
-----

Q2. Define the business cycle of depression.

Ans. ....  
-----

### **5.4 Meaning of Inflation**

In common parlance inflation often refers to a sustained increase in prices. Yet, the economists differ in their approaches while defining inflation. Some simply express it as fall in value of money at a constant rate of growth. They say that it is a purely monetary phenomenon when too much money follows too few goods. Thus, it follows that increase in money supply causes rise in prices along with the fall in purchasing power.

### **5.5 Types of Inflation**

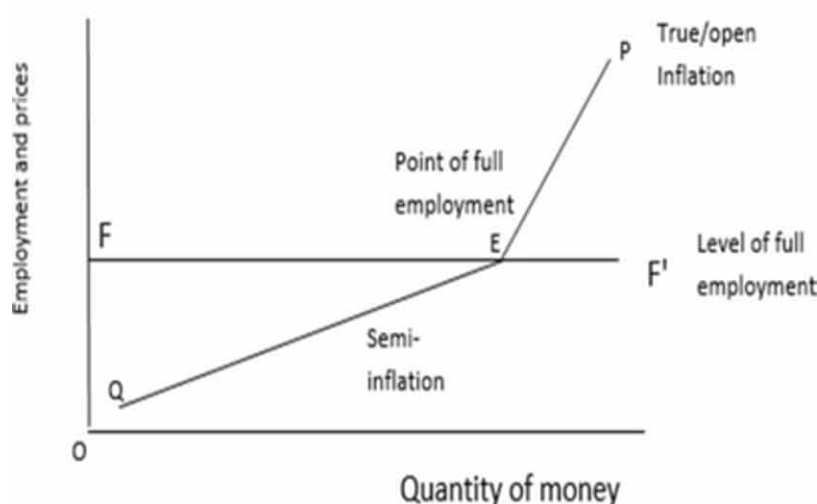
Inflation is further categorized on various scales. Some categorize it by its causes, some by its time of occurrence while some by its rate of change. These types are discussed below:

#### **5.5.1 Types of Inflation by Level of Employment in the Economy**

Most of the Keynesian economists think that inflation occurs after the level of full employment is achieved in the economy. They say, any rise in prices before the level of full employment only induces the investors to invest more which further leads to increase in demand for factors of production and pushes the economy towards the level of full employment. Keynes opined that the inflation is caused by the excess of effective demand and hence open inflation occurs only after the level of full employment is achieved in the economy. He says that any increases in quantity of money before the level of full employment increases the level of income, output and employment proportionately and any increase in prices during this phase is mainly due to the structural bottlenecks. Therefore, any inflation that occurs before the level of full employment is achieved is termed as semi-inflation, reflation or bottle-neck inflation. But as the level of full employment is achieved, any increase in money supply leads to pressure on demand for productive resources and since all the resources are already fully employed, therefore, it leads to sharper increase in prices. Keynes calls this phase as a phase of open or true

inflation. These types can be observed from the figure 2. The figure shows that  $FF'$  is the level of full employment, curve  $QEP$  shows the price level and  $E$  is the point where the full employment is achieved. Below the curve  $FF'$ , as money supply increases, it leads to slower increase in prices than the period after level of full employment is achieved. This is shown by lower slope of the curve  $QE$  than that of the  $PE$ . Thus, we can observe that the economy faces semi-inflation, reflation or bottleneck inflation below  $FF'$  and open or true inflation above the curve  $FF'$ .

**Figure 2: Types of Inflation by Level of Employment**

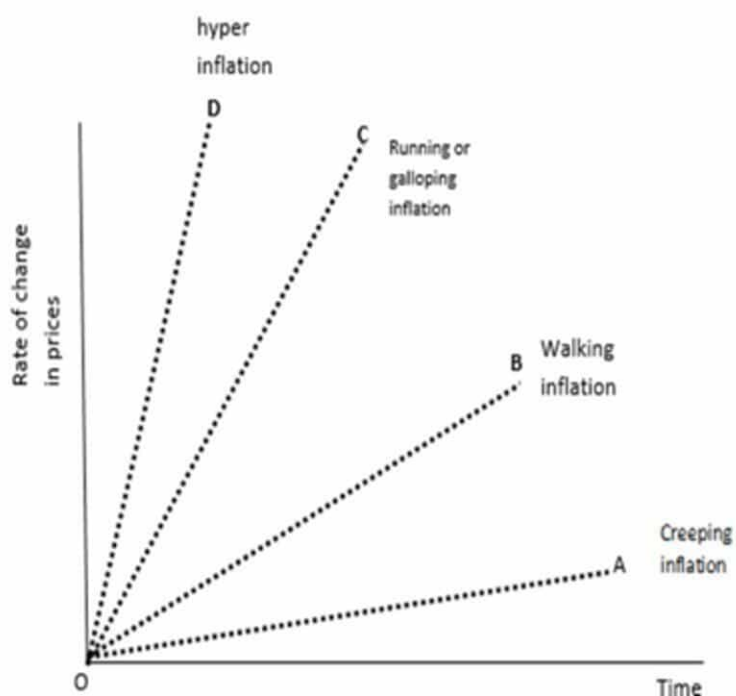


### **5.5.2 Types Of Inflation by The Rate of Increase in Prices**

Open inflation may assume different types by the rate of change in prices. Initially, prices may rise at a lower rate but if the problem is not overcome by conscious policy actions, the situation may aggravate. Little doses of inflation are considered as the oxygen of the economy as it gives the investors a feeling of optimism that their profitability is rising. However, a very high rate of inflation may cut their profits drastically as the cost of inputs also increases. The economists believe that not all types of inflation are bad. A smaller rate of change in prices is good for the economy. They call this rate as creeping inflation while a rate of inflation higher than that may fall in to a category of walking or running inflation while the hyper-inflation is caused by wars, a catastrophe or some other emergency situation which halts the production with drastic economic consequences. Under such situations the purchasing power of the money people have in their hands is eroded overnight. However, under normal

circumstances, any economy may go through the phases of creeping, walking or running inflation. Figure 3 shows these types by the rate of change in prices. The curve OA shows that the prices are increasing at a very slow rate, usually less than 10 per cent per decade or less than 1 per cent per annum. This curve shows the case of creeping inflation. The curve OB shows the case of walking inflation i.e. the prices are rising at a rate of 30-40 per cent per decade or 3-4 per cent per annum while the running inflation (shown by curve OC) shows that the rate of change in prices is about 100 per cent per decade or 10 per cent per year. On the other hand, the curve OD shows the case of hyper-inflation which means that the prices rise by 100 per cent in a period of less than one year and the cumulative change in such cases can be more than 1000 per cent in a decade if it is left unchecked by any government. This will definitely lead to devastating conditions for any economy.

**Figure 3: Types of Inflation by Rate of Change in Prices**



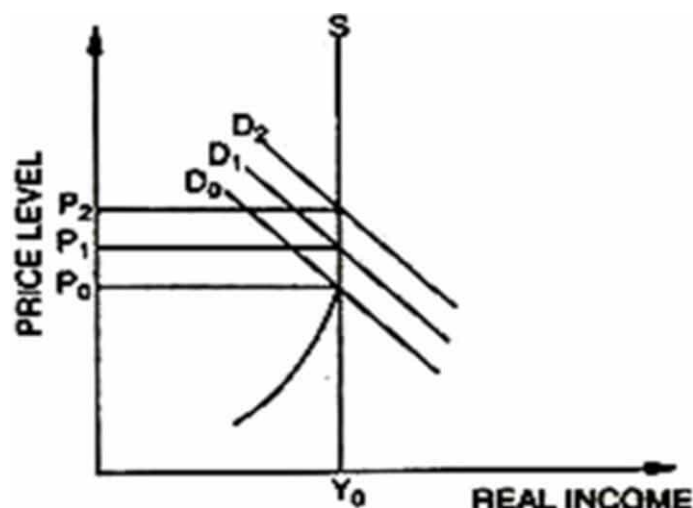
### **5.5.3 Types of Inflation by the Causes**

In this section we will discuss the types of inflation by their causes. It is generally stated that inflation can be caused by both demand and supply sides. Hence, it can be called demand pull or cost push inflation. All other types like credit inflation, wage inflation or structural inflation can be put under these two broader categories.

### **5.5.3.1 Demand Pull Inflation**

This type of inflation is caused by excess demand, relative to the available supply of goods and services. When the economy has already reached the full employment level, there is no possibility of increasing the supply of goods and services but increase in supply of money increases the demand. This leads to increase in prices in factors as well as goods market. This can be observed from figure 4. In this figure,  $S$  is the supply curve while  $D_0$  is the original demand curve. The original equilibrium is obtained at  $OP_0$  level of prices and the economy is at the level of full employment as we can see that after the point of intersection of original demand and supply curves, the supply curve becomes parallel to Y-axis which means that the supply of goods and services cannot be increased with existing resources. Hence, any increase in demand will lead to increase in prices. The figure shows that as the demand increases, the demand curve shifts upwards to  $D_1$  and the new equilibrium is attained at higher prices i.e.  $OP_1$ . Similarly, when demand further increases to  $D_2$ , the prices also increase to  $OP_2$ .

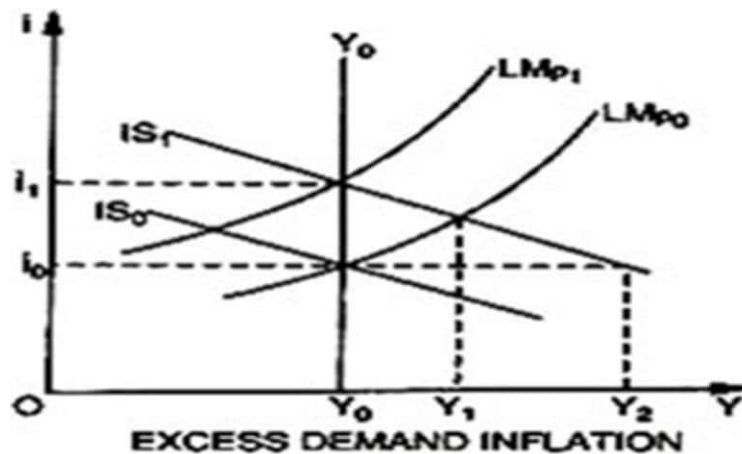
**Figure 4: Demand Pull Inflation**



The concept of demand pull inflation can also be understood with the help of the IS and LM curves. Figure 5 shows that the initial increase in excess demand is to the extent of  $Y_0Y_2$  as the IS curve shifts from  $IS_0$  to  $IS_1$ . This leads to increase in prices and new equilibrium is attained at  $Y_1$  at an interest rate higher than the original  $O_i0$ . During this process, the contraction in LM curve occurs due to two reasons, an increase in excess demand, shifts the existing resources to transaction purposes and there will be lesser demand for speculative purposes at higher rate of

Interest. Further, increase in prices resulting from this excess demand also reduces the real value of the money balances people have in their hands, this is just like a fall in money supply. Hence, the LM curve shifts inwards to  $LM_{p1}$  and the final equilibrium is restored at full employment level i.e.,  $Y_0$  but at higher rate of interest and prices.

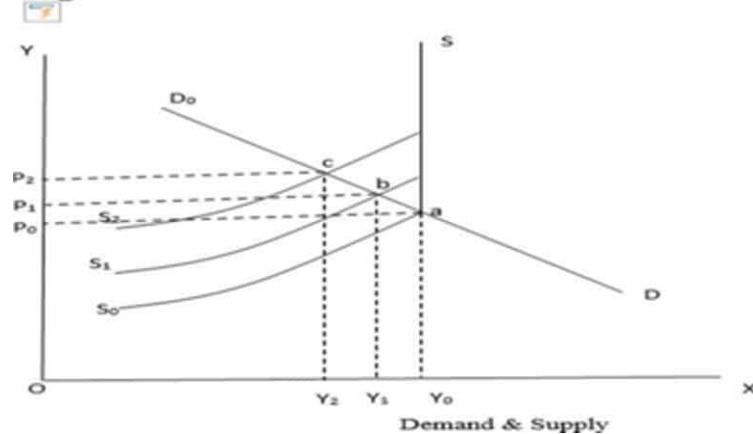
**Figure 5: Demand Pull Inflation: IS And LM Curves**



### **5.5.3.2 Cost Push Inflation**

Another view point is that instead of excess demand, the prices rise due to increase in cost of production. It may occur due to demand for higher wages by the labour unions, increase in prices of raw materials or other inputs or due to a higher mark-up by the sellers, especially in an oligopolistic market. The idea of cost push inflation was put forth in its theoretical form by Thorp and Quandt (1959). Whenever, there is an increase in prices, the producer will ask for higher prices for the same level of supplies as their cost of production has increased.

**Figure 6: Cost Push Inflation**

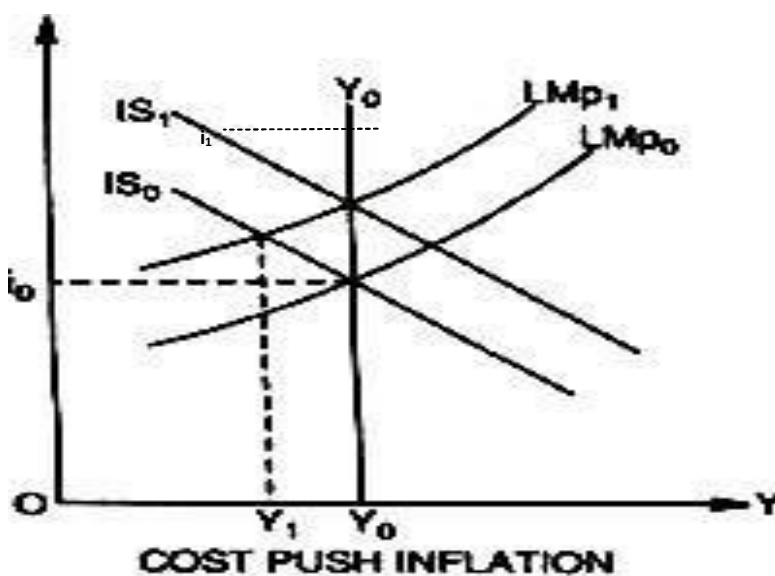




In figure 6,  $DD_0$  is the demand curve and  $SS_0$  is the original supply curve. The original equilibrium is attained at point 'a', where the economy is at the full employment level. After increase in cost of the inputs, the marginal cost of production increases as a result, the supply curve shifts from  $SS_0$  to  $SS_1$  and the new equilibrium is attained at point 'b'. This leads to increase in prices to  $OP_1$  and unemployment is created to the extent of  $Y_0Y_1$ . A further increase in cost shifts the supply curve to  $SS_2$  and the price level increases to  $OP_2$  while the level of unemployment increases to  $Y_0Y_2$ . Thus, the increase in cost not only leads to rise in prices but also an increase in unemployment.

The working of cost push inflation can also be understood with help of the IS and LM curves, as shown in figure 7.

**Figure 7: Cost Push Inflation: Is and LM Curves**



In this figure, the original equilibrium is attained where  $IS_0$  and  $LM_0$  intersect each other and full employment is achieved at  $OY_0$  and the rate of interest is  $i_0$ . With an increase in cost of production, more of the money is spent in purchase of inputs and less of the money is left for other purposes, this is like contraction of money supply, which is represented by inward shift of the LM curve to  $LMP_1$ . The new equilibrium is attained at  $OY_1$  level of income which is less than the full employment level. The level of full employment can only be achieved if there is fiscal expansion and the IS curve shifts to  $IS_1$ . But it will cause a further rise in rate of interest

to1 which is equivalent to increase in prices.

### **Check Your Progress- II**

Q1. Define Demand Pull Inflation.

Ans. ....  
-----

Q2. Define cost push inflation.

Ans. ....  
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### **5.6 Effects Of Inflation**

As we have discussed earlier lesson that every increase in prices, is not considered bad. Though, most of the theories assume that the money is neutral, indicating in simple terms that the increase in prices is similar for all the sectors and sections of the economy. But this does not happen in real life. When prices rise, different factors are affected differently. The lower income sections of the society, those with fixed income and consumers often suffer more than the richer sections and the producers or the sellers. So, it is important to discuss the effects of inflation on different sections of the society.

Some of these effects are discussed below:

- 1. Effects on the Producers:** After the level of full employment is achieved, any increase in money supply may turn the rise in prices from a creeping inflation to walking or running inflation and if it remains uncontrolled then even to hyperinflation. Under such situations, the producers have to bear a very high cost of production. So they have only two options of either reducing the supplies or to maintain the supplies at higher prices. This will further have a negative impact on their sales and hence on the profitability.
- 2. Effects on Distribution:** Inflation is often seen as an agent to increase the income inequalities as it does not increase the income of various factors of production in equal proportions. Big hoarders and speculators earn more while those with fixed income lose their purchasing power. The profits, rent etc. may increase while the wage rate may not change in proportion to the rate of inflation. This redistributes the resources from the hands of the low income groups to the high income groups. Thus, inflation increase the income inequalities.

3. **Effect on Debt:** As the increase in prices leads to deterioration in the purchasing power, the debtors are considered to be benefited from the inflation. If the rate of interest remains unchanged with increase in prices or the change in rate of interest is less than the rate of inflation, then the debtor will return lower amount of money in real terms. Under such cases, the creditors will suffer from inflation as they will not get back the same amount of money in real terms.
4. **Effect on Wage/Salaried Earners:** Many studies have indicated that after inflation, the wages or salaries of the persons increase after a lag and more often this increase is not in proportion with the inflation rate. In countries where agricultural sector employs a big proportion of its workforce and/or a majority of the workers belong to the unorganised sector (as in India), any increase in prices pushes the people towards the poverty line. With a small increase in prices, a big majority of them fails to make their both ends meet. Thus, with inflation, the middle class is pushed towards poverty; those who were earlier just above the poverty line, are pushed below the poverty line and poor become poorer.
5. **Effect on Human Capital Formation:** Inflation has a negative impact on standard of living of common masses. With limited income, when the prices increase, they find it difficult to maintain their original standards. This leads to cut in expenditure on education and health of the family members. During the periods of inflation, the school fees and cost of medical treatment also increases. Hence, people find it difficult to attain higher education, nutritional diets and proper medical care for their wellness. This has an adverse effect on the process of human capital formation.
6. **Social Problems and Political Instability:** Inflation aggravates the income inequalities. A big proportion of the population of developing economies live under the conditions of vulnerability to poverty. The growth does not percolate to the lower sections of the society and inequalities are in their worst form. This leads to wide spread unrest among the common masses. With a life full of deprivations, public often lose faith in the democratically elected governments. This results in political instability. Wider inequalities also leads to social problems. When people do not get enough from their livelihoods and their labour is not adequately rewarded, they resort to other means such as looting, corruption, dowry, or other illegal ways to amass money.

## **5.7 Summary**

Business cycle can be defined as the downward and upward fluctuations of gross domestic product (GDP) along with its natural growth rate over a long period of time. Business cycles influence business decisions enormously and set the tendencies for future business. In this unit, there are four phases of business cycles namely, Depression, Recovery, Prosperity and Recession. The period of prosperity opens up new and larger opportunities for investment, employment, and production and promotes business in the economy. Whereas, the period of depression reduces business opportunities and investment as well as employment in the economy. Thus, in order to earn maximum profit, an entrepreneur must analyze the economic environment of the period before taking his important business decision. We have further discussed about the meaning and types of inflation. Here, inflation means increase in money supply which causes rise in prices along with the fall in purchasing power. Demand pull and cost push inflation are the types of inflation. Demand pull inflation means rise in prices is caused by excess demand, relative to the available supply of goods and services, while cost push inflation means, instead of excess demand, the prices rise due to increase in cost of production.

## **5.8 Questions for Practice**

### **A. Short Answer Type Questions**

- Q1.What do you mean by a business cycle?
- Q2.Define prosperity.
- Q3.How would you differentiate between recession and recovery?
- Q4.What are the characteristics of the phase of depression in any business cycle?
- Q5.What do you mean by inflation?
- Q6.Define hyper-inflation
- Q7.Do you think that all types of inflation are bad? If not, why?
- Q8.Differentiate between cost-push and demand-pull inflation.

### **B. Long Answer Type Questions**

- Q1.What do you mean by a business cycle? Discuss various phases of a business cycle.
- Q2.Discuss various types of inflation.
- Q3.What is inflation? Discuss its causes and effects.

## **5.9 Suggested Readings**

Thorp, Willard L. and Richard E. Quandt (1959). *The New Inflation*. McGraw-Hill Book Company Inc., New York.

Keynes, J.M. (1940). *How to Pay for the War: A Radical Plan for the Chancellor of the Exchequer*. Macmillan and Co., Ltd. London.

Samuelson, Paul A. (1948), *Economics: An Introductory Analysis*, McGraw-Hill.

Say, J. B. (1834). *Treatise on Political Economy*. 6th American Edition. Grigg and Elliot, Philadelphia.

Schumpeter, J.A. (1961). *The Theory of Economic Development: An inquiry in to profits, capital, credit, interests and business cycles*. Translated from German Edition (trans. Redvers, Opie). Oxford University Press, New York.

**M.A (ECONOMICS)**

**SEMESTER –II**

**COURSE: MACRO ECONOMICS**

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**UNIT 6 A: MONEY: DEFINITION, TYPES, FUNCTIONS AND ROLE**

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**STRUCTURE**

**6.0 Learning Objectives**

**6.1 Introduction**

**6.2 Meaning of Money**

**6.3 Origin of Money**

**6.4 Stages of Growth of Money**

**6.5 Definitions of Money**

**6.6 Features of Money**

**6.7 Functions of Money**

**6.7.1 Primary Functions**

**6.7.2 Secondary Functions**

**6.7.3 Contingent Functions**

**6.8 Importance of Money**

**6.9 Evils of Money**

**6.9.1 Economic Evils of Money**

**6.9.2 Non-Economic Evils of Money**

**6.10 Classification of Money**

**6.10.1 On the Basis of Nature**

**6.10.2 On the Basis of Legality**

**6.10.3 On the basis of Money Material**

**6.11 Paper Money**

**6.12 Near Money**

**6.13 Difference Between Money and Near Money**

**6.14 Summary**

## **6.15 Questions for Practice**

## **6.16 Suggested Readings**

### **6.1 Learning Objectives**

After reading this unit, learner will be able to:

- Know the Meaning and Origin of money
- Problems of barter system and stages of growth of money
- Identify the difference between money and near-money
- Identify the functions of money
- Know about evils and classification of Money

### **6.2 Meaning of Money**

Basically, term money was derived in English language from Latin word 'Moneta'. Moneta is another name of the Roman Goddess Juno. The first regular mint was established in Rome in the temple of the Goddess Juno or Moneta. The early Roman coins minted on one side, the head of the Goddess with her name Moneta. With the passage of time, the name of money passed on to the product of the mint after the name of this Goddess. Money cannot be described on the basis of the matter it is made of it. It can be defined in terms of its functions.

### **6.3 Origin of Money**

The difficulties of barter made it essential for people to derive some meaning of money to overcome the problems of barter system, the method derived was the use of something which served as a medium of exchange and a measure of value which later on considered as money, has gradually become the central figure in an economy and revolution in the history of mankind. The need for money was realized long ago and the idea originated in the very early stages of man's economic life. The difficulties of barter were felt more and more as production increased and exchange expanded. Specialization developed exchange and the use of a medium and a standard became necessary. But money developed through a number of stages and its nature has been changing from time to time and from region to region.

However, there are two theories related to the growth of money.

1. **Theory of Spontaneous Growth of Money:** Spontaneous growth theory of money was propounded by Prof. Spalding. This theory states that money was not discovered by any particular individual. Its growth was just spontaneous. With the development of civilization, exchange increased and to overcome the problems of exchange, people started to use a particular commodity as a medium of exchange. Thus, with the passage of time, this commodity came to be accepted as money. In this way, money came into existence of its own.
2. **Theory of Evolution of Money:** This theory is associated with the name of Prof. Crowther. This theory states that money has come into being not on its own but due to specific human efforts. According to Crowther, "Money is one of the most fundamental of all man's invention. It needed the conscious reasoning power of man to make the step from simple barter to money accounting. It was with a view to find a standard measure of value and a medium of exchange."

#### **6.4 Stages of The Growth of Money**

**1. Commodity Money:** As human civilization went on to develop, commodities were used as money. For instance, in the hunting stage, people used animal skins, bows and arrows etc. as money. In the animal stage, goats, sheeps, cows and oxes were used as medium of exchange. 'Similarly, in agricultural stage, grains were used as medium of exchange. Thus, in different stages, different commodities were accepted as medium of exchange.'

Demerits: The following are the main demerits of commodity money:

- a. These commodities lacked profitability.
- b. All cattle or other goods are not homogeneous.
- c. Supply of commodities could abruptly change.

**2. Metallic Money:** Metallic money was introduced in 8th century by king Midas to overcome the difficulties of commodity money. With the growth of human civilization man discovered various metals like iron, gold, —brass, copper, silver etc. These metals were used as money. In the beginning, people were indifferent to the weight of the pieces of these metals. But with the passage of time, different pieces of metals were weighted to ensure uniformity. As a result, the metal pieces were stamped and



their value was inscribed on them.

**Demerits.** Some of the elements of metallic money are as under:

- a. Metal coins proceed to expensive form of money supply.
- b. Supply of metallic coins could not always be adjusted to their demand.
- c. Metal coins used to be very heavy in weight.

**3. Paper Money:** Paper money was first of all introduced in China in 1807 to remove the difficulties of metallic money. As is known, metallic money is inconvenient as well as risky affair to transfer. There is involved a lot of risk of being stolen. Therefore, to cope with these difficulties, traders in the past used to deposit their metal money with money lenders and obtain certificate of deposit. These certificates were used to obtain metal money at different stations. Therefore, these certificates came to be used as money.

**Merits:** The main Merits of paper money are as under:

- a. This is a cheap source of currency.
- b. It can easily be transferred from one place to other.
- c. Its supply can be easily adjusted according to its need.
- d. Credit Money. Banking system came into existence due to expansion of trade.

Growth of banking system led to the creation of credit money. It comprises of cheques, promissory notes etc. This is a very simple, convenient secured as well as less expensive form of monetary system.

**4. Near Money:** Near money means those promissory notes which are readily converted into money. Near money comprises of Treasury Bills, Exchange Bill, Bonds, Securities, Fixed Deposits with the Banks, Insurance policies and the like. Therefore, near money is less liquid as compared to paper money.

## **6.5 Definitions of Money**

Money is not easily defined because it has many definitions due to its scattered subject matter. Still, it is controversial what money is and what we constitute in money. The near money assets perform the functions of money and satisfy the definition of money. It is possible to know the constituents of money, but it is very difficult to give its suitable and universal definition. Another reason due to which it is

not easy to define money precisely because of changing usages and customs. How can in a dynamic society, fixed or rigid definition of money can be given? In old times, precious metals were regarded as money like gold and silver coins. But in the modern times, paper notes and demand deposits, plastic money (ATM Cards, and Credit Cards) have become part and parcel of money. The present controversy has been cleared by including time deposits or fixed liabilities referred to by Milton Friedman, Radcliffe Committee and Gurley and Shaw, the non-banking financial in term diaries and liabilities of the saving banks into money.

*H. G. Johnson* in his "Monetary Theory and Policy" and *EL. Feige* in, "Demand for Liquid Assets: A Temporal Cross Section Analysis" have followed four approaches to the definition of money.

1. Conventional Approach.
2. Chicago Approach or Monetarists Approach.
3. Gurley and Shaw Approach or Liquidity Approach.
4. Central Bank Approach.

These approaches are discussed below:

- 1. Conventional or Traditional Approach:** This is the oldest approach to the definition of money. According to this approach, money acts only as a medium of exchange. It means money is defined in terms of its characteristics like spend ability, and liquidity, etc. According to *G. Crowther* "if a thing that is fact generally acceptable in payment and generally used as a medium of payments, it is money." General acceptability depends upon the social and legal conventions. Keynes opined, "Money is that delivery by which debt contracts and price contracts are discharged and in the shape of which a store of general purchasing power is held."

This definition of money includes in it the currency (which is the liability of the central bank) and demand deposits (which are the liabilities ' of the commercial banks.)

$$M = C + D$$

M - Money Supply, C- Currency, D- Demand Deposits.

- 2. Chicago Approach or Monetarist Approach or Quantity Theorist Approach:**

This approach is associated with the Nobel Prize Winner, Milton Friedman and other Quantity Theorists or Monetarists. The Chicago economists have broadened the scope of money by defining it as "a temporary abode of purchasing power" (Milton Friedman). It means money can function as a temporary abode of purchasing power if it is kept in the form of cash, demand deposits or any other asset which is close to currency: *i.e.*, near money asset. According to this approach money includes currency, demand deposits and time deposits,

$$M = C + D + T$$

M. Friedman and D. Meiselman have given two criteria to include time deposits in money.

**3. Gurely and Shaw Approach or Liquidity Approach:** This approach has been given by Professors John G. Gurley and Edward S. Shaw, in their book 'Money in a Theory of Finance', and the Radcliffe Committee. They have stated that there are many assets which have claims against financial intermediaries: currency and demand deposits are just two among them. They lay stress on large spectrum of financial assets. On the basis of this approach, they include in money ( $M$ ), the currency ( $C$ ), demand deposits ( $Z$ ), time deposits ( $T$ ), saving bank deposits ( $SB$ ), shares ( $S$ ), bonds ( $B$ ) etc.

$$M = C + D + T + SB + S + B,$$

Thus, Radcliffe Committee and Gurley and Shaw approach include in money the Chicago definition plus the liabilities of non-banking financial intermediaries. Thus the

**4. The Central Bank Approach:** The central banking approach has further broadened the scope of the concept of the money. According to this approach, there is similarity between money and other means of financing purchases which are measurable and immeasurable. The *measurable-concept* means, it is the total amount of credit outstanding that matters and the money supply affects only because bank credit is a part of total credit. The *unmeasurable concept* means the concept of liquidity of the economy and credit can be substituted for money without limit. Money is the credit extended by a wide variety of sources. The credit has to be controlled to regulate the

economy. Thus, under this approach, money includes currency (C), bank credit (D), time deposits (T) credit from non-banking financial institutions (NBFI) and credit from unorganized agencies (CUA) to economize its use.

$$M = C + D + T + \text{NBFI} + \text{CUA}.$$

### **Check Your Progress- I**

Q1. Mention the names of the stages of the growth of money.

Ans. ....  
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Q2. Define conventional or traditional approach of money.

Ans. ....  
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### **6.6 Features of Money**

The main features of money are as stated below.

- 1. General Acceptability:** The main features of money are that people accept it as a medium of exchange. It is accepted as a standard of payment without any hesitation. In this regard Neralyn has rightly observed, "The essential function which money enables to identify money is that, it is generally accepted as a means of paymentl.
- 2. Money is Not a Veil:** Economists regarded money as a veil. It was held that money acts as a medium of exchange without affecting the level of economic activity in any way. However, modern economists opined that money is not a veil. It is an active agent of the economic system. In this way, money is required in every economy before the process of production starts. Changes in the demand for and supply of money significantly in- fluence the nature and level of economic activity.
- 3. Measure of Value:** It is possible to measure the value of goods and services in terms of money.
- 4. Liquid Asset:** Money is considered as the most liquid asset. Liquidity refers to that asset which can be converted into goods and services as and when desired. Other assets, other than money, are not equally liquid. Thus, houses, land, furniture etc.

are not as liquid as money. One has to first dispose off these assets, convert them into money, before other goods and services are bought.

5. **Voluntary Acceptability:** Another important feature of money is that it has voluntary acceptability of the people. The people always wish to hold money. This does not need any legal sanction.
6. **Money is a Means and Not an End:** Money is useful only indirectly. It means, we can buy goods and services with money to satisfy our wants. Therefore, money is only a means to satisfy human wants. Thus, money is of no direct satisfaction.
7. **Medium of Exchange:** Money acts as the medium of exchange for the sale and purchase of goods and services.
8. **Government Control:** All economic problems are related to the flow of money in the economy. In the modern economies, the role of Govt. is not nearly restricted to the administration of the country. Rather, it is increasingly participating in economic activities. To control, the inflationary and deflationary tendencies in the system, the role of the Govt. is regarded as an unsuitable phenomenon. Generally, the Central Bank of country acts on behalf of the Govt. to regulate the flow of money in the system.

### **6.7 Functions of Money**

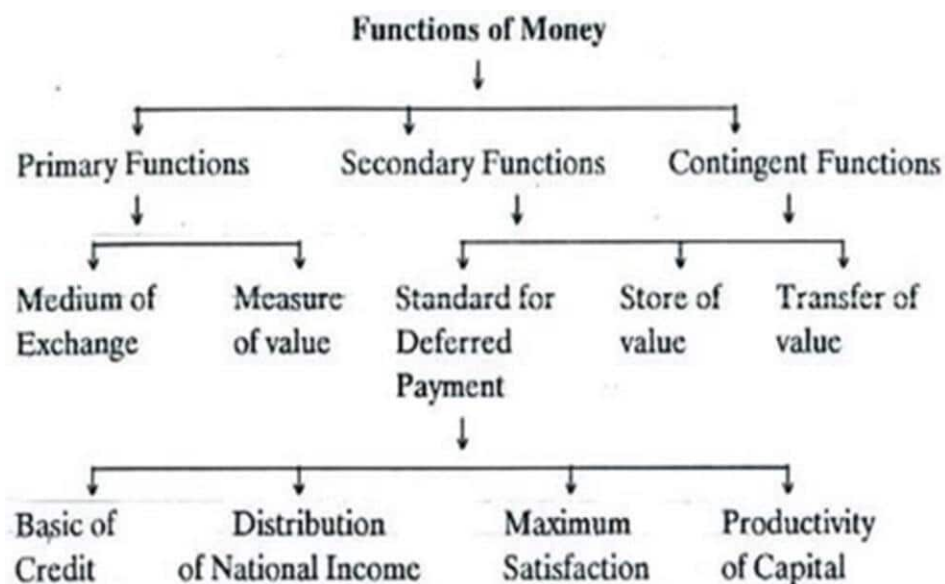
Money came into existence due to various difficulties of the barter system. The functions of money are such that they are expected to remove the difficulties of barter. Even the best definition of money cannot bring out the exact features of money. We must, therefore, like Prof. Walker, say, *money is what money does*, i.e. anything that performs the functions of money. A proper understanding of the term money, therefore, necessitates a discussion of the functions of money. It will not be out of place to quote a couplet which describes the function of money as:

***"Money is a matter of functions four,  
A medium, a measure, a standard and a store."***

Prof. Kinley has classified the functions of money into three groups:

- (i) Primary or essential,
- (ii) Secondary, and
- (iii) Contingent.

The following picture is illustrative of the functions which money performs in modern times:



### 6.7.1 Primary Functions

Primary functions of money are the following:

- 1) **Medium of Exchange:** The most important function which money performs is the medium of exchange. Medium of exchange implies that anything which is generally accepted in exchange of goods and services. The acceptance of money as a means of payment is a matter of social or legal convention. Each person accepts money with the influence that others will accept it in payment. The social convention could be set up through a formal pledge by all members of society to accept a certain commodity agreed upon as a medium of exchange. If some social convention is enforced by law, it is called legal convention. According to Newton, "The essential function which enables us to identify money is that it is generally accepted as a means of payment." By performing its role on a medium of exchange, money has removed the difficulties of barter system.
- 2) **Common Measure of Value.** Another function of money is the measure of value. It implies that the value of each commodity is measured in the monetary unit. Money is looked upon as a collective measure of values. Since all values are expressed in terms of money, so it is an easy job to determine the rate of exchange between various goods and services under the barter system, it is very difficult to determine the rate of exchange between various types of goods and services. But

the discovery of money has removed this difficulty. But money still has difficulty in its role as a collective measure of value. And commodity which acts as a measure must itself be stable in value. But this cannot be said of money. Money as a unit of account helps in economic comparison and hence preferences can be ranked on the basis of satisfaction achieved. Moreover, this function facilitates accounting and book-keeping. The planners use shadow prices for the evolution of a project. Individuals on the basis of this function of money get the economic information.

### **6.7.2 Secondary Functions**

In the secondary functions of money, include:

1. **Store of Value:** The store of value is the most important function of money. It is very useful for economic analysis. The store of value is also termed as generalized purchasing power of money. It implies the shifting of purchasing power from present to the future. Money is also stored as permanent abode of purchasing power. Keynes was first who realized its importance. In this sense, money is stored in the form of asset. Money is an asset because it is claim against all goods and services, which one likes to buy. People may keep their wealth in the form of money. Money has to compete with other assets. It is the most liquid of all assets. It is so because it can be easily exchanged for any goods and services. Liquidity in general means the ability of an asset to be converted into cash without any risk or loss or wastage of time. The liquidity of an asset depends on its ready transferability and stability in value. All assets other than money lack reversibility in the sense that their value in payment is not equal to their value in receipt.
2. **Standard of Deferred Payments:** Under barter system, borrowing and lending were very difficult. But the modern money economy has facilitated these processes. Now both lending and borrowing are done in terms of money. A large volume of transactions are consented with contractual payments which are expressed in money, it serves as a

standard of deferred payments. It is more stable and durable as compared to other goods and has general acceptability. Therefore, due to these reasons money continues to be desirable as a standard of deferred payments.

3. **Transfer of Value.** The area of exchange has widened with the growth of the economies. The exchange of goods is done at distant places. It is necessary in these cases to transfer purchasing power from one place to another. Money has facilitated the transfer of value. In modern times, the wants of the people are multifarious. Therefore, to meet these wants, the goods and services are bought from remote areas. Money being liquid and generally acceptable can be used for transfer of value. Any person can sell any asset at a place and buy it at another place; it is due to this function of money that the idle funds lying with one person can be lent at interest to another person to use them optimally. As a result, it helps in the economic development of the country.
4. **Guarantor of Solvency:** Prof. Kent referred to this function of money as guarantor of solvency. In order to meet the unexpected obligation, the person and business firms have to keep large sums of money. They hold money to avoid insolvency. Thus, when money is kept to avoid insolvency, it is called guarantor of solvency. Kent lamented that money as guarantor of solvency is different from money as a store of value. Store of value function of money implies the buying of goods sooner or later. But when money is kept as guarantor of solvency, individual has not to part with it until it becomes absolutely necessary.

### **6.7.3 Contingent Functions**

The main contingent functions of money are as under:

- 1) **Distribution of National Income:** The goods and services are produced by four factors of production. They have to be duly rewarded for their efforts. It is with the help of money that the national income produced by four factors of production i.e. land, labour, capital and entrepreneur is distributed in the shape of rent, wages, interest and profit- respectively. Thus, money facilitated the distribution of national income and each factor of production is paid in terms of money.
- 2) **Basis of Credit System:** In the modern economic setup credit has occupied a vital place. Credit is called promise to pay. Every currency note or cheque carries the



legend: On demand I promise to pay Rupee. Prior to the invention of money, the manufacturing of credit by banks was not possible. But in the modern money world, the cheque system, drafts and bills of exchange are widely used. The basis of these credit instruments is money. People save some part of their income and put in the bank. On the basis of these deposits the banks create credit. Thus, money serves as the basis of credit.

- 3) **Equalization of Marginal Utilities and Productivities:** It is money with which consumers and producers maximize their satisfaction. The use of money results in the application of principle of substitution. Human wants are unlimited and variegated whereas income is scarce. The consumer uses his limited resources in

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \frac{MU_z}{P_z} = \dots, \frac{MU_n}{P_n}$$

such a way so that marginal utilities from various goods are equal, e.g.,

Similarly, the producer uses his limited resources in such a fashion as the cost of production is minimum and profits are maximum.

This equates the marginal physical productivities of different factors of production.

$$\frac{MPP_x}{P_x} = \frac{MPP_y}{P_y} = \frac{MPP_z}{P_z} = \dots, \frac{MPP_n}{P_n}$$

### Static And Dynamic Functions of Money

Paul Einzig had classified all the functions of money into two broad categories, viz., static functions and dynamic functions.

1. **Static Functions:** Static functions of money apply to conventional, fixed, technical, and passive functions of money. These functions only help to regulate the economic system; they do not infuse any element of dynamism into the system. These basically include the Primary and Secondary functions of money, such as medium of exchange, standard of value, store of value, transfer of value and standard for deferred payments.
2. **Dynamic Functions:** Dynamic functions of money imply those functions of money which impart dynamism to the economy. By imparting dynamism, we mean to ensure stability of price level as well as to improve the level of income and

employment. Dynamic functions also consist of such functions as increasing the liquidity of capital and serving as the basis of credit creation. All such functions of money make it amply clear that money is a Dynamic Force. In order to resolve the problems of inflation and deflation, the Govt. in its formulation of the monetary policy, focuses only on the dynamic functions of money.

The basic dynamic functions of money are:

- (i) Money creates the situation of inflation or deflation through changes in the price level
- (ii) Money facilitates full utilization of the natural and man-made resources. This increases the level of national income.

### **Check Your Progress- II**

Q1. What are the primary functions of money?

Ans.....  
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Q2. Define static and dynamic functions of money.

Ans.....  
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### **6.8 Importance of Money**

In modern economy, money plays a very crucial role because the modern economies cannot function properly without money. Thus, money occupies a prime place in all branches of economics. The following are the main points of significance of money:

- 1. Importance in Consumption:** The invention of money has greatly benefitted the consumers. The consumers get their incomes in the form of money which gives them a ready command over a variety of goods and services. They can postpone their demand if they so desire. According to Robertson, "Money helps each member of society to ensure that the means of enjoyment, to which he has access, yield him the greatest amount of actual enjoyment which is within his reach.
- 2. Importance in Production:** Money helps the producers in a number of ways by its significant role in deciding, planning and managing the productive activities in the most efficient way. Moreover, the existence of money helps the producers to

discover what people want and how they want.

3. **Removal of the Difficulties of Barter System:** The existence of money has removed the drawbacks of old barter system. Under barter system goods are exchanged for goods. There always exists the double coincidence of wants. But, the invention of money has greatly facilitated by removing these difficulties. Now, the value can be measured easily and quickly. There is no difficulty in the exchange of indivisible goods.
4. **Importance in Distribution:** Money has greatly facilitated the process of distribution of national product among different factors of production in terms of rents, wages, interest and profit. All these payments are made in terms of money. It signifies the fact that money acts as a medium of exchange.
5. **Importance in Public Finance:** The magnitude of public finance is so vast that it cannot be managed without money. Public finance deals with the income and expenditure of the govt. The government receives income in the form of taxes, fees, fines etc. and spends this income on developmental and administrative purposes. Without money, these functions of the modern states would become difficult and complex.
6. **Importance in Capital Formation:** Money has greatly facilitated the process of capital formation. It means increase in investment. Investment will be undertaken only when there are savings. The financial institutions mobilize the savings from the general public and channelize them into productive processes by the way of advancing loans to the investors.
7. **Increase in National Unity:** In every country of the world, money has served as a helping hand to promote the national unity. It has curtailed the social isolation. People living in far off regions meet each other for commercial purposes. It serves to encourage the national unity in a country.
8. **Measure of Social Welfare:** Social welfare can be measured only through money. The utility derived by a person can only be measured in terms of money.
9. **Importance in Trade:** Money through its function as a medium of exchange facilitates trade. In modern economics, the rapid exchange of goods and services is possible because of money. Money constitutes the basis of price mechanism

through which the economic activities of the community are adjusted.

**10.Economic Development:** Monetary policy of every country greatly influences its economic development. In an economy, if money supply is more, people will spend more which will lead to an increase in demand, production and thus, there is every possibility of economic development.

**11.Increase in Standard of Living:** The smooth functioning of money economy helps the society to raise its standard of living. It does so by increasing the overall production and through equitable distribution of income and wealth.

**12.Solution to Central Economic Problems:** Money facilitates convenient and appropriate solution of the central economic problems of an economy. The main central problems of an economy are what to produce, how to produce and for whom to produce.

**13.Division of Labour and Extent of Market:** Because of money, there has been a phenomenal expansion of the markets. Production is now being done on large scale. This has increased the degree of mechanization. High degree of mechanization has facilitated division of labour and specialization.

**14.Basis of Credit:** In modern age, trade depends on credit. In the absence of money, credit creation was not possible. As a store of value, money has facilitated the creation of credit. To quote Halm, "Money is the most appropriate mode of credit, because compared to goods; its value remains relatively stable. Credit system will just come to end in the absence of money.

## **6.9 Evils of Money**

According to *Ludwig Von Mises*, "Money makes the mare go." But money is not an unmixed blessing. Money is stated as the root of all evils." Highlighting the evils of money Mises has further stated, "Money is regarded as the cause of theft and murder of deception and betrayal. Money is blamed when the prostitute sells her body and when the bribed judge perverts the law. It is money against which the moralist declaims when he wishes to oppose accessible materialism. Significantly enough, avarice is called the love of money and all evils attributed to it."

*Robertson* has stated, "Money, which is a source of so many blessings to mankind, becomes also, unless we can control it, a source of peril and confusion".

Money is a valuable though dangerous invention. It is a good servant but a bad master. . The various economic and non-economic evils of money are discussed as under:

**6.9.1 A. Economic Evils of Money.** The economic evils of money are as stated below:

- 1. Inflationary and Deflationary Pressures:** Inflation and deflation which are caused by monetary factors have been causing hardship to the people. One of the greatest demerits of money is the change in its value. It means there may be inflationary or deflationary pressures.

During inflation, wealth concentrates in the hands of business communities and the poor have to suffer due to sky-high prices. In this case the rich become richer-and-the poor-gets poorer. The inflationary pressures jeopardize the economy. The real production will fall and speculative activities will be encouraged. During deflation, the purchasing power of money rises and the business community suffers a great loss. The working class faces the situation of unemployment. Of course, the middle-class gains. Deflation was severe in 1929 which caused a radical fall in employment. Thus, the pattern of production changes due to change in the value of money.

- 2. Trade Cycles:** Wide fluctuations in business activity and prices have been the result of the flow of money. Under a capitalistic system, trade cycles are a normal feature. A boom is followed by a slump and slump results in boom. Therefore, instability exists in the economy. The result is that different sections of the society face difficulties and inconveniences. In fact, money is the cause for ups and downs in the country. In a barter economy, there is no possibility of trade cycles because there are no chances of over production and under production.

- 3. Inequalities of Income:** One of the greatest evil of money is the inequalities of income and wealth. It has divided the society into two classes i.e. haves and have nots. It results in concentration of wealth in the hands of capitalistic classes. But it adversely affects the working class. It makes the rich richer and poor poorer. It is due to this reason; money had created a wide gulf between different groups of the society. This has led to the exploitation of working class and the existence of degradation in the midst of plenty.

- 4. Over-Capitalization:** With the inception of money, borrowings and lendings have

become possible. But the easy borrowing and lending have led to the problems of over- capitalization and over-production. It means some industries use more capital than required. Over capitalization results in over production and therefore uncertainty and instability.

5. **Misuse of Credit:** Money is the basis of credit. If with the help of money, more and more credit is created, but output is not increased, in that case too much money chases too few goods. It will result in rise in prices which is a chronic problem in the modern economy. Thus, money results in misuse of credit.
6. **Hoarding:** In the materialistic world, people give more importance to money than what it deserves. Instead of putting money in productive channels, people start hoarding it. Thus, it creates problems in production. The concept of money will function nicely only if all that is saved is invested. But the Hoarding of savings would adversely affect income, output and employment.
7. **Black Marketing:** Money has also created the problem of black money. In the face of exorbitant tax rates, people start evading taxes by concealing income. They find it convenient because of the storability characteristic of money. Black money in turn induces black marketing and speculative activities. This existence of black money runs a parallel economy within an economy. It has devastating effects on the sound functioning of monetary and fiscal policies.

#### **6.9.2 (B) Non-economic Evils of Money**

If money is not properly managed, it pollutes social, political, moral and ethical life. The non-economic evils of money are as follows:

1. **Political Evils:** Money is a source of danger and disaster in political life if it is not managed in the best interests of the community. Money has not only spoiled political life and democratic institutions but has also bred ferocious wars. Money in reality has become the life blood of modern economy. In a poor country like India, it is with money that votes can be purchased by the economically rich. Thus money affects the political institutions adversely.
2. **Special Evils:** Money has stepped up the propensity of materialism cum so was wrecked social life. The success or failure of a person is measured in terms of money. Friendship, love, affection and respect, etc., are measured likewise. Money

puts a curtain on all the evils of man. Everyone in order to have a good status in the society wishes to accumulate more and more wealth. For that he resorts to all types of exploitations. Thus, good social institutions have been relegated to the background with the inception of money. Further, the spiritual values have declined and avarice has prevailed over. Money has encouraged thefts, murders, frauds, etc.

**3. Moral and Ethical Evils:** Moral and ethical considerations have been sacrificed at the altar of money. People in the modern times derive more pleasure from money rather than from anything else. Money is regarded as end rather than a means. It has corrupted all political and social institutions. It has made the people money-minded and hence corrupt. Thus, money has resulted in moral and ethical degeneration. A greedy husband may murder his wife for bringing fewer dowries. Likewise, a greedy father may get his educated and beautiful daughter married to an ugly and uneducated rich man. Thus, for man, money has become '*Gospel of Mammon.*'

### **Check Your Progress- III**

Q1. Mention the importance of money in consumption.

Ans. ....  
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Q2. What are the non-economic evils of money?

Ans. ....  
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### **6.10 Classification of Money**

The various types of money can be known by its classification. Different economists have classified money on different grounds. But mainly money can be classified as under:

#### **6.10.1 Classification on the basis of Nature**

Prof. Keynes has divided money in two parts on the basis of nature as i.e. Actual money and Money of Account.

##### **1. Actual Money**

Actual money refers to that money which circulates actually in a country. It is the actual medium of exchange. It acts as a medium of exchange, measure of value and

store of wealth. It is through money that goods and services are exchanged in the market. In India, all coins in the form of rupees and paise and currency notes of different denomination in circulation constitute actual money. Benham termed this kind of money as Unit of Currency and Seligman calls it *Real or Concrete Money*. Lord Keynes has divided money into two sub-parts.

**A. Commodity Money:** Various commodities have been used as money in different places and at different periods. *Pastoral tribes* and *advises* used cattle, and some still do, as money. But as cattle were neither divisible nor uniform in size and quality, it did not prove to be a good medium of exchange. Some common articles of trade, such as tobacco or salt or skins, were later used as money, since they were not perishable, and under those circumstances, handled easily. Rum was used as a medium of exchange in the early years of New South Wales. Cigarettes were used both as a medium of exchange and as a measure of value in some prisoners-of-war camps and in the black market of Europe immediately after the war.

**B. Representative Money:** It refers to that money whose intrinsic value is not equal to its face value. Such money is allowed to be converted into commodity money. It is indicative of value. Paper money is an example of representative money. It is also of two types: Convertible and Inconvertible. Convertible money can be exchanged for commodity money but so far as inconvertible money is concerned, authorities issuing it or the government are not liable to convert it into commodity money. Therefore, it is called Fiat Money.

## **2. Money of Account**

Money of account refers to that in which all sorts of accounts are kept. According to Keynes, "Money of account is that in which debts and general purchasing power are expressed. For example, in India, Rupee is a money account although its forms and contents have undergone changes many a times. There was a time when rupee coin was made of silver. These days, it is made of nickel. Such money has been referred to as ideal money by Seligman.

### **6.10.2 Classification on the basis of Legality**



In this category, money can be divided into following three parts.

**1. Legal Tender Money (Standard money):** Legal money refers to the money having force of law at its back. No one can refuse to accept it as a means of payment. It is standard money through which all economic transactions are carried out within boundaries of a country. Legal tender money may be of the following two types:

- A. **Limited Legal Tender Money:** Limited legal tender money is accepted as legal tender only up to a certain limit. As in our country, the small coins of 1, 2, 5, 10 and 25 paise are legal tender only to a sum of Rs. 25.
- B. **Unlimited Legal Tender Money:** It refers to that money which has to be accepted as a medium of payment up to any amount. For instance, in India, 50 paise coins, one- rupee coins and currency notes of all denominations are unlimited legal tender.

**2. Optional Money:** Optional money is that which is ordinarily accepted by the people but legally nobody can be compelled to accept it. In simple words, this type of money does not enjoy a legal status. To accept or not to accept it as a medium of exchange depends on the people. Cheques, drafts, hundies, bills of exchange etc. are some of the instances of optional money. Robertson termed optional money as bank money.

#### **Difference between Legal Tender and Optional Money**

	<b>Legal Money</b>	<b>Optional Money</b>
1.	The acceptance is compulsory	Acceptance is expedient and optional.
2.	Legal tender money is issued under statutory provisions.	Optional money is issued on the basis of deposits lying in the banks.
3.	Legal Tender Money is a medium of payment in UDC's.	Optional money is a medium of payment in developed countries.
4.	Legal tender money is bought with risk.	Optional money entails no risk.
5.	Receipt is called on for payment in case of legal tender money.	No receipt is required for payment in case of optional money.

**3. Outside and Inside Money:** Outside money refers to that monetary asset which has its origin in the act of the Government, purchase of goods and services. This asset consists of the claim of private sector against public sector. When there is change in the revenue, expenditure and transfer payments of the Government there exists corresponding change in the stock of outside money.

Inside money refers to that monetary asset which has its origin in the act of financial institutions purchases of securities. This sort of money develops due to purchase of securities by the financial institutions. It is generated by banks. Therefore, the money whose supply comes into being as a result of expenditure by private sector is termed as inside money. Its stock increases when financial institutions like commercial banks purchase the securities.

#### **6.10.3 On the Basis of Money Material**

On the basis of money material, money can be classified into following parts.

**A. Metallic Money:** With the advent of gold and silver and the discovery of other metals, the use of commodities as money was suspended. Their place was taken up by gold and silver and these have probably been used as money for some five thousand years. Their exchange value would have been considerably lower than their intrinsic value had they not been widely used as money. They serve as a medium of exchange because they are durable, divisible, homogeneous and not very bulky. Besides, since their total supply is quite consistent over time and distance fluctuations in their value are not very significant as was the case with perishable goods.

In the beginning, gold and silver was used as a medium of exchange without being coined. It meant that everyone using them as medium of exchange had to satisfy himself as to the weight and fineness of the metal. Later on, the invention of coinage saved him from this trouble.

**B. Standard Coins:** These coins are those whose value as commodity is equal to its value as money. Those coins are made either of gold or silver. These coins have definite weight and fitness. Their face value is equal to their intrinsic value.

**C. Token Coins:** Token coins refer to those coins whose value as commodity is less than their value as money. It comprises of all those coins whose face value is more

than intrinsic value. They are used for making small payments. These coins are made of copper, nickel etc. They serve as subsidiary to standard coins.

Now the issue is that Is Indian Rupee a Standard Coin or A Token Coin

It is not easy to analyse whether Indian rupee is a standard coin or a token coin. The reason in what it contains the attributes of either standard coin or token coin. Prior to 1893, Indian rupee was a standard coin. It was made of silver. Its intrinsic value was equal to the face value. There was free coinage of it. But now its position has changed altogether. In other words, now Indian rupee is both a standard coin as well as token coin. As a token coin it comprises of less coinage of it, it is made of silver. On the other hand, as a standard coin it has attributes of principal money of the country, medium of exchange and unlimited legal tender.

**D. Subsidiary Coins:** Subsidiary coins refer to those coins whose intrinsic value is less than their face value. These coins are of small denomination. These coins are made of light and cheap metal. These are used to make small payments. These are limited legal tender. There is no free coinage.

#### **Check Your Progress- IV**

Q1. Briefly classify money on the basis of nature.

Ans. ....  
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Q2. Define inside and outside money.

Ans. ....  
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### **6.11 Paper Money**

Paper money means promissory notes printed on a special type of paper. The issuing authority promises to pay the bearer the sum mentioned there in. Basically, in 19th century, paper money was first of all used in China. But with the passage of time, it spread to the other countries of the world.

#### **Types of Paper Money**

Paper money is of following four types:

1. **Representative Paper Money:** Representative paper money refers to that money which is fully backed by gold and silver. In the beginning, the main purpose of issuing paper notes was to check the loss caused by wear and tear of precious metal. Paper money used to serve merely as a representative of gold and silver lying in reserve fund. People were ensured that actual money was gold and silver. In order to inspire the confidence among people, paper money was fully backed by gold and silver. It is called represented money because it represented gold and silver lying in fund. It is fully convertible into gold and silver. In America, gold & silver certificates were issued as representative money for a short period. In Indian context, Hilton young Commission in 1925 suggested the adoption of Gold Bullion Certificates, but it is not carried out.
2. **Convertible Paper Money:** Convertible paper money refers to that money which is convertible into standard coins. Govt. guarantees to give gold or silver at a fixed rate in exchange for paper money. This system was valued to revalue this drawback of representative paper money.

**Features:** The representative convertible paper money has the following characteristics.

- a) It is backed by gold and silver.
- b) Public is ensured by the Government that it can get gold and silver in exchange for paper notes.
- c) Gold or silver is bought or sold at predetermined rates.
- d) A part of reserve fund is kept in the form of full bodies.

3. **Inconvertible Paper Money:** Inconvertible paper money means money which is not convertible into gold and silver. In simple words, Government does not give any guarantee to convert currency notes into precious metals. No metallic reserves are kept to back the currency notes. This type of money remains in circulation on the basis of credit of the govt.

**Features:** The main features of inconvertible paper money are as

1. No insurance is given by the Government, to convert it into gold and silver.
2. Paper money serves as standard money.
3. Paper money is unlimited legal tender.

4. Exchange rate of currency is fixed for the convenience of foreign trade.

**4. Fiat Paper Money.** Fiat money refers to the money which circulates on the authority of the Govt. In the words of Keynes, "Fiat money is that money which is created and issued by the state but is not convertible by law into anything other than itself. It is also known as emergency money. The reason is that it is issued under emergency condition. This type of money is not backed by any reserves. Government does not give any guarantee to convert it into metallic coins. In fact, it is extra-ordinary money which is issued under exceptional cases.

### **6.12 Near Money**

To know the concept of near money it is necessary to understand the nature of wealth. Wealth is of two types: *Real wealth and financial wealth*. Real wealth comprises of physical assets like houses, land, machines, materials etc. Financial wealth includes currency notes, coin, and demand deposits of banks. These can be used to buy goods and services. These are liquid in nature. Contrary to this, time deposits, treasury bills, bills of exchange, bonds, debentures, shares, life insurance policy etc. are called Near Money. To buy goods and services, these are first to be converted into cash. These can be converted into money without any loss of time and wealth. Therefore, near money refers to those assets which cannot be used immediately to buy goods and services, but which can be converted into money very easily and their values are known in terms of money.

**Parts of Near Money:** The following assets are included in near money

- 1. Time or Fixed Deposits:** Time deposits mean those amounts which are deposited in the banks for a fixed period. However, it can be withdrawn before the expiry of specified period.
- 2. Bills of Exchange:** It is an instrument of credit in which a debtor is ordered to pay with interest the amount of loan on the expiry of the specified period, say 90 days.
- 3. Treasury Bills:** Treasury bills are those instruments of credit on the basis of which Government gets loan from the public for a short period.
- 4. Bonds:** Bonds means documents on whose strength the Govt. & the firms get

loans for a long period. Bond issued by the firm and industries are called debentures.

- 5. Shares:** Joint stock companies collect their funds by issuing shares to the public.

The shareholder can encash their shares by selling the same in the share market.

- 6. Policies of Life Insurance:** On the basis of security of policies of life insurance, loans can be obtained from LIC. Likewise, policies of Unit Trust of India can also be converted easily into money.

### **6.13 Difference between Money and Near Money**

<b>Money</b>	<b>Near Money</b>
1. Money includes currency notes, coin and demand deposit of banks.	1. Near money includes treasury bills, bills of exchange, bond, Govt. securities, and fixed deposit in banks.
2. Money has general acceptability.	2. Near money lacks general acceptability.
3. Money is liquid.	3. Near money is less liquid.
4. Money does not yield any income.	4. Near money is a source of income.
5. Money is a medium of exchange.	5. Near money is not a medium of exchange.

### **Check Your Progress- V**

Q1. Define convertible paper money.

Ans. ....

Q2. What do you mean by convertible money?

Ans. ....

### **6.14 Summary**

Money, the term is derived to overcome the difficulties of barter system. Initially, barter system was used in the economy for the exchange of commodities. In this barter system one product or commodity was exchanged for another commodity as

per the requirement of the consumer. Generally, Money is accepted in the form of medium of exchange, measure of value, store of value and standard of deferred payments. The primary functions of money include the medium of exchange and measure of value; however, the secondary functions of money contain standard of deferred payments, store of value, transfer of value. Contingent functions of money consist of basis of credit creation, maximum satisfaction, distribution of income, guarantee of solvency, increase in the liquidity of capital.

### **6.15 Questions for Practice**

#### **A. Short Answer Type Questions**

- Q1. Define Money.
- Q2. What are the stages of money?
- Q3. What are the primary functions of money?
- Q4. Explain the four evils of money.
- Q5. Explain the dynamic functions of money.
- Q6. Give suitable definition of money.
- Q7. Discuss the types of paper money.
- Q8. Distinguish Money and Near Money.
- Q9. Define legal tender money.

#### **B. Long Answer Type Questions**

- Q1. What is Money? Write the stages and main features of Money.
- Q2. Discuss the primary and secondary functions of Money.
- Q3. Describe the economic and non-economic evils of money.
- Q4. What is money? Discuss its importance.
- Q5. Money is what money does critically examine the statement.
- Q6. Classify money on the basis of nature and legality.

### **6.16 Suggested Readings**

- Money and Banking, by T.N. Hajela,
- Money and Banking by KPM Sundram.
- Money and Banking by Schuam Series, McGrawHill Publishing Co.

Ltd., NewDelhi.

Money Economics-Institutions, Theory and Policy by Suraj B Gupta.

Innovations in Banking Services by H.R. Suneja.

Monetary Economics: Institutions by Suraj B. Gupta.



**M.A (ECONOMICS)**

**SEMESTER–II**

**COURSE: MACRO ECONOMICS**

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**UNIT 6(B): THEORIES OF MONEY: FISHER’S TRANSACTION BALANCE  
APPROACH AND CAMBRIDGE CASH BALANCE EQUATION, KEYNESIAN  
LIQUIDITY PREFERENCE THEORY**

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**STRUCTURE**

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**6.7 Importance of Liquidity Preference Theory**

**6.8 Criticisms of Liquidity Preference Theory**

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## 6.11 Suggested Readings

### **6.0 Learning Objectives**

After reading this unit, learner will be able to:

- understand concepts of theories of money
- distinguish the difference between value of money and price level
- know about quantity theory of money-definitions
- Describe the equations of quantity theory of money
- Know about the comparison between transaction and cash balance approach

### **6.1 Introduction**

Value of different goods and services is expressed in terms of money, but the value of money cannot be expressed in terms of money. If the value of money is expressed in terms of goods and services, it will have millions of expressions. In a view to overcome the difficulties we calculate the collective value of money. We select some goods and services as used in day-to-day life. Their average price is calculated. It is known as general price level. There is inverse relation between the value of money and general price level. When general price level (P) falls, value of money rises. Therefore,

$$\text{Value of Money} = \frac{1}{P}$$

In the words of Fisher, "Purchasing power of money is the reciprocal of the level of prices, so that the study of purchasing power of money is identical with the study of price value."

### **6.2 Quantity Theory of Money: Meaning**

The quantity theory of money has a long history. But the pure version of the theory is said to have come from David Hume. It was stated in several forms. The classical economists' quantity theory assumed two forms. The first one is the Transactions Approach of Irving Fisher, an American economist. The second version known as the Cash Balances Approach came from the Cambridge economists led by Marshall. The quantity theory of money became quite popular in these two forms. The theory was eclipsed for sometimes due to the Keynesian Revolution. Milton Friedman, a Chicago economist, made a restatement of the theory in 1956.

According to Fisher's quantity theory of money there is a direct and proportionate

relation between quantity of money and general price level and inverse relation between quantity of money and value of money.

### **Definitions**

According to R.S. Sayers, *"The value of money changes inversely and the price level directly to the changes in the quantity of money"*.

According to **Fisher**, *"Other things remaining unchanged, as the quantity of money in circulation increases the price level increases in direct proportion and the value of money decreases and vice versa"*.

According to **J.S. Mill**, *"The value of money, other things being the same, varies inversely as its quantity; every increase of quantity lowers the value and every diminution raising it in a ratio exactly equivalent."*

According to **Prof. A.C.L. Dey**, *"The quantity theory of money states that the price level varies in direct proportion to the quantity of money. If the quantity of money doubles so will be the price level. Similarly, they will fall together."*

### **Equations of Quantity Theory of Money**

- Transaction or Fisher Equation
- Cash Balance or Cambridge Equation.

#### **6.2.1 Transaction or Fisher Equation**

Prof. Irving Fisher in 1911 put forward transaction approach of money in his famous book, "The Purchasing Power of Money". According to Fisher, "The quantity theory is correct in the sense that the level of prices varies directly with quantity of money and values of trade are not changed." To Fisher demand for money is made for transaction motive. Value of money, like any other good is determined by the demand for and supply of money. Therefore, value of money or price level is determined at that point where demand for money is equal to supply of money.

#### **Demand for Money**

The demand for money is just different from the demand for other commodities. Sugar or cloths are demanded because they directly satisfy some want of the consumer. But demand for money is not direct, it is a derived demand. Money is demanded because it is a medium of exchange. Thus, greater the number of transactions to be

done, the larger will be the demand for money. So, we can write,

$$MV = PT$$

$$\therefore M = \frac{PT}{V}$$

### Supply of Money

For a clear understanding of the theory, supply of money should be examined separately in the context of point of time and period of time. At a point of time, quantity of money is equal to stock of money i.e., currency. Currency is the amount of notes and coins issued by the Government. Let it be denoted by M.

In equilibrium, the demand for money is equal to its supply. Therefore,

$$MV = PT$$

When a period of time is considered, flow of money is to be taken into consideration; another factor enters the scene. It is known as transaction velocity of circulation of money. Velocity of money is the average number of times a unit of money changes hands during a given period and is denoted by V. Every time the unit of money changes hands, it is as if a new unit of money has come into being. Thus, a unit of money changing hands five times during a period is doing the work of five rupees ( $1 \times 5 = 5$ ). Thus, supply of money now becomes MV.

### Velocity of Money:

It is not only the quantity of money but its velocity which adds to the purchasing power of money. Velocity refers to the rate at which money passes in payment from one person to another person. Thus, it means an average number of times a single unit of money changes hands in course of transactions during a certain period of time. It depends upon a number of factors and is considered to be independent of changes in M. In the long period V depends upon the habits of the people regarding the use of cheques, hoarding of cash, the frequency of income receipts, population, rapidity of transport, etc. In the short period it depends upon rate of interest, changes in the price level, and the degree of confidence about future events. Many times it offsets changes in M. If M does not increase, V increases to meet the demand for more money. V declines, if people accept cheques and do not insist on cash in payment for goods. It also goes down when liquidity preference increases or credit is easily available or political instability is anticipated. If wages are paid after longer intervals, more money

is needed for transaction purpose. Therefore, V increases when economic development is increasing and the monetized sector is expanding. It is also high where density of population is high. Thus, in equilibrium,

$$PT = MV$$

$$\text{or} \quad P = \frac{MV}{T}$$

Here, we have only assumed that all transactions are done in cash. But this is not always so. People have deposits in the banks on which they draw cheques to make payments. So such bank money should legitimately form part of money supply. Let the bank money be denoted by M'. It has a velocity of its own, represented by V' and is evident from the fact that the total payments made through cheques are far more than the deposits in the banks. Thus, money supply increases by M'V' and the total quantity of money becomes MV + M'V'. Therefore, we can write it as under:

$$PT = MV + M'V'$$

$$\text{or} \quad P = \frac{MV + M'V'}{T}$$

where P stands for price-level, T for number of transactions, M for Quantity of Money *i.e.*, currency.

V for transaction velocity of circulation, M' for bank money

V' for velocity of circulation of bank money.

This form of equation was developed by Fisher and called as Fisher's equation of exchange. Fisher assumed that V, V' and T are constant. There is fixed proportion between M and M'. Therefore, we can conclude it as under:

(a) P changes because M changes. P is the passive factor.

(b) P changes in the same proportion in which M changes.

In short, there is direct and proportional relationship between quantity of money and price level.

We, further conclude that:

- (i) There is inverse relation between value of money and quantity of money.
- (ii) The change in value of money is inversely proportional to change in the quantity of money. When quantity of money is doubled, value of money is halved.

### **6.2.2 Assumptions**

The main assumptions of the theory are as stated below:

1. **Constant Ratio between Bank Money and Currency Money:** The ratio of credit money to cash remains stable during the short period. In fact, bank money ( $M_1$ ) is a function of currency money ( $M$ ). With expansion of currency, bank money expands and vice versa.
2. **Money is a Medium of Exchange:** Fisher's approach is based on the medium of exchange function of money. Money is used for transactions purposes only.
3. **No Hoarding:** There exists no hoarding. It means that the entire quantity of money is put into circulation.
4. **Full Employment:** The theory is based on the assumption of full employment. It means there are no idle resources available to expand the production of goods and services.
5. **Price Level (P) is a Passive Factor:** The price level is a passive factor itself. It states that price is affected by other variables of the equation and it does not effect the other variables of the equation. An increase in the supply of money ( $M$ ) or velocity of circulation ( $V$ ) raises the price level and vice versa. An increase in transaction reduces the price level but an in-price level does not increase supply of money or velocity or total transactions.
6. **Constant Velocity or Constant V and V:** The velocity of circulation of money ( $V$ ) is an independent element in the equation and is constant in the short period. Any change in the quantity of money ( $M$ ) does not affect velocity of circulation because it depends on exogenous factors like banking habits of people, population, consumption pattern. These factors are normally stable in the short period, so  $V$  also remains constant. Similarly  $M$  does not affect  $V$ .
7. **Constant Volume of Transactions (T):** The total volume of trade or total transactions are also not affected by any change in the quantity of money ( $M$ ) and other factors in the equation because Fisher says that  $T$  depends upon natural resources, technological development and population etc. which are outside the equation, so that any change in  $M$  does not affect  $T$ .

8. **Long Period:** Fisher's theory is based on the assumption of long period. According to this theory, a proper co-ordination is established between quantity of money and price level in the long run.

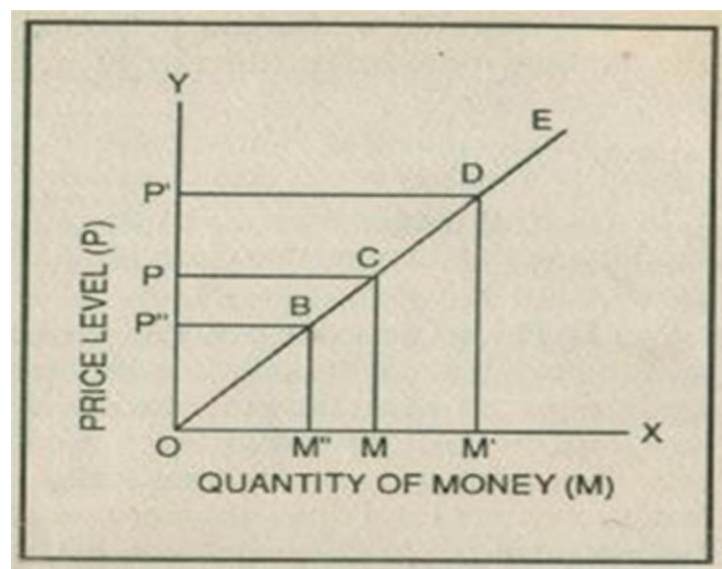
### 6.2.3 Diagrammatic Presentation

It should be remembered that the equation of exchange in itself is not the quantity theory of money. Fisher has used it only as a tool to prove the validity of the theory. For better understanding, the theory can be expressed with the help of a diagram given below:

In this diagram, quantity of money is shown along the horizontal axis and the general price level along the vertical axis. When the quantity of money is equal to OM price level is OP. If quantity of money rises to OM', price level also rises to OP'. The proportionate rise in the general price

level  $\frac{P-P'}{P}$  is equal to the proportionate increase in the quantity of money  $\frac{M-M'}{M}$ . Similarly, when the total quantity of money in circulation falls to OM'', price level also falls to OP'' and the

proportionate fall  $\frac{M-M''}{M}$  in the quantity of money. Thus change in the quantity of money causes an equi-proportionate change in the price level. By joining the points B, C and D, we get the curve BE. This curve forms an angle of 45° with the horizontal axis and represents the equi- proportionate relationship between AM (changes in M) and AP (changes in P).



#### **6.2.4 Criticisms**

The quantity theory, as propounded by Fisher is by no means the final word regarding the determination of value of money. It has been subjected to a severe criticism. It has been denounced as unsuitable, at least, in its rigid form. The main points of criticism are as under:

1. **No Fixed Relation between M and M':** The theory has assumed a constant ratio between the amount of currency (M) and the amount of credit money (M'), so that when M is doubled M' is also doubled. In actual practice, however, it may not be so. For example, during periods of boom and depression M and M' do not move in the same proportion, or even in the same direction. During boom period, because of greater demand for credit, M' will continue to rise even if there is no increase in M. On the contrary, during depression M' will be low in spite of a rise in M.
2. **Causal Process not Explained:** The theory has been expressed in the form of an equation. It becomes too mechanical. It does not explain what forces arise when M changes which lead to subsequent increase in P. For example, Keynes was to explain later that increase in M reduces rate of interest which causes investment, output, costs to mount and thus give the price level the push in the upward direction.
3. **Difficulty of Measuring Variables:** It is very difficult to measure V and V. Again T is difficult to calculate because it is not easy to add up transactions expressed in different units like meters of cloth, tons of steel etc. Moreover, V, V and T are not constant.
4. **Stress on Supply Side:** The theory is based on both the demand and supply sides, but in reality, more attention is paid to changes on the supply side *i.e.* M to the exclusion of other forces. Demand side remains constant at PT.
5. **Ignores Money as a Store of Value:** Money is not only a medium of exchange; it is a store of value as well. The quantity theory as developed by Fisher ignores this second important function of money. An increase in demand for hoarding should be treated as a reduction in money supply in circulation.
6. **Assumption of Full Employment:** The theory assumes full employment, while in reality; generally, unemployment is seen, thus rendering inoperative the logical sequences of the Quantity Theory. Keynes proved that Say's Law of Markets was



invalid.

7. **Static Theory:** The theory applies only in a world in which many things remain constant. But in the real-world changes are always taking place. Thus, the theory is not dynamic.
8. **Money not a Medium of Exchange:** Quantity theorists regard money only as a medium of exchange. They believe that the entire quantity money is used for purchasing goods and services. It has, however, been pointed out by Keynes and other modern economists that money is used as a store of value also.
9. **Ignores the Role of Rate of Interest:** It is not a satisfactory theory of money because it ignores the role of the rate of interest. The relation between the changes in the supply of Money and Price is not direct but indirect. Given the liquidity preference, an increase in the supply of Money lowers the rate of interest and consequently investment increases which along with consumption expenditure raises the level of income and output thereby affecting price level.
10. **Existence of Barter System:** The theory assumes the existence of the barter system. But in most of the backward countries barter is still popular with rural population. Thus, the scope of the theory becomes limited.
11. **Ignores Short Period Fluctuations:** The theory considers only long period changes in prices, as a result of changes in the quantity of money. It fails to explain short period fluctuations which, according to Keynes, are of greater significance.
12. **Fails to Integrate the Theory of Value and Theory of Money:** Keynes has pointed out that the equation of  $MV = PT$  fails to integrate the theory of money with the theory of value. Money plays an active role and affects rate of interest which in turn determines the level of output and employment. Therefore, theory of prices should form an integral part of theory of money.

This drastic criticism against this theory should not lead us to believe that it is absolutely useless. Indeed, the Chicago School of Economists has tried to show that the money supply is one significant influence on the value of money. In fact, there has been a tendency to over-criticize the theory and try to read into it more than that Irving Fisher really intended. In reality, the theory merely illustrated a static position of equilibrium which is assumed to prevail at a given moment

either before or after a change has taken place. Money, however, is a dynamic factor in the economy, so the picture of the situation presented by the equation is not a realistic one.

### **Check Your Progress- I**

Q1. What do you mean by quantity theory of money?

Ans. ....

Q2. Define demand for money in Fisher's equation.

Ans. ....

### **6.3 Balance Approach or Cash Balance Equation**

Another version of quantity theory of money is contained and finalized in cash balance or Cambridge approach. It was developed and finalized by a group of Cambridge economists i.e. Marshall, A.C. Pigou, Robertson and J.M. Keynes. This theory states that value of money is determined by demand for and supply of money. At any particular time, supply of money remains constant, therefore, changes in demand for money have more influence on value of money. This theory lays more stress on demand for money compared to its supply. Therefore, it is also known as Demand Theory of Money.

#### **Supply of Money**

Supply of money at a certain time includes all the notes, coins with the public and the demand deposits. Therefore,

$$\text{Supply of Money} = \text{Notes} + \text{Coins} + \text{Demand Deposits}$$

#### **Demand for Money**

Demand for money refers to people's desire for holding cash balances. According to cash balance equation demand for money is not for the purpose of transaction alone but for the purpose of storing up value also. Therefore, people store up value in the form of cash balances so as to use the same as a medium of exchange. Cash balance is that proportion of the annual real income which people desire to hold in the form of money. Thus, total demand for money is the aggregate of cash balance of money holdings of all individuals at a given moment of time.

$$\text{Demand for Money} = \text{Cash Balances}$$

### Different Equations of Cash Balance Approach

Different economists have put forward the following equations to determine the value of money.

**1. Marshall's Equation:** According to Marshall, the value of money is determined not only by

changes in money supply but also by change\* in demand for money. Symbolically,

$$M = KY + K'A$$

M = Quantity of Money, K = Fraction of real income, Y = Aggregate real income

K' = Fraction of total assets, A = Aggregate money value

The followers of Marshall abandoned the asset part of the equation. Symbolically,

$$M = KY$$

$$Y = PO$$

P = Price level, O = Output

Therefore, the equation can be expressed as

$$M = KPO$$

$$P = \frac{M}{KO}$$

In terms of purchasing power, it is opposite to the price level

$$P = \frac{KO}{M}$$

Thus, there is inverse and proportionate relationship between value of money and money supply.

**2. Pigou's Equation:** Pigou has given his equation of money in the form of purchasing power or value of money. In terms of value of money

$$P = \frac{KR}{M}$$

P = Value of money, K = Properties of cash held by people.

R = Real resources, M = Money supply.

In terms of price level, the equation can be written as

$$P = \frac{M}{KR}$$

Since K and R are assumed to be constant, so there is direct and proportionate relation between money supply and price level. According to Pigou, demand for money

consists of legal money. So, he modified the equations as

$$P = \frac{KR}{M} [C + h(1 - C)]$$

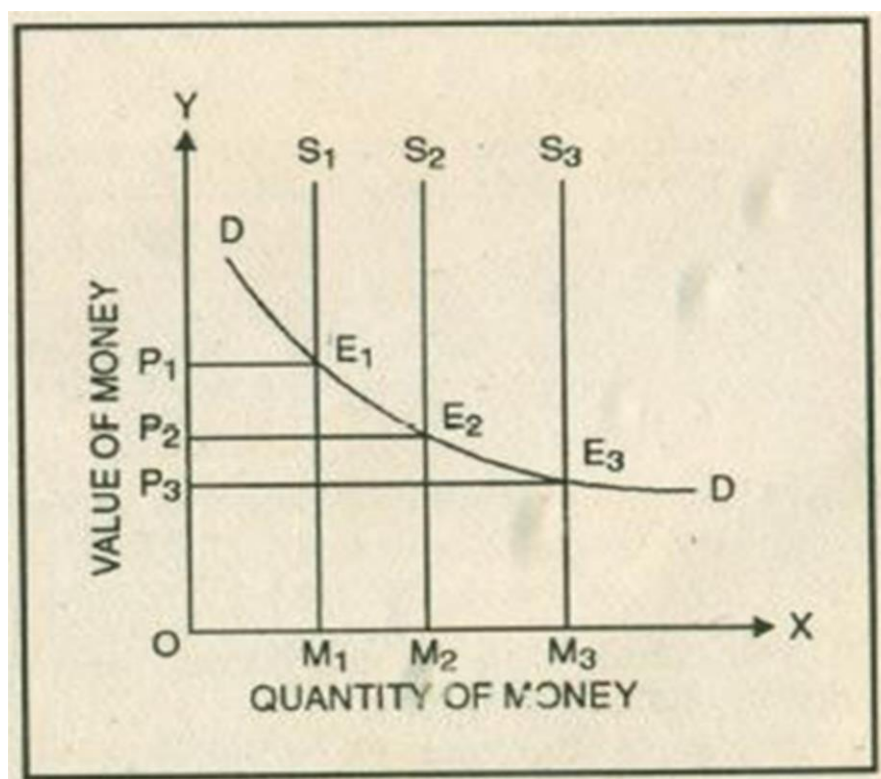
$C$  = Cash with people,  $1 - C$  = Bank deposits,  $h$  = Proportion of bank deposit held by bank

This can be shown with the help of figure.

In the diagram  $DD$  is the demand curve for money and  $M_1S_1$ ,  $M_2S_2$  and  $M_3S_3$  are the supply

curves of money drawn on the assumption that money supply is fixed at a point of time. It means

money supply is a stock concept. On Y-axis Pigou's purchasing power or value is taken. When the money supply is  $M_1S_1$  and demand is  $DD$ , in that case the value of money is  $OP_1$ . Now with the increase in money supply from  $OM_1$  to  $OM_2$ , the value of money is reduced from  $OP_1$  to  $OP_2$ . The fall in the value of money by  $P_1P_2$  exactly equals the increase in the supply of money by  $M_1M_2$ . If money supply increases three times, from  $OM_1$  to  $OM_3$  the value of money is reduced by exactly one third from  $OP_1$  to  $OP_3$ . Thus,  $DD$  is the rectangular hyperbola where elasticity is equal to one.



Thus, it is clear that the price level will vary inversely with  $K$  or  $R$  and directly with  $M$ . Pigou in his equation has laid stress on  $K$  rather than  $M$ . It means the value of money depends on demand for money to hold cash.

**3. Robertson's Equation:** Robertson has given the more or less the similar equation of exchange as given by Pigou. The only difference between the two is that Pigou gave total real resources whereas Robertson gave the volume of total transactions. This equation is as

$$M = KPT$$

or

$$P = \frac{M}{KT}$$

P = Price Level, M = Quantity of Money, T = Quantity of Goods and Services

K = Portion of T which people want to keep cash.

**4. Keynes' Equation:** Keynes in his equation laid more emphasis on consumer goods.

$$n = P(K + rk') \text{ or } P = \frac{K + rk'}{n}$$

According to Keynes, people hold cash to buy consumer goods and services. Keynes equation is

n = Quantity of money, P = Price level, K = Proportion of consumer goods

rk' = Proportion of Cash reserves

### Criticisms:

1. **Nothing New:** It is alleged that the cash balance equation is simply quantity theory in new algebraic dress. The conclusions of the analysis are not different from those of transaction analysis except for a change in emphasis.
2. **Fails to explain casual process:** This approach also fails to explain the casual process. It holds that changes in P are caused by changes in K. But the authors have failed to realize that K itself is influenced by changes in P. It is, therefore, both a cause and effect of changes in P.
3. **Speculative Demand for Money Ignored:** Explanation of demand for money is incomplete as it fails to take into consideration the speculative demand for money which is a very powerful factor in determining the demand for money in modern times. This means that the link connecting the theories of interest and level of

income through the demand for money is missing.

4. **Long Period Theory:** Like traditional theory, Cambridge equation also explains only long period changes in the value of money. It fails to explain short period fluctuations.
5. **Narrow Approach:** An important drawback in cash balance equation is that it deals with money in terms of consumption goods alone. It is a narrow view of the determination of the price level.
6. **Static Theory:** The cash balance approach provides a set of equations which are only exercises in comparative statics. These cannot analyze the dynamic economic analysis.
7. **Fails to explain Trade cycles:** This theory fails to explain trade cycles. It does not explain the causes that give rise to boom and depression.
8. **Excessive Emphasis on Value of Money:** It ignores the real forces like income, saving and investment on the value of money. The theory considers the changes in demand for money only which bring about changes in value of money which is wrong.
9. **Unreal Assumptions:** It assumes some of the factors like K and T to be constant. But in real life K and T are not constant. They are subject to change.

#### **6.4 Comparison Between Transaction and Cash Balance Approach**

A. **Similarities:** Both the equations have following similarities.

1. **Same conclusions:** Both equations reach the same conclusion that price level changes in the same proportion as the quantity of money does.
2. **Same Equation:** The cash balances equation  $P = \frac{M}{KT}$  of Robertson is quite similar to the equation of exchange given by Fisher,  $P = \frac{MV}{T}$ . Both the equations use the same notations, meaning the same thing. The only difference lies in V and K. But in reality, V and K are reciprocal to each other.
3. **Functions of Money:** Both the approaches regard function of money as medium of exchange. To Robertson, Fisher equation and Cambridge equations are not fundamentally different from each other.
4. **Concept of Money Supply:** From the different equations we find that MU + M'U' of Fisher equation and M' of Robertson and Pigou and 'n' of Keynes refer to

total supply of money.

**B. Dissimilarities:** The points of dissimilarities between transaction and cash balance approach are stated below.

1. **Functions of Money:** In Fisher theory money has been treated as medium of exchange whereas in Cambridge equation, its function of store of value has been given due importance.
2. **Velocity of Circulation:** Fisher theory lays more emphasis on velocity of circulation of money. Cash balance theory lays greater emphasis on that part of total money which is kept cash.
3. **Nature of Price:** In Fisher Equation and in Cambridge equation price is not used identically. In Fisher equation price refers to general price level. But in Cambridge version price is concerned only with the prices of consumption goods.
4. **Relative Importance of Demand for Money and Supply of Money:** *Fisherian* approach has stressed on supply of money. But in the cash balance approach there is shift of emphasis from the supply of money to the demand for money. It is more realistic since demand for money definitely plays an important role.
5. **Definition of Money:** The two approaches to the quantity theory of money use the concept of money in different ways. The Fisherian version emphasis is on the medium of exchange function of money. The Cambridge version emphasize on the store of value function of money. In this way, Fisher's version of quantity uses the concept of money in a narrow sense.
6. **Transaction Velocity and Income Velocity:** Fisher approach stressed on the importance of transaction-velocity or circulation of money. On the other hand, Cambridge equations emphasize on that part of income which is kept in the form of cash balance. Therefore, Fisher considers the transaction velocity of money while cash balance approach considers the income-velocity.
7. **Stock and Flow Concepts:** The Cambridge version regards money as a stock concept, whereas in Fisher's equation it is a flow concept. According to Cambridge equation, the money supply refers to given stock at any point of time. But Fisherian equation refers money supply as a flow. To elaborate this argument, Fisher links the flow of money expenditure and money holdings. But

the Cambridge economists link the money holding and stock of wealth. It is on this account that Fisher emphasizes  $V$  whereas Cambridge economists lay stress on the importance of  $K$ .

8. **Nature of  $V$  and  $K$ :** The nature of  $V$  and  $K$  has been interpreted differently by the two approaches. In Fisher's equation velocity of circulation is a highly mechanical concept. It is a measure of speed at which money changes hands. Velocity depends on various factors like length of the pay period, spending habits of the people, the development of banking system, etc. But on the other hand, the Cambridge version has laid stress on  $K$  which depends on psychological and introspective factors like habits, human attitude, behavior, etc.

### **6.5 Superiority of Cash Balance Approach**

Despite similarities and dissimilarities between the two approaches, cash balance approach is certainly superior to the transaction approach on the basis of the following points:

1. **Basis of Liquidity Preference Theory:** Further, the cash-balances approach has helped Keynes to develop his famous "Liquidity Preference Theory" which is based on the preferences of the people to hold cash for various motives.
2. **Explanation of Trade Cycle:** It is also claimed that  $K$  is definite while  $V$  is vague. It is easier to find out  $K$  rather than  $V$ . Cash balance approach is, therefore, more significant in understanding the cyclical fluctuations.
3. **Integration of Theory of Money with the Theory of Value:** By recognizing the forces of demand and supply and using demand supply analysis for the determination of value of money, the Cambridge equation has integrated the theory of money with the general theory of value.
4. **Casual Process:** Fisher's approach explains that changes in the price-level are caused by changes in supply of money. This does not explain the casual process between money supply and the price level. Cambridge approach explains how price level changes even if money supply is held constant due to changes in  $K$ .
5. **Broader Concept of Demand:** Cambridge equation gives a broader concept of demand because according to the approach money is demanded not only for transaction but also for storing of value.



6. **Importance to Demand Side:** Another achievement of Cambridge equation is that it takes into consideration supply as well as demand for money. In the traditional theory, demand side is ignored.
7. **More Realistic:** The Cambridge equation stresses on cash balances. They regard human motives as important factor which affect the price level. The subjective factor behind K has led to the study of factors like expectation, uncertainty, motives for liquidity and rate of interest.
8. **Short Period:** Cambridge equation is more appropriate as it studies short term factors. On the other hand, Fisher's equation studies long term factors.
9. **Easy Calculation:** According to Kurihara, calculation of  $K'$  and  $R'$  in Cambridge equation is easier than  $V$  and  $T$  in Fisher equation.
10. **Based on Micro Factors:** Another reason for the superiority of Cambridge equation is that it is based on micro decisions and behavior. Contrary to this Fisher equation is criticized on the ground that it is based on macro factors.

### **Check Your Progress- II**

Q1. Define Marshall's equation of money.

Ans. ....  
 -----

Q2. Discuss the superiority of cash balance approach.

Ans. ....  
 -----

### **6.6 Liquidity Preference Theory**

The famous economist of twentieth century, Lord Keynes explained a monetary method of the determination of rate of interest in his famous book "*The General Theory of Employment, Interest and Money*". This theory is also known as Liquidity Preference Theory. According to this theory, interest is price of the services of money. Accordingly, interest is determined by demand

for and supply of money. Interest is a monetary phenomenon.

First of all, we must know what is meant by interest? According to Keynes, "Interest is the reward for parting with liquidity". And the rate of interest is the premium which is to be offered to induce the people to hold wealth in some form other than the hoarded money.) He further explained, "The rate of interest is the premium which is to be offered to induce the people to hold wealth in some form other than the hoarded money."

According to Prof. Mayers, —Liquidity preference is the preference to have an equal amount of cash

rather than claims against others."

In other words, people give preference for holding money in cash form (liquidity) to lending it to others. Thus, preference for liquidity is called liquidity preference. Again, they will, therefore, part with liquidity only if they are given a reward or price for it. This reward for parting with liquidity is called interest.

### **Determination of Interest**

According to liquidity preference theory, interest is determined by the demand for and supply of money. It is determined at a point where supply of money is equal to demand for money. A detailed description of demand for and supply of money is given as below.

#### **6.6.1 Demand for Money**

To Keynes, money is not only a medium of exchange, but also a store of wealth. Now, there arises a question, why people want to hold cash? According to Keynes, there are three motives behind liquidity preference.

#### **6.6.2 Transaction Motive**

According to Peterson, "The transactions motive relates to the need to hold some quantity of money balances (either currency or demand deposits) to carry on day-to-day economic dealings". Most of the people receive their incomes by the week or month while the expenditure goes on every day. Therefore, a certain amount of ready money is kept in hand to make daily payments. Not only individuals and households need money to meet daily requirements, but business firms also need it to meet daily transactions like the payment of wages, purchase of raw-materials and to pay for the cost of transport, etc.

The demand for money for transactions purposes depends upon various factors like income, the general level of business activity, and the interval at which income is received. For instance, if income is received after a long interval of time, a larger proportion of income will have to be kept in ready cash. Similarly, where goods are available on credit, fewer amounts of ready cash is needed. Thus, as a general rule, it can be said that the transactions demand for money is income elastic and may be expressed as

$$(L_t) = f(Y)$$

Demand for money for transaction motive ( $L_t$ ) is the function ( $f$ ) of income ( $Y$ ) i.e. depends on income.

### **6.6.3 Precautionary Motive**

Every individual and firms keep their savings in liquid form for rainy days. Some part of the income is saved to provide for contingencies as illness in the family, a journey that may be required to be undertaken under compelling circumstances, some guests may arrive, some money is to be kept apart for some such event as birth or marriage, some friend or relative may require financial assistance. For all such purposes, the person would like to keep money in liquid form or semi-liquid form, e.g., in savings bank. Liquidity preference for such motive is not as high as for the transaction motive. Nevertheless, there is some liquidity preference for precautionary motives. This fact can be expressed in the form of an equation as

$$L_p = f(Y)$$

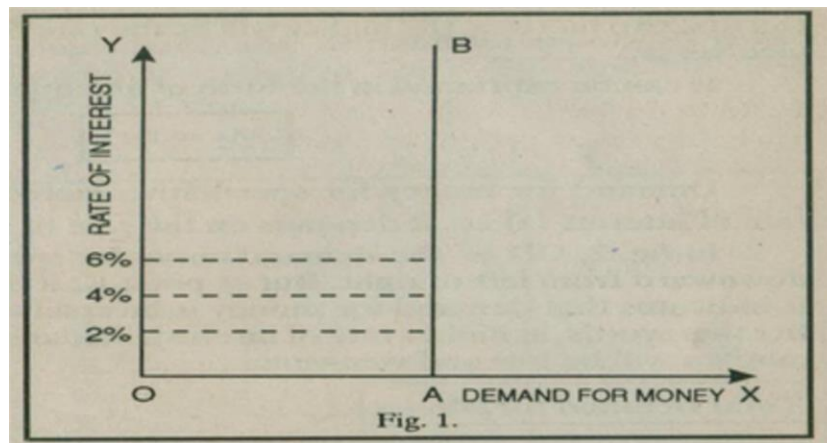
Demand for money for precautionary motive ( $L_p$ ) is a function ( $f$ ) of income ( $Y$ ) i.e. depends on income.

According to Keynes, demand for money for precautionary motives depends on income. Keynes

denoted  $M_1$ , the combined demand for these two motives. Thus,

$$M_1 = L_t + L_p = f(Y)$$

In fig. 1 vertical line AB represents the demand for precautionary and transactionary motives. It signifies the fact that demand for money for these two purposes remains OA irrespective of any change in rate of interest.



#### **6.6.4 Speculative Motive**

If a man has money that he can spare even after satisfying his consumption needs and after building funds sufficient to meet contingencies, he would like to invest money in such a way that brings him profits. In this case he would not be very keen for keeping his money in liquid form. The liquidity preference is low in such cases. Thus, holding back money in cash form in the hope of earning more income in future is called speculative motive. According to Keynes "Speculative motive is the motive of earning profit from knowing better than the market what the future will bring forth." Therefore, people prefer to hold cash to earn more profit on account of change in future rate of interest or price of bonds. In short, demand for money for speculative motive is interest elastic.

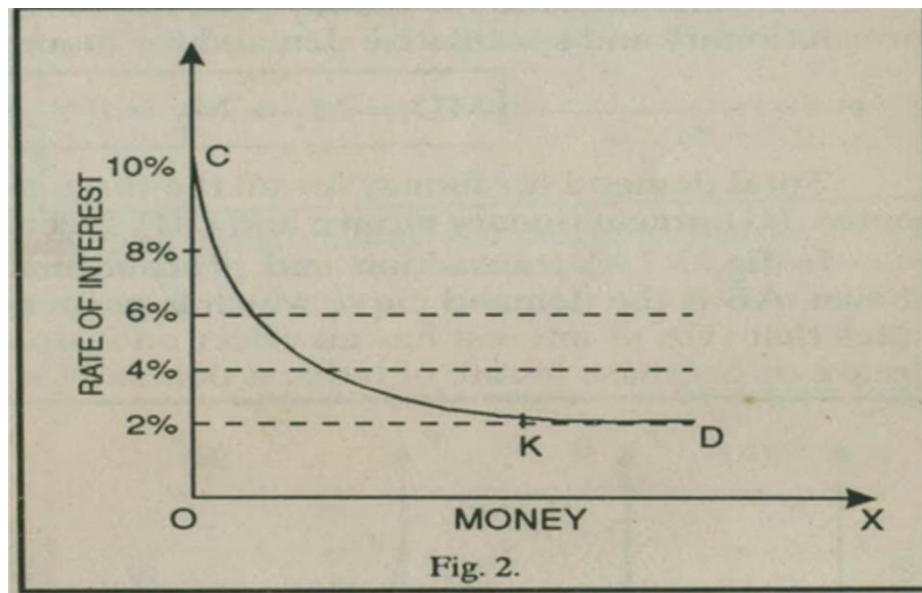
A high rate of interest can bring some money kept for precautionary motive for lending, but it will hardly be possible to bring out the money kept for transactional motive for lending. The more the money that is kept for the first two motives, the higher will be the rate of interest in the society and vice-versa.

It can be expressed in the form of an equation

$$M_2 = f(r)$$

Demand for money for speculative motive ( $M_2$ ) is a function ( $f$ ) of rate of interest ( $r$ ) i.e. it depends on the rate of interest.

In fig. 2, CD is the demand curve for speculative motives. It slopes downward from left to right. But at point K, it becomes parallel to X-axis. It indicates that demand for money is inversely related to rate of interest. In other words, at higher rate of interest, demand for money for speculative motives will be low and vice-versa.



Now, the total demand for money (MD) is the summation of transaction, precautionary and speculative demand for money.

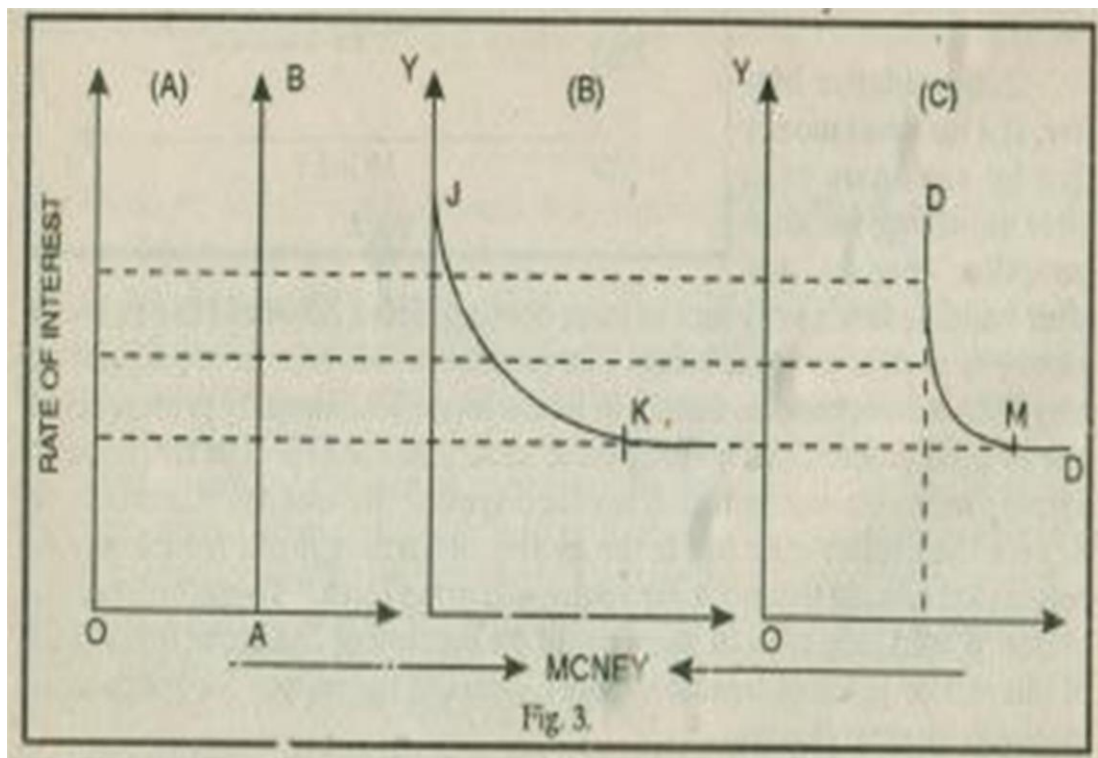
$$MD = M_1 + M_2 = f(Y, r)$$

Total demand for money for all the three motives i.e. (I) transaction motive (II) precautionary motive and (III) speculative motive.

In fig. 3 (A) transaction and precautionary demand for money is shown. AB is the demand curve which is perpendicular to X-axis. It indicates that rate of interest has no effect on it. In other words, with the increase or decrease in rate of interest demand for money remains stable.

In fig. 3(B) speculative demand for money is shown. JK is the demand curve which at point K becomes horizontal to X-axis. It signifies that rate of interest does affect the demand which is lower and vice-versa

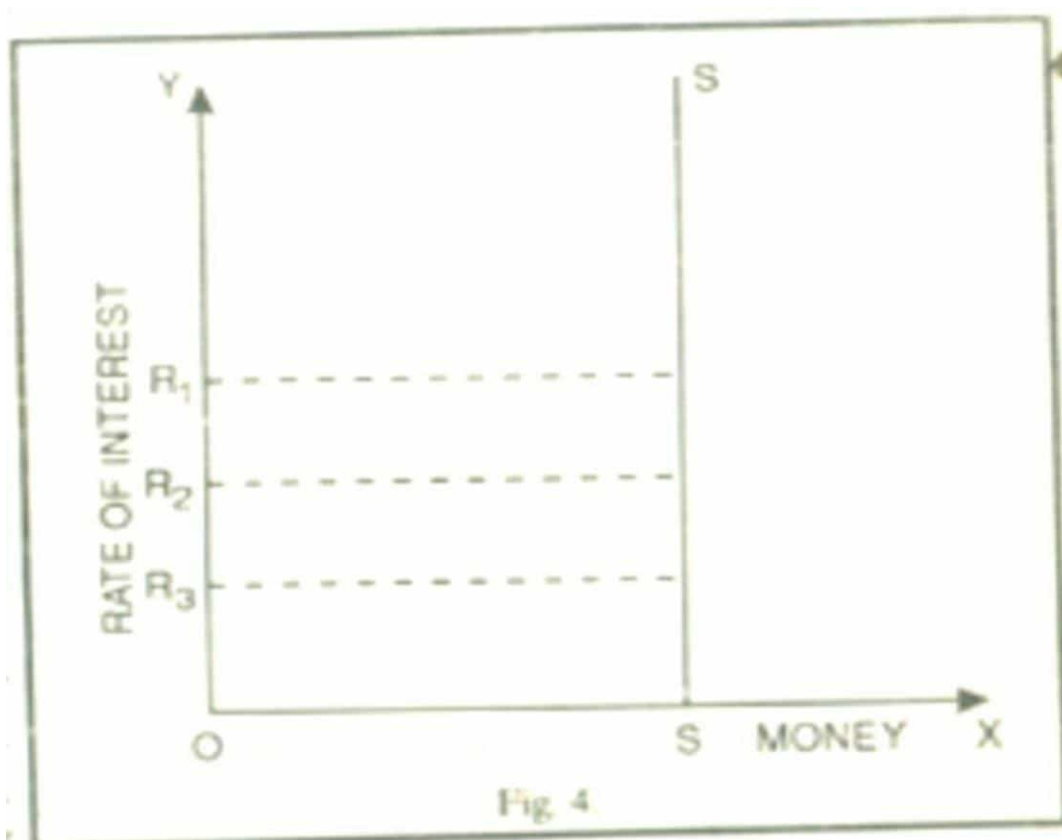
In fig. 3 (C) total demand for money is shown. It is the summation of transaction, precautionary and speculative demand for money. It is DD curve which at point M becomes horizontal to X-axis. This demand curve is known as liquidity preference curve.



#### 6.6.5 Supply of Money

By supply of money is meant the sum total of currency and bank deposits held by non-banking public. The money supply in a country is determined by the monetary authority such as the central bank. Money supply is not related to the rate of interest. It is the need of the economy which will determine the quantity of money.

Therefore, the supply curve of money (M) is shown as a vertical line parallel to the ordinate (Y) axis as shown in Fig. 4.



### Equilibrium Rate of Interest

According to Keynes, equilibrium rate of interest is determined at a point where demand for money is equal to supply of money.

$$MD (LP) = MS.$$

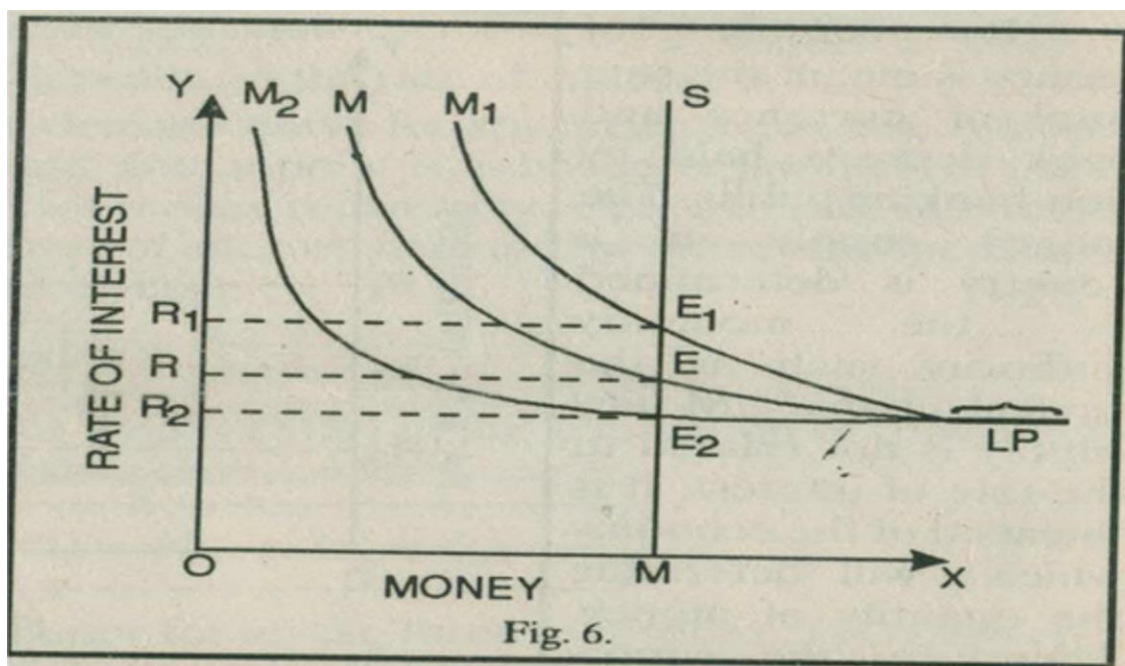
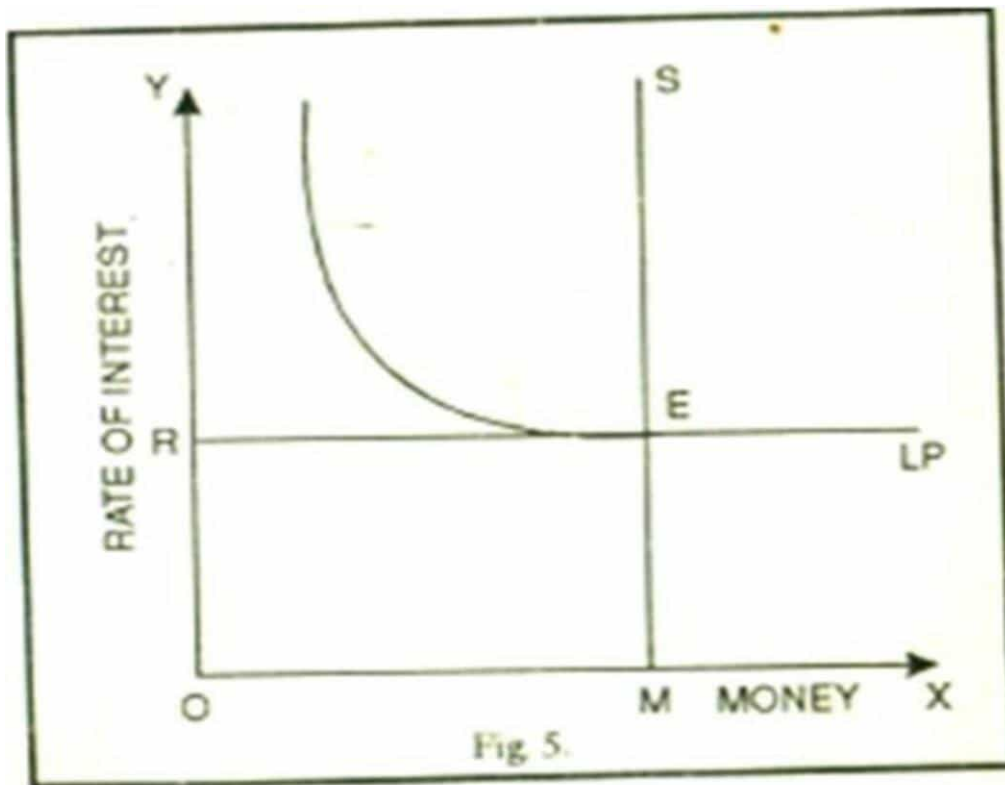
In fig. 5 MS is the supply curve of money where LP is the liquidity preference or demand curve for money. Both these curves intersect each other at point E which determines OR rate of interest. However, effect of change in demand for money and supply of money are explained asunder.

### Change in Demand for Money

If the supply of money remains constant, and as the liquidity preference for money increases rate of interest also increases and vice-versa.

In fig. 6 SM is the supply of money curve. M, M<sub>1</sub>, M<sub>2</sub> are the demand for money curves. Now suppose that initially M is the demand curve. Here equilibrium is restored at point E where M curve cuts MS and or rate of interest is determined. If liquidity preference increases to M<sub>1</sub>, new equilibrium will be at E<sub>1</sub> and the interest rate increases to OR<sub>1</sub>. If contrary to this liquidity

preference curve falls to  $M_2$ , equilibrium will be at point  $M_2$  which will determine  $OR_2$  interest rate.



### Change in the Supply of Money

If demand for money remains constant, as the supply of money increases, rate of interest decreases and vice-versa.



In fig. 7 LP is the liquidity preference curve while MS, M<sub>1</sub>S<sub>1</sub> and M<sub>2</sub>S<sub>2</sub> are the supply curves. In the beginning, MS is the supply curve which intersects demand curve at point E. Here equilibrium rate of interest is OR. Now if the supply of money decreases to M<sub>1</sub>S<sub>1</sub>. Here LP curve cuts supply curve at E<sub>2</sub>. The equilibrium rate of interest is OR<sub>1</sub>.

On the other hand, if supply of money increases to S<sub>2</sub>M<sub>2</sub>, equilibrium interest rate falls to OR<sub>2</sub>.

### **Main Points of the Theory**

1. Interest is a monetary phenomenon and the rate of interest is determined by the intersection of demand for money and supply of money;
2. Given the supply of money, the rate of interest rises as the demand for money increases and falls as the demand for money decreases
3. Given the demand for money, the rate of interest falls as the supply of money increases and rises as the supply of money decreases
4. The rate of interest cannot be reduced beyond the lower limit set by the liquidity trap.

### **Check Your Progress- III**

Q1. Explain transaction motive of money.

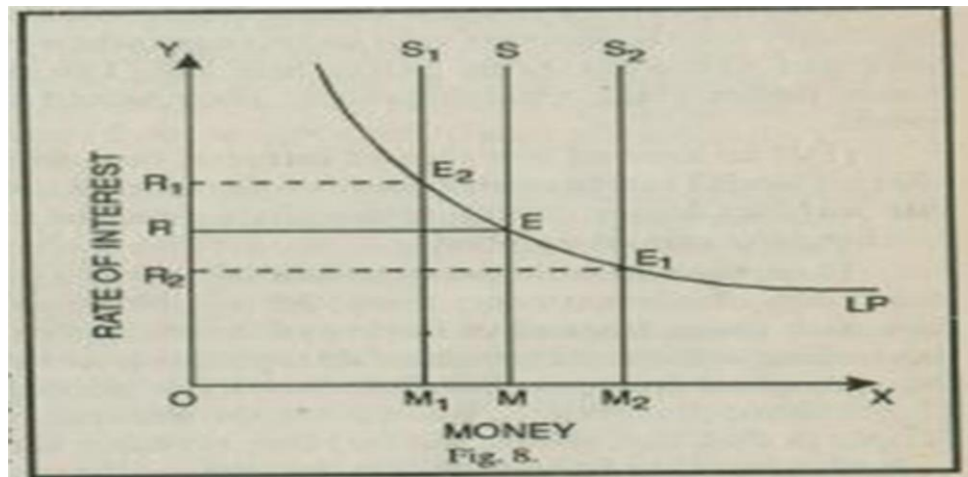
Ans. ....  
-----

Q2. Define speculative motive of money.

Ans. ....  
-----

### **6.6 Liquidity Trap**

By liquidity trap, we mean a situation where the rate of interest cannot fall below a particular minimum level. It means rate of interest is always positive. It cannot be zero or negative. It can be shown with the help of fig. 8.



Along the X-axis is represented the speculative demand for money and along the Y-axis the rate of interest. The liquidity preference curve LP is downward sloping towards the right. It signifies that the higher the rate of interest, the lower the demand for speculative motive and vice-versa. Thus, at the high current rate of interest OR, a very small amount OM is held for speculative motive. This is because at a high current rate of interest much money would have been lent out or used for buying bonds and therefore less money will be kept as inactive balances. If the rate of interest rises to OR<sub>1</sub> then less amount OM<sub>1</sub> will be held under speculative motive. With the further fall in the rate of interest to OR<sub>2</sub>, money held under speculative motive increases to OM<sub>2</sub>. It will be seen in Fig. 9 that the liquidity preference curve LP becomes quite flat *i.e.*, perfectly elastic at a very low rate of interest.

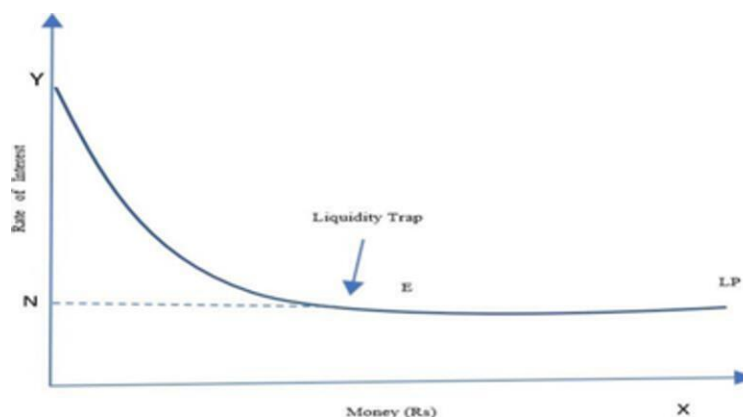


Figure 9

It is horizontal line beyond point E, towards the right. This perfectly elastic portion of

liquidity preference curve indicates the position of absolute liquidity preference of the people. That is, at a very low rate of interest people will hold with them as inactive balances any amount of money they come to have. This portion of liquidity preferences curve with absolute liquidity preference is called liquidity trap by some economists.

$$M_1 = L_1(Y)$$

Now let us examine why interest rate cannot fall below a particular level:

- A. substituting bonds for money, apart from loss of liquidity, also involves some cost and inconvenience. Some minimum return is required to offset this cost and inconvenience. When the interest rate is very low say zero, the lenders will not lend money.
- B. At the lowest possible interest rate, people will hold money rather than to make an investment in bonds or securities.
- C. The rate of interest cannot fall below floor level. There is every possibility for the interest rate to increase it has reached its lowest level and hence the bond prices may fall. The investors would not buy bonds under these circumstances. They would rather like to sell their bonds.
- D. In case of low rate of interest, investors hope that the rate of interest would increase and come to the natural level. A rise in the interest rate involves lesser capital losses than a rise in the rate of interest after reaching the minimum level.

Thus, the rate of interest cannot fall below a particular level. The minimum rate of interest represents the liquidity trap, where people keep all cash with them. Instead of buying of bonds and securities, they sell them. According to Keynes the rate of interest can never reach zero because once the rate of interest reaches floor level the people expect it to increase.

### **6.7 Importance of Liquidity Preference Theory**

1. **Importance of Money:** Keynes' liquidity preference theory of interest highlights the importance of money in the determination of the rate of interest. According to this theory, interest is a monetary phenomenon and the rate of interest is determined by the demand for and supply of money.
2. **Importance of Liquidity Preference:** Liquidity preference or the demand for money has attained the special importance in Keynes' theory of interest refers to the

desire of the people to hold their wealth in liquid form (i.e. to hold cash). Keynes gives three reasons for holding cash, i.e., the transactions motive, the precautionary motive, and the speculative motive. Interest has been considered as the reward for parting with liquidity. Thus, Keynes has laid greater emphasis on the store of value function of money.

- 3. Importance of Speculative Demand:** Speculative demand for money or demand for idle balances is the unique Keynesian contribution. It means the demand for holding certain amount of cash in reserve to make speculative gains out of the purchase and sale of bonds through future changes in the rate of interest. According to Keynes, the rate of interest is determined by the decision as to how much saving should be held in money and how much allocated to bond purchase.
- 4. More Generalized:** The classical theory was a special theory applicable only to a full- employment situation. Keynes theory is more general in that it is applicable both to full as well as under employment situations.
- 5. Integrated Theory:** A great merit of Keynes theory is that it has integrated the theory of interest with the general theory of output and employment. Employment depends on the level of investment and inducement to invest is influenced apart from marginal efficiency of capital, by the rate of interest.
- 6. Integration with Price:** Keynes has integrated the theory of interest with the theory of price. The classical writers had unduly emphasized such real factors as abstinence and time preference. According to Keynes, interest is the price of money, and like the price of any commodity, it is determined by the demand for and supply of money.
- 7. More Practical:** The theory is of great practical significance also. The rate of interest depends on the demand for and supply of money. The supply of money is regulated by the government or the monetary authority of the country. Therefore, the government can greatly influence the rate of interest by regulating money supply. Also, through its liquidity trap hypothesis, the theory stresses the limitation of monetary authority in lowering the rate of interest beyond a certain level.
- 8. Long Term Vs Short Term Interest Rates:** According to Keynes, interest is a reward for parting with liquidity. The interest rate differs on debts of different lengths and maturities. The interest rate on daily loans will be different from the rates of

interest on weekly, monthly and yearly loans. Debts of longer maturity like three, five or ten years will have different interest rates.

### **6.8 Criticisms/Shortcomings of Liquidity Preference Theory**

The liquidity preference theory of interest has been widely criticized by Prof. Hansen, Don Patinkin and Hazlitt on the following bases:

- 1. No liquidity Without Savings:** Keynes argued that interest is the reward for parting with liquidity. However, critics point out that without saving there can be no funds. The question of parting with liquidity arises only after we have saved money. If there are no savings, there is no parting with liquidity either. According to Prof. Hansen, "without savings there can be no liquidity to surrender. The rate of interest is the return for saving without liquidity."
- 2. Real factors ignored:** It is observed that the rate of interest is not purely a monetary phenomenon. Real factors comprising of productivity and savings play an important role in the determination of the interest-rate. According to Keynes, interest is independent of the demand for investment funds whereas in reality cash balances of businessmen are greatly influenced by their demand for investment funds. The demand for investment funds depends on the marginal revenue productivity of capital. When marginal efficiency of capital is high, businessmen expect higher profits, there is greater demand for investment funds and so the rate of interest goes up. Similarly, if the propensity to consume of the people declines, savings would increase. Therefore, supply of funds in the market will increase which tend to lower the market rate of interest.
- 3. Indeterminate:** Most economists have pointed out that like the classical and the neo-classical theories of interest, the liquidity preference theory is also indeterminate. According to Keynes, rate of interest is determined by the speculative demand for money and the supply of money available for speculative purposes. Given the total supply of money we cannot know how much is available for the speculative motive, unless we know what the transactions demand for money is. And we cannot know the transactions demand for money unless we first know the level of income.
- 4. Applicable to Advanced Countries:** Keynes theory of interest is applicable only to advanced countries where money is widely in circulation and the money market is

well organized. It is only in such countries that people can choose among different types of securities. It does not apply to backward countries where the choice of assets is limited. It cannot be applied to a barter economy.

5. **Contradictory:** According to the theory, the rate of interest depends on liquidity preference. Greater the liquidity preference, higher is the rate of interest; smaller the liquidity preference, the lower is the rate of interest. However, it is noticed that during depression, people have high liquidity preference and yet the market rate of interest is low. Similarly, in times of inflation, people's liquidity preference is low but the rate of interest is high. These facts contradict with Keynes theory.

In the words of Prof. Hazlitt 'For if a man is holding his funds in the form of a time deposits or short-term treasury bills, he is being paid interest on them, there he gets interest and liquidity too. What becomes then of Keynesian theory that interest is the reward for parting with liquidity.'

6. **All or Nothing Theory:** Keynes assumes that the choice always lies between liquid cash and liquid bonds. The theory is, therefore, all or nothing theory. In reality, however, various investible assets, differing in liquidity, are available in the market. A person who has some savings does not want to either hold in cash or invest it in illiquid bonds. Instead, he keeps some cash, some liquid assets, and some illiquid assets. Keynes has thus unnecessarily separated the liquid from the illiquid assets for the determination of the interest-rate.
7. **Hoarding:** Keynes in his theory has not explained the term hoarding properly. All those factors which raise propensity to hoard have not been explained by Keynes. On this account, we cannot call Keynes theory as complete.
8. **Productivity of Capital:** Keynes theory ignores productivity of capital. According to critics, interest is not only the reward for parting with liquidity but it arises due to productivity of capital. Had the capital not been productive, no one had demanded it and, hence, paid no interest on capital.
9. **Supply Side Ignored:** Keynes theory has limited validity from supply side also. It is not possible to reduce the rate of interest by increasing money supply and vice-versa. It is possible that when supply is increased, increase in liquidity preference in the same ratio may keep the interest rate unaffected.
10. **Several Motives for Liquidity Preference:** According to Keynes, "interest is a

reward for parting with liquidity. In reality, liquidity is kept not only for three motives. Practically, liquidity preference depends on money, and other factors like rate of savings, propensity to consume, marginal efficiency of capital etc. All these factors are completely ignored by Keynes.

**11. Contrary to Facts:** Another defect of the theory is that liquidity preference theory goes directly contrary to the facts that it presumes to explain. According to this theory, the rate of interest should be the highest at the bottom of depression when, due to falling prices, people have great liquidity preference. But, in reality, rate of interest is the lowest at the bottom of depression. On the contrary, according to the liquidity preference theory, the rate of interest should be the lowest at the peak of a boom when, due to general rise in incomes and prices, the liquidity preference of the people is the lowest. But generally, the interest rate is the highest at the peak of a boom. Hazlitt has observed Keynes liquidity preference theory as incomplete. According to him, "This type of demand and supply theory is not incorrect but it is superficial and incomplete." But this theory in modern economics occupies an important place because it takes into account monetary factors in determining interest rate. There is always less than full employment in an economy. It is with the help of liquidity preference theory that full employment can be restored.

#### **Check Your Progress- IV**

Q1. Define liquidity trap.

Ans. ....  
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Q2. Give any two criticisms of liquidity preference theory.

Ans. ....  
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#### **6.9 Summary**

Quantity theory of money used to determine the general price level in the economy. As per Fisher's theory of money, there is direct determination of price level on the basis of supply of money. Therefore, it has direct and proportional relationship between money supply and price level. i.e., if money supply doubles, price will double and as money supply is reduced to half, it will decline by the same amount. According to Fisher's theory of money, total value of all the goods sold during a particular period is

equal to the total quantity of money spent during that period. Another approach of quantity theory of money is cash balance approach. According to this theory it is not the total money, but that portion of cash balance that people spend which influences the price levels. Most of the people in the society hold a cash balance in their hands rather than spending the entire amount all at once. In liquidity theory of money, as given by Keynes, money does not directly affect the price level. A change in quantity of money leads to change in the rate of interest, which further leads to change in income, output and employment. Therefore, all these factors will lead to change in price of goods. In liquidity trap, we mean a situation where the rate of interest cannot fall below a particular minimum level. It means rate of interest is always positive.

### **6.10 Questions for Practice**

#### **A. Short Answer Type Questions**

- Q1. Distinguish Value of Money and Price Level.
- Q2. What do you mean by Quantity theory of money?
- Q3. Give the equations of cash balance approach under:
- a. Pigou's equation
  - b. Keynes's equation
- Q4. What do you mean by Liquidity Trap? Explain with diagram.
- Q5. Define Liquidity Preference theory briefly.
- Q6. Define demand and supply of money under liquidity preference theory.
- Q7. Brief Note on
- a. Precautionary Motive.
  - b. Speculative motive
- Q8. Write the assumptions of Fisher's quantity theory of money.
- Q9. Explain transaction equation of money with the help of diagram.
- Q10. Why rate of interest cannot fall below a particular level under liquidity preference Theory? Explain it.

#### **B. Long Answer Type Questions**

- Q1. Critically explain Transaction Approach of Fisher's Theory of Money.



Q2. Discuss the Cambridge Equation or Cash Balance Approach of Theory of Money.

Q3. What do you mean by liquidity preference? Give its importance.

Q4. Critically examine Keynes's liquidity preference theory of money.

Q5. Write Similarities and dissimilarities of Transaction and cash Balance Approaches of Money.

#### **6.11 Suggested Readings**

- Money and Banking, by T.N. Hajela,
- Money and Banking by KPM Sundram.
- Money and Banking by Schuam Series, McGrawHill, Publishing Co. Ltd., New Delhi.
- Money Economics-Institutions, Theory and Policy by Suraj B Gupta
- Innovations in Banking Services by H.R. Suneja
- Monetary Economics: Institutions by Suraj B. Gupta

**M.A (ECONOMICS)**

**SEMESTER –II**

**COURSE: MACRO ECONOMICS**

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**UNIT 7: FUNCTIONS OF COMMERCIAL BANKS AND PROCESS OF CREDIT  
CREATION**

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**STRUCTURE**

**7.0 Learning Objectives**

**7.1 Introduction**

**7.2 Meaning and Definition of Commercial Bank**

**7.3 Types of Banks**

**7.3.1 On the Basis of Reserve Bank Schedule**

**7.3.2 On the Basis of Ownership**

**7.3.3 On the Basis of Domicile**

**7.3.4 On the Basis of Functions**

**7.4 Functions of Commercial Banks**

**7.4.1 Basic Function**

**7.4.1.1 Accepting Deposits**

**7.4.1.2 Advancing Loans**

**7.4.1.3 Credit Creation**

**7.4.2 Agency Functions**

**7.4.3 General Utility Function**

**7.5 Summary**

**7.6 Questions for Practice**

**7.7 Suggested Readings**

## **7.0 Learning Objectives**

After reading this unit, learner will be able to:

- Know the meaning of commercial banks
- Describe the types of banks
- Understand the functions of banks

## **7.1 Introduction**

As far as the origin of the present banking system in the world is concerned, the first bank called the "Bank of Venice" is believed to be established in Italy in the year 1157 to finance the monarch in his wars. The first bank in India was started in 1770 by the Alexander & Co., an English Agency as "Bank of Hindustan" which failed in 1782 due to the closure of the Agency House in India. The first bank in the modern sense was established in the Bengal Presidency as "Bank of Bengal" in the year 1806.

According to G. Crowther the modern banking has three ancestors in the history of banking in this world: -

**7.1.1** The Merchants

**7.1.2** The Goldsmiths

**7.1.3** The Money Lenders

### **A. The Merchants**

It was the merchant bankers who first evolved the system of banking as the trading activities required remittances of money from one place to another place which is one of the important functions of a bank even now. Because of the possibility of theft of money during physical transportation of money, the traders began to issue the documents which were taken as titles of money. This system gave rise to the institution of "Hundi" which means a letter of transfer whereby a merchant directs another merchant to pay the bearer of hundi the specified amount of money in the Hundi and debit this amount against the drawer of Hundi.

### **B. The Goldsmiths**

The second stage in the growth of banking was the role of goldsmiths. The business of goldsmiths was such that he had to secure safe to protect the gold against theft and take special precautions. In a period when paper was not in circulation and the money consisted of

gold and silver, the people started leaving their precious bullion and coins in the custody of goldsmiths. As this practice spread, the goldsmiths started charging something for taking care of the gold and silver. As the evidence of receiving valuables, he started to issue a receipt. Since the gold and silver coins had no mark of the owners, the goldsmiths started lending them. The goldsmiths were prepared to issue an equal amount of gold or silver money to the receipt holder, the goldsmith receipts became like cheques as a medium of exchange and a means of payment by one merchant to the other merchant.

### **C. The Money Lenders**

The third stage in the growth of banking system is the changing of the character of goldsmiths into that of the money lenders. With the passing of time and "on the basis of experience the goldsmiths found that the withdrawals of coins were much less than the deposits with them and it not necessary to hold the whole of the coins with them. After keeping the contingency reserve, the goldsmiths started advancing the coins on loan by charging interest. In this way the goldsmith money lender became a banker who started performing two important functions of the modern banking system that of accepting deposits and advancing loans. The only difference is that now it is the paper money and then it was gold or silver coins.

## **7.2 Meaning and Definition of Commercial Bank**

It is very difficult to give a precise definition of a bank due to the fact that a modern bank performs a variety of functions. Ordinarily a 'Bank' is an institution which deals with the money and credit in such a manner that it accepts deposits from the public and makes the surplus funds available to those who need them, and helps in remitting money from one place to another safely. Different economists have given different definitions of a bank. Some of the important definitions are as under:

According to G. Crother "*A bank collects money from those who have it to spare or who are saving it out of their incomes, and it lends this money to those who require it.*"

As per R.P. Kent "*A bank is an organization whose principal operations are concerned with the accumulation of the temporarily idle money of the general public for the purpose of advancing to other for expenditure.*"

From these definitions it can be concluded that a bank in the modern times refers to an institution which is having the following features:

**7.2.1** That it is a commercial institution - earning profits

**7.2.2** That it deals with money - accepts deposits from public and advances loans to the needy

borrowers.

**7.2.3** That it deals with credit - it has the ability to create credit.

**7.2.4** That it creates demand deposits - which serves as a medium of exchange and manages the payment system of the country.

Therefore, an ideal definition of a bank can be given as under:

A bank is a commercial establishment which deals in debts and aims at earning profits by accepting deposits from general public at large, which is repayable on demand or otherwise through cheques or bank drafts and otherwise which are used for lending to the borrowers or invested in Government securities.

### **7.3 Types of Banks**

Banks are of various types and can be classified: on the basis of reserve bank schedule, on the basis of ownership, on the basis of domicile and basic functions. These types of banks explain below:

#### **7.3.1 On the basis of Reserve Bank Schedule**

Banks can be of the following two types on the basis of Second Schedule of the Reserve Bank of India Act, 1934. i.e., Scheduled Banks and Non-scheduled Banks.

**Scheduled Banks:** All those banks which are included in the list of Schedule Second of the Reserve Bank of India are called the Scheduled Banks.

Only those banks are included in the list of scheduled banks which satisfy the following conditions:

That it must have a paid-up capital and reserves of Rs.5 lakhs.

That it must ensure the Reserve Bank that its operations are not detrimental to the interest of the depositors.

That it must be a corporation or a cooperative society and not a single owner firm or a partnership firm.

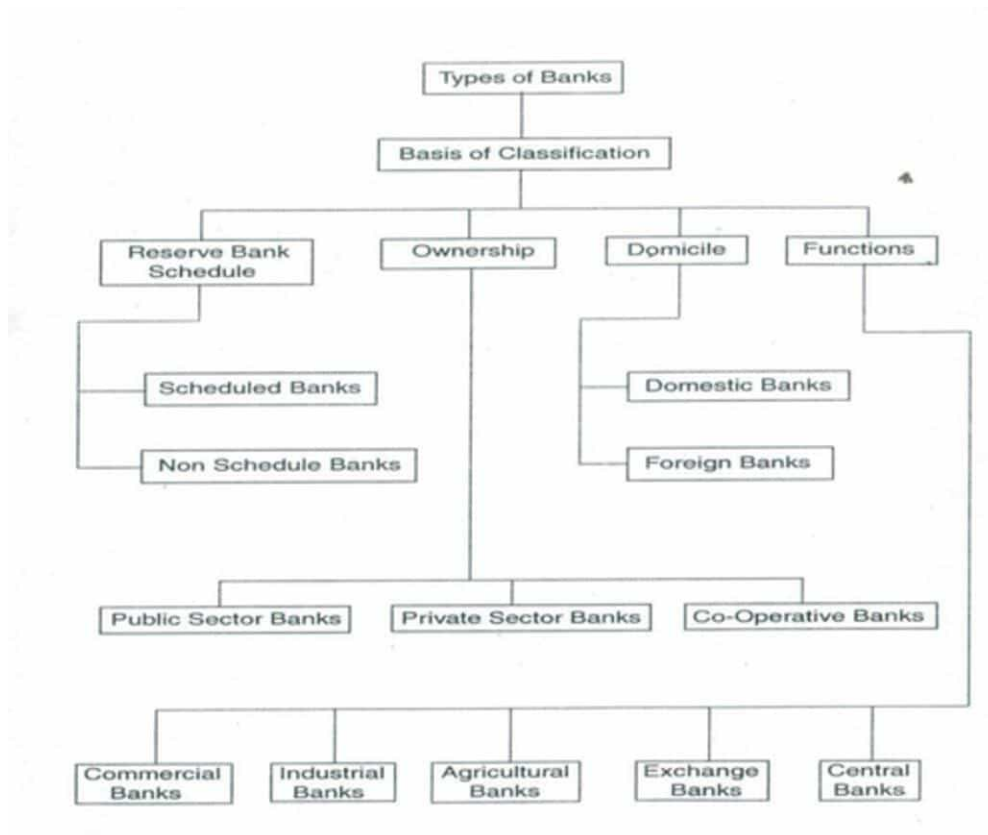
**Non-scheduled Banks:** The banks which are not included in the Second Schedule of the Reserve Bank of India Act, 1934 are called non-scheduled banks. They are not included in the second schedule because they do not fulfill the three pre conditions laid down in the act to qualify for the induction in the second schedule.

#### **7.3.2 On the Basis of Ownership**

Banks can be classified on the basis of ownership in the following categories:

**A. Public Sector Banks:** The banks which are owned or controlled by the Government are called "Public Sector Banks" 1955 the first public sector commercial bank was established by passing a special Act of Parliament which is known as State Bank of India. Subsequently the Government took over the majority of shares of other State Banks which were operating at the state levels namely State Bank of Patiala, State Bank of Bikaner & Jaipur, State Bank of Travancore, State Bank of Mysore, State Bank of Indore, State Bank of Saurashtra and State Bank of Hyderabad presently working as subsidiaries of State Bank of India.

In the field of banking, the expansion of public sector was marked with the nationalization of 14 major commercial banks by Mrs. Indira Gandhi on July 19, 1969 through an ordinance with the deposits Rs.50 crores each. Again, on April 15, 1980 another group of 6 commercial banks were nationalized with the deposits Rs.200 crores each, resulting in the total of 20 such banks. But due to the merger of New Bank of India with the Punjab National Bank in 1993-94, the number of nationalized banks has been reduced to 19. The State Bank of India and its seven subsidiaries had already been nationalized. The progressive nationalization of banks has increased the role of public sector banking in the country. In 1996 these nationalized commercial banks had 31,055 branches all over India whereas State Bank of India and its subsidiaries alone had 12,903 branches.



At present there are 27 Public Sector Banks (1 State Bank of India +7 Subsidiaries of State Bank +19 Nationalized Banks). The regional Rural Banks are also covered under the category of Public Sec-or Banks. At present there are 196 Regional Rural Banks in India.

Under the new liberalization policy of the Government, The Oriental Bank of Commerce, State Bank of India, Corporation Bank, Bank of India and Bank of Baroda have offered their share to the general public and financial institutions and therefore these banks are no longer owned by Government of India. Although majority of the shares 3 still with the Government, therefore these are still public sector banks.

**B. Private Sector Banks:** On thy contrary Private Sector Banks are those banks which are owned and controlled by the private sector i.e., private individuals and corporations. The private sector played a strategic role in the growth of Dint stock banks in India. In 1951 there were in all 566 private sector tanks of which 92 banks were scheduled banks and the remaining 474 were non-scheduled banks. At that time there was not even a single public sector bank. With the nationalization of banks in 1969 and 1980 neither role in commercial banking had declined considerably. Since then, the number of private sector banks is decreasing and the number of public sector banks is increasing. However the following known private sector banks continued to operate in the banking sector (Total there are 25 such banks operating in India):

1. The Federal Bank Ltd.
- 2.The Nedungadi Bank Ltd.
- 3.Bharat Overseas Bank Ltd.
- 4.Lord Krishna Bank Ltd.
- 5.The Laxmi Vilas Bank Ltd.
- 6.The Vyasya Bank Ltd.
7. The Jammu & Kashmir Bank Ltd.
8. The South India Bank Ltd.
9. The Karur Vyasa Bank Ltd.

Private sector banks include Foreign Banks, Scheduled Commercial Banks and Non-Scheduled Commercial Brinks. The Government of India set-up a nine-member committee under the chairman-hip of Sh. Narsimham, former Governor of Reserve Bank of India, to examine the structure and functioning of the existing financial system of India and



suggest financial sector reforms. According to Committee report which was submitted to the parliament on December 17, 1991, the private sector banks should be allowed to be established in India. But the minimum capital of new private sector banks should be at least Rs.100 crore. Thereafter a number of private commercial banks have been established in India. At present the major private sector banks established in India are:

1. UTI Bank Ltd.
2. HDFC Bank Ltd.
3. IDBI Bank Ltd.
4. Times Bank Ltd.
5. IndusInd Bank Ltd.
6. Bank of Punjab Ltd.
7. Centurion Bank Ltd.
8. Global Trust Bank Ltd.
9. Development Credit Bank Ltd.
10. ICICI Banking Corporation Ltd.

Till March 1996 all these private sector banks had 76 branches. Existing private sector banks have been assured that they will be allowed to expand their activities without any fear of nationalization.

- C. Co-operative Banks:** The word cooperation stands for working together. Therefore, co-operative banking means an institution which is established on the principle of cooperation dealing in ordinary banking business. Cooperative banks are special type of banks doing ordinary banking business in which the members cooperate with each other for the promotion of their common economic interests.

### **Features of Cooperative Banking**

Following are the distinguishing main features of a cooperative bank: -

1. Membership of Cooperative Banks is voluntary.
2. Functions of a Cooperative Bank are common banking functions.
3. Organization and management of a Cooperative Bank is based on democratic principles.
4. Main objectives of a Cooperative bank are to promote economic, social and moral development of its members.
5. Basic principle of Cooperative Bank is equality.

Therefore, we can conclude and define a cooperative bank as under:

*"Cooperative Bank is an institution established on cooperative basis which deals in ordinary banking business for the promotion of economic, social and moral development of its members on the principle of equality."*

The short-term agricultural credit institutions cater to the short term financial needs of the agriculturists which have the following three tier federal structure:

- a) At the Village level : Primary Agricultural Credit Societies.
- b) At the District level : Central Cooperative Banks.
- c) At the State level : State Cooperative Banks.

### **7.3.3 On the Basis of Domicile**

The banks can be classified into the following two categories on the basis of domicile:

**Domestic Banks:** Those banks which are incorporated and registered in the India are called domestic banks.

**Foreign Banks:** Foreign Banks are those banks which are set up in a foreign country with their control and management in the hands of head office in their country of origin but having business branches in India. Foreign Banks are also known as Foreign Exchange Banks or Exchange Banks. Traditionally these banks were set up for financing the foreign trade in India and discounting the foreign exchange bills. But now these banks are also accepting deposits and making advances like other commercial banks in India. Notable leading foreign banks in India are:

- i) ANZ Grindlay's Bank having 56 branches in India.
- ii) The Standard & Chartered Bank with 24 branches in India.
- iii) Hongkong Bank having 21 branches in India.
- iv) American Express Bank.
- v) Citi Bank.
- vi) Bank of America and others foreign banks.

### **Check Your Progress- I**

Q1: Define the term bank.

Ans. ....  
-----

Q2: Define public sector banks.

Ans. ....

Q3. What do you mean by scheduled banks?

Ans. ....

#### **7.3.4 On the Basis of Functions**

The banks can be classified on the basis of functions in the following categories:

- 1. Commercial Banks:** Commercial banks are those banks which perform all kinds of banking business and functions like accepting deposits, advancing loans short term loans, credit creation, and agency functions for their customers. Since their major portion of the deposits are for the short period, they advance only short term and medium-term loans for business, trade and commerce. Majority of the commercial banks are in the public sector. Of late they have started giving long term loans also to compete in the commercial money market. These commercial banks are also called joint stock banks because they are constituted and organised in the same manner as the joint stock companies are constituted. Major commercial banks operating in India are as under:

Subsidiaries	
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
	9.
	10.
	11.
	12.

	13.
	14.
	15.
	16. United Bank of India.
	17.
	18.
	19.

**2. Industrial Banks:** The Industrial banks are those banks which provide medium term and long-term finance to the industries for the purchase of Land and Building, Plant and Machinery and other industrial equipment. They also underwrite the shares and debentures of the industries and also subscribe to them. The main functions of an Industrial Banks are as follows:

- A. They provide long term finance to the industries to purchase Land and Buildings, Plant and Machinery and construction of factory buildings.
- B. They also accept long term deposits.
- C. The under write the shares and debentures of the industry and sometimes subscribe to them.

In India there are number of financial institutions which perform the functions of an Industrial Bank. Major financial institutions are as under: -

- A. Industrial Development Bank of India (IDBI).
- B. Industrial Finance Corporation of India (IFCI).
- C. Industrial Credit and Investment Corporation of India (ICICI) and
- D. State Industrial Development Corporations such as Punjab State Industrial Development Corporation (PSIDC).

**3. Agriculture Banks:** The needs of agricultural credit are different from that of industry, business, trade and commerce. Commercial banks and Industrial banks do not deal with agriculture credit financing. An agriculturist has both types of needs:

- i) He requires short term credit to purchase seeds, fertilizers and other inputs and
- ii) He also requires long term credit to purchase land, to make permanent improvement on land, to purchase agricultural machinery and equipment such as tractors etc.

Agricultural credit is generally provided in India by the Cooperative institutions. The

Cooperative Agricultural Credit Institutions are divided into two categories: -

**A. Short term agricultural credit institutions**

The short-term agricultural credit institutions cater to the short-term financial needs of the agriculturists which have the following three tier federal structure:

- a) At the Village level: Primary Agricultural Credit Societies,
- b) At the District level: Central Cooperative Banks
- c) At the State level: State Cooperative Banks.

**B. Long term agricultural credit institutions**

The long-term agricultural credit is provided by the Land Development Banks which were earlier known as Land Mortgage Banks. The land development banks provide long term to agriculturists for a period ranging from 5 years to 25 years.

- 4. Exchange Banks:** The exchange banks are those banks which deal in foreign exchange and specialized in financing the foreign trade. Therefore, they are also called foreign exchange banks. Foreign Exchange Banks are those banks which are set up in a foreign country with their control and management in the hands of head office in their country of origin but having business branches in India. Notable leading foreign exchange banks in India are:

- i) ANZ Grindlay's Bank having 56 branches in India, Head office in England
- ii) The Standard & Chartered Bank with 24 branches in India, Head office in England.
- iii) Hongkong Bank having 21 branches in India, Head office in Hongkong.
- iv) American Express Bank with Head office in United States of America.
- v) Citi Bank with Head office in United States of America.
- vi) Bank of America with Head office in United States of America.

- 5. Central Bank:** The Central Bank is the apex bank of a country which controls, regulates and supervises the banking, monetary and credit system of the country. The Central Bank is owned and controlled by the Government of the country. The Reserve Bank Of India is the Central Bank in India.

The important functions of central bank are as follows: -

- i) It acts as banker to the Government of the country.
- ii) It also acts as agent and financial advisor to the Government of the country.
- iii) It has the monopoly to issue currency of the country.

- iv) It serves as the lender of the last resort.
- v) It acts as the clearing house and keeps cash reserves of commercial banks.

### **Check Your Progress- II**

Q1. Define industrial banks.

Ans. ....

Q2. What do you mean by agricultural banks?

Ans. ....

### **7.4 Functions of Commercial Banks**

The Commercial Banks perform a variety of functions which can be divided in the following three categories: -

- Basic Functions.
- Agency Functions.
- General Utility Functions.

#### **7.4.1 Basic Functions**

The basic functions of bank are those functions without performing which an institution cannot be called a banking institution at all. That is why these functions are also called primary or acidtest functions of a bank. The basic/primary/acid test functions of a bank are:

- Accepting Deposits
- Advancing of Loans.
- Credit creation.

##### **7.4.1.1 Accepting Deposits**

The first and the most important function of a bank are to accept deposits from those people who can save and spare for the safe custody with the bankers. It serves two purposes for the customers. On one hand their money is safe with the bank without any fear of theft and on the other hand they also earn interest as per the kind of saving they have made. For this purpose, the banks have different kinds of deposit accounts to attract the people which are as under:

- 1) **Saving Deposit Account:** The Saving Bank Account is the most common bank account being utilized by the general public. The basic purposes of this account are to mobilize the small savings of the general public. Certain restrictions are imposed on the depositors regarding the number of withdrawals and amount to be withdrawn in a given period of time. Generally, the rate of interest paid by the bank on these deposits is low as compared to recurring or fixed deposit accounts. Cheque facility is also provided to the depositors with certain extra restrictions on the depositors. One of the conditions is that the depositor shall have to maintain a minimum balance in the account say Rs.500 which is otherwise very low in the case of an account without the facility of the cheque book, say Rs.20 only. Some service charges are also imposed if the depositor uses the cheque facility at large levels.
- 2) **Fixed Deposit Account:** This is an account where money can be deposited for a fixed period of time say One Year or Two years or Three Years or Five Years and so on. Once the money is deposited for a fixed period of time, the depositor is prohibited from withdrawal of money from the bank before the expiry of the stipulated period of time. The basic advantage to the customer is that he is offered interest at the higher rate of interest and the banker is free to utilize the money for that fixed period. But where a customer is in need of money in any contingency or emergency, the bank also has the facility to provide loan against the fixed deposit receipt at liberal terms and conditions. Even if a customer insists on the withdrawal of his money the fixed deposit receipt can also be encashed before the expiry of the stipulated period of time with the condition that the customer shall not be entitled to higher rate of interest, but the customer is allowed that rate of interest which is applicable on the saving deposit account as if the amount was deposited in the savings account.
- 3) **Current Deposit Account:** In the savings bank account, there are restrictions on the number of withdrawals that can be made in a day or a week or a month. Therefore, it does not suit to the needs of traders and businessmen who have to make several payments daily and deposits money in a similar manner. Therefore, there is a facility for them in the shape of another account called Current Deposit Account. These accounts are generally maintained by the traders and businessmen who have to make a number of payments every day. Money from this account can be withdrawn by the account holder as many times as desired by the customer. Normally bank does not pay any interest on these current accounts, rather some incidental charges are charged by the banker as service charges. These accounts are also called demand deposits or demand liabilities.

The facility of Over Drafts is providing to the traders through these current accounts for which the banks charge interest on the outstanding balance of the customers. A limit is fixed by the bankers for withdrawal of over drafts and the customer is not allowed to withdraw more than that limit from his O/D current account. Say if a trader has an O/D limit of Rs. 100,000. with a bank, he can withdraw money upto Rs. 1,00,000 from the bank without depositing any money with the bank. But he cannot withdraw more than Rs.1,00,000. He shall have to pay interest on such withdrawals.

- 4) **Recurring Deposit Account:** To encourage regular savings by the general public, another account is opened in the banks called Recurring Deposit Account. This account is preferred by the fixed income group, because a particular amount fixed at the time of opening the account has to be deposited in the account every month for a stipulated period of time. Say Rs.500 per month for a period of three years. In this case the customer is bound to deposit Rs.500 per month regularly for a period of three years. Generally the bank pays rate of interest higher than that of a saving account and just equal to the fixed deposit account on such recurring deposit accounts. The withdrawal of money is allowed only after the stipulated period of time along with the interest. Rather the account stands closed at the end of the stipulated period of time. In this case also the bank provides a facility to withdraw the money before the stipulated period of time in the case of any emergency. The bank shall allow rate of interest which is applicable on saving bank account in case the customer want to close the account before then stipulated period of time.

- 5) **Home Loan Account:** Home loan account facility has been introduced in some scheduled commercial banks to encourage savings for the purchasing of or construction of a house to live. In this account the customer is required to deposit a particular amount per month or half yearly or even yearly for a period of five years. After the stipulated period bank provide three to five times of the deposited amount a loan to the subscribers to purchase or construct a house. Rate of interest is also very attractive on this account nearly equal to that of the fixed deposit account. Even the rebate of Income Tax is also available on the amount contributed in this account under Section 88 of the Income Tax Act, 1961. Facility to close the account after the stipulated period of time is also allowed.

#### **7.4.1.2 Advancing of Loans**

Advancing of loans is the second acid test function of the commercial banks. After keeping



certain cash reserves, the banks lend their deposits to the needy borrowers. It is one of the primary functions without which an institution cannot be called a bank. The bank lends a certain percentage of the cash lying in the deposits on a higher rate of interest than it pays on such deposits. The longer is the period for which the loan is required the higher is the rate of interest. Similarly higher the amount of loan, the higher shall be the rate of interest. Before advancing the loans, the bank satisfies themselves about the credit worthiness of the borrowers. This is how a bank earns profits and carries on its banking business. There are various types of loans which are provided by the banks to the borrowers. Some of the important ways of advancing loans are as under: -

- 1) **Call Money Advances:** The Call Money Market which is also known as inter-bank call money market deals with very short period loans called call loans. The Call Money Market is a very important constituent of the organized money market which functions as an immediate source of very short term loans. The major suppliers of the funds in the call money market are All Commercial Banks, State Bank of India (SBI), Life Insurance Corporation of India (LIC), General Insurance Corporation (GIC), Unit Trust of India (UTI) and Industrial Development Bank of India (IDBI) and the major borrowers are the Scheduled Commercial Banks. No collateral securities are required against these call money market loans.

As the participants are mostly banks, it is also called inter-bank call money market. The Scheduled Commercial Banks use their surplus funds to lend for very short period to the bill brokers. The bill brokers and dealers in stock exchanges generally borrow money at call from the commercial banks. The bill brokers in turn use them to discount or purchase the bills. Such funds are borrowed at the call rate which varies with the volume of funds lent by the commercial banks. When the brokers are asked to pay off the loans immediately, then they borrow from SBI, LIC, GIC, and UTI etc. These loans are granted by the commercial banks for a very short period, not exceeding Seven Days in any case. The borrowers have to repay the loan immediately whenever the lender bank calls them back.

- 2) **Cash Credits:** This is a type of loan which is provided to the businessmen against their current assets such as Shares, Stocks, Bonds etc. These loans are not based on credit worthiness or personal security of the customers. The bank provides this loan through opening an account in the name of the customer and allows them to withdraw borrowed amount of loan from time to time up to the limit

fixed by the bank which is determined by the value of security provided by the borrowers. Interest is charge only on the amount of money actually withdrawn from the banks and not on the amount of the sanctioned amount of loan.

In some other cases certain banks follow a different procedure for cash credits. The whole amount of loan is credited to the current account of the borrower. In case of a new customer a separate account is opened and amount of loan is transferred to it. The borrower is free to withdraw the money through cheques as and when required by the borrower. But in this case the borrower has to pay the interest on the whole amount credited in their accounts.

- 3) **Overdrafts:** The facility of Over Drafts is providing to the traders and businessmen through current accounts for which the banks charge interest on the outstanding balance of the customers. A limit is fixed by the bankers for withdrawal of over drafts and the customer is not allowed to withdraw more than that limit from his Over Draft Current Account. This facility is required by the traders and businessmen because they issue several cheques in a day and similarly deposits so many cheques daily in their current accounts. They may not be knowing at a particular day that whether there is a balance in the account or not and their issued cheques are not dishonored they are provided with the facility of overdrafts. Say if a trader has an Over Draft limit of Rs. 200,000 with a bank, he can withdraw money upto Rs. 2,00,000 from the bank without depositing any money with the bank. But he cannot withdraw more than Rs.2,00,000. He shall have to pay interest on such withdrawals.
- 4) **Discounting Bills of Exchange:** This is another popular type of lending by the commercial banks. A holder of a bill of exchange can get it discounted with a commercial bank. Bills of Exchange are also called the Commercial Bills and the market dealing with these bills is also called commercial bill market. Bills of exchange are those bills which are issued by the businessmen or firms in exchange of goods sold or purchased. The bill of exchange is a written unconditional order signed by the drawer (seller) requiring the drawee (buyer) to pay on demand or at a fixed future date, (usually three months after date written on the bill of exchange), a definite sum of money. After the bill has been drawn by the drawer (seller), it's accepted by the drawee (buyer) by countersigning the bill. Once the buyer puts his acceptance on the bill by signing it, it becomes a legal document. They are like postdated cheques issued by the buyers of goods for the goods received. The bill holder can get this bill discounted in the bill market if he wants the amount of the bill before its actual maturity.

These bills of exchange are discounted and re-discounted by the commercial banks for lending credit to the bill brokers or for borrowing from the central bank. The bill of exchange market is not properly developed in India. The Reserve Bank of India introduced the bill market scheme in 1952. Its main aim was to provide finance against bills of exchange for 90 days. The scheduled commercial banks were allowed to convert a part of their advances into promissory notes for 90 days for lodging as collateral security for advances from Reserve Bank.

In 1970 on the recommendations of Narsimham Committee, the Reserve Bank Of India introduced the Bill Re-discounting Scheme. Under this scheme, all licensed scheduled commercial banks are eligible to re-discount with Reserve Bank of India genuine trade bills arising out of actual sale or purchase of goods. Apart from the scheduled commercial banks, certain other financial institutions were also allowed to re- discount the bills. These financial institutions included LIC, GIC, UTI, IDBI, ICICI, IFCI, NABARD, SBI and CANBANK Mutual Fund.

- 5) **Term Loans:** Earlier the commercial banks were advancing only short-term loans. The commercial banks have also started advancing medium term and long-term loans. Now the maturity period of term loans is more than one year. The amount of the loan sanctioned is either paid to the borrower or it is credited to the account of the borrower in the bank. The interest is charged on the whole amount of loan sanctioned irrespective of the amount withdrawn by the borrower from his account. Repayment of the loan is accepted in lump sum or in the installments.

#### **7.4.1.3 Credit Creation**

Credit creation is one of the basic functions of a commercial bank. A bank differs from the other financial institutions because it can create credit. Like other financial institutions the commercial banks also aim at earning profits. For this purpose, they accept deposits and advance loans by keeping small cash in reserve for day-to-day transactions. In the layman's language when a bank advances a loan, the bank creates credit or deposit. Every bank loan creates an equivalent deposit in the bank. Therefore, the credit creation means multiple expansions of bank deposits. The word creation refers to the ability of the bank to expand deposits as a multiple of its reserves.

The credit creation refers to the unique power of the banks to multiply loans and advances, and hence deposits. With a little cash in hand, the banks can create additional purchasing power to a considerable extent. It is because of this multiple credit creation power that the commercial banks have

been named the "factories of creating credit" or manufacturers of money.

#### **7.4.2 Agency Functions**

The Commercial Banks also perform certain agency functions for and on behalf of their customers. The bank acts as the agent of the customer while performing these functions. Such services of the banks are called agency services. Some of the important agency services are as under:

- 1) **Remittance of Funds:** Commercial banks provide a safe remittance of funds of their customers from one place to another through cheques, bank drafts, telephone transfers etc.
- 2) **Collection and Payment of Credit Instruments:** The commercial banks used to collect and pay various negotiable instruments like cheques, bills of exchange, promissory notes, hundis, etc.
- 3) **Execution of Standing Orders:** The Commercial Banks also execute the standing orders and instructions of their customers for making various periodic payments like subscriptions, rents, insurance premiums and fees on behalf of the customers out of the accounts of their customers.
- 4) **Purchase and Sale of Securities:** The commercial banks also undertake the sale and purchase of securities like Shares, Stocks, Bonds, Debentures etc., on behalf of their customers performing the function as a broker agent.
- 5) **Collection of Dividends on Shares and Interest on Debentures:** Commercial banks also make collection of dividends announces by the companies of which the customer of the bank is a shareholder, and also collects the interest on the debentures which becomes due on particular dates generally half yearly or annually.
- 6) **Trustees and Executors of Wills:** The commercial Banks preserves the wills of their customers as their trustees and execute the wills after the death of the customer as per the will as the executors.
- 7) **Representation and Correspondence:** The commercial banks also act as the representative and correspondents of their customers and get passports, travelers' tickets, book vehicles and plots for their customers on the directions of the customers.

#### **7.4.3 General Utility Functions**

In addition to basic functions and agency functions the commercial banks also provide general utility services for their customers which are needed in the various walks of life and the commercial banks provide a helping hand in solving the general problems of the customers, like

safety from loss or theft and so many other facilities some of them are as under:

1. **Locker Facility:** The commercial banks provide locker facility to its customers at very reasonable charges, which is not possible at the premises of the customers. The customers can avail the facility of lockers in different sizes according to the needs of the customers. The locker charge also varies with the size of the lockers. The customers can keep their valuables in it and important documents in these lockers for safety. Lockers can be operated in the usual business hour of the bank on all working days.
2. **Traveler's Cheque Facility:** Where customers want to visit long distant places and also need money, they need not carry the money with them which is not safe during long distant journeys and there is always a fear of loss or theft during the journey. The commercial banks provide a unique facility through traveler's cheque. The customers can get traveler's cheques from the banks and travel without the fear of theft or loss of money. Where ever they need money they can approach the branch of the bank in that city and encash the traveler's cheque according to the need of the customer and keep the balance in traveler's cheques again.
3. **Gift Cheque Facility:** Some commercial banks also provide the facility of issuing gift cheques in the denomination of different amounts according to the needs of the customers, say for Rs.11, 21, 51, 101, 501 and so on. This facility is provided for the special occasions for the customers and normally the banks do not charge anything for issuing these gift cheques.
4. **Letter of Credit:** The commercial banks also help their customers by providing another unique service by providing the letter of credit in which the bank certifies the credit worthiness of the customers. These letters of credit are used in the long distant trade and specially in foreign trade where the parties do not know each other's and it is bank which provides the safety to them regarding their credit worthiness by issuing letter of credit.
5. **Underwriting Contracts:** The commercial banks underwrite the securities issued by the public or private companies and Government securities. It is the reputation of the bank which matters in the underwriting contracts. Where the bank is a very reputed one, the investors shall not have any hesitation in investing the money in which their banker is the underwriter. In case the public do not purchase the securities, it is the underwriting bank which has to purchase the securities upto the amount of which the bank has underwritten.
6. **Provide Statistical Data:** The commercial banks also help their customers by providing them important information through statistical data. Commercial banks collect statistical data in which

important information relating to industry, trade, commerce, money and banking is collected and published in their journals and bulletins containing research articles on the economic and financial matters. Such statistical data may be useful for the customers in dealing with their own business, trade or commerce.

- 7. Foreign Exchange Facilities:** The commercial banks also deal in the business of foreign currencies. These banks provide foreign exchange and also discount the foreign bills of exchange. Some commercial banks have also opened special branches for the foreign exchange services to the non-resilient Indians settled abroad.
- 8. Merchant Banking Services:** The commercial banks have also started providing merchant banking facilities. The Banking Commission Report, 1972 emphasized the need of creating specialized institutions to cater financial requirements of different sectors exclusively and examined the need of setting up merchant banking institutions. Commission recommended the setting up of merchant banking institutions. Consequently, in 1972 itself State Bank of India started its merchant banking division. Since then, a number of other commercial banks and financial institutions started their merchant banking divisions. Now the merchant banking firms in private sector have started gearing up to meet the challenge posed by commercial banks and financial institutions in the field of merchant banking in India.

Merchant Banking activities were regulated by guidelines of SEBI and Ministry of Finance, Companies Act, 1956, Securities Contract (Regulation) Act, 1956 and listing guidelines of stock exchanges in India. In December 1992, in its wisdom SEBI came out with Securities And Exchange Board of India (Merchant Banking) Regulations, 1992, a comprehensive enactment to regulate merchant banking activities in India.

Merchant Banking is no longer a monopoly of Institutional and Banker merchant bankers only. After SEBI (Merchant Bankers) Regulation 1992, merchant banking has been given a specific direction. Since their role in public issues is exhaustive and their responsibilities also lute, professional expertise is necessarily needed. In India the merchant banking activity can be divided basically amongst the following main segments:

- A. Financial Institutions like ICICI, IDBI, IFCI, and SIDBI floated merchant banking divisions.
- B. Public Sector Nationalized Commercial Banks promoted subsidiaries to carry out merchant banking activities like SBI Caps, PNB Caps and Canfina etc.
- C. Foreign Banks promoted merchant banking divisions like Grindlays Bank, Standard

Chartered Bank Citi Bank and Honkong Bank etc.

D. Private sector merchant banker's corporate firms like JM Financials, Kodak Mahindra Finance, DSP Finance etc.

**9. Acting as Referee:** The commercial banks are the best source of seeking information about the creditworthiness of the customers. Banks may be referred for seeking information regarding credit worthiness, financial position, business reputation and respectability of their customers.

### **Check Your Progress- III**

Q1. Define current deposit account in banks.

Ans.....  
-----

Q2. What do you mean by credit creation?

Ans.....  
-----

Q3. Mention the name of general utility functions of banks.

Ans.....  
-----

### **7.5 Summary**

Bank is an institution which deals with the money and credit in such a manner that it accepts deposits from the public and makes the surplus funds available to those who need them, and helps in remitting money from one place to another safely. In other words, a bank is a commercial establishment which deals in debts and aims at earning profits by accepting deposits from general public at large, which is repayable on demand or otherwise through cheques or bank drafts and otherwise which are used for lending to the borrowers or invested in Government securities. As far as types of banks is concerned, based on reserve bank schedule (i.e., schedule banks and non-scheduled banks) ownership (i.e., public sector, private sector banks and co-operative banks), domicile (i.e., domestic and foreign banks) and functions (i.e., commercial banks, industrial banks, agricultural banks, exchange banks and central banks). In the context of functions of commercial banks, broadly divided into three parts: basic functions, agency functions and general utility functions. Basic functions consist of accepting loans, advancing loans and credit creation.

## **7.6 Questions for Practice**

### **7.6.1 Short Answer Type Questions**

- Q1. Write a note on the origin of banks.
- Q2. Give a comprehensive definition of a bank.
- Q3. What are the different types of banks?
- Q4. What are Scheduled Commercial Banks?
- Q5. Write a note on Private Sector Banks.
- Q6. Explain the functions of banks under advancing loans.
- Q7. What are the agency functions of banks?
- Q8. Write a note on Foreign Banks.
- Q9. What are Industrial Banks?
- Q10. What do you mean by credit creation?

### **7.6.2 Long Answer Type Questions**

- Q1. Define a bank. Write a detailed note on types of banks on the basis of ownership.
- Q2. Write the classification of Commercial Banks.
- Q3. Explain the basic functions of Commercial Banks.
- Q4. Define the agency functions and general utility functions of banks.

## **7.7 Suggested Readings**

- Money and Banking, by T.N. Hajela,
- Money and Banking by KPM Sundram
- Money and Banking by Schuam Series, McGrawHill Publishing Co. Ltd., New Delhi.
- Money Economics-Institutions, Theory and Policy by Suraj B Gupta
- Innovations in Banking Services by H.R. Suneja
- Monetary Economics: Institutions by Suraj B. Gupta.



**M.A (ECONOMICS)**

**SEMESTER –II**

**COURSE: MACRO ECONOMICS**

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**UNIT 8: MONETARY POLICY- OBJECTIVES AND TOOLS FISCAL POLICY -  
OBJECTIVES AND TOOLS**

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**STRUCTURE**

**8.0 Learning Objectives**

**8.1 Introduction**

**8.2 Meaning of Monetary Policy**

**8.3 Objectives of Monetary Policy**

**8.4 Types of Monetary Policy**

**8.5 Tools or Instruments of Monetary Policy**

**8.6 Application of the tools of Monetary Policy to Achieve Objectives**

**8.7 Meaning of Fiscal Policy**

**8.8 Objectives of Fiscal Policy**

**8.9 Types and Various Combinations of Fiscal Policy**

**8.10 Tools or Instruments of Fiscal Policy**

**8.11 Application of the tools of Fiscal Policy to Achieve Objectives**

**8.12 Summary**

**8.13 Questions for Practice**

**8.14 Suggested Readings**

**8.0 Learning Objectives**

After reading this unit, learner will be able to:

- Outline the concept of fiscal and monetary policy
- Know the objectives of fiscal and Monetary policy
- Use of tools of fiscal and Monetary policy for its objectives

## **8.1 Introduction**

Macroeconomic policies play crucial role in an economy. Fiscal Policy is a significant policy tool of economic framework of the economy. Fiscal Policy is the policy related to Public Revenues, Public Expenditures, Public Debts and also Deficit Financing by the government. Fiscal policy helps to mobilize the resources, allocation of resources, capital formation, rise in investment levels and alike. Fiscal Policy aims to promote development and productive activities. It includes both Development activities (like expenditure on infrastructure, transport, small scale industries etc.) and non-development activities (like salaries, pensions, subsidies etc.). Fiscal Policy provides incentives to private sector investment and production. Fiscal Policy is designed by the government of the country. For example, in India, the union finance minister formulates and deals with Fiscal policy through annual budget and other interventions.

## **8.2 Meaning of Monetary Policy**

Monetary policy means the policy relating to supply of money, availability of money and cost of money. Through monetary policy, central bank regulates the supply of money, direction and cost (rate of interest) of money in the economy.

Harry, Johnson, —A policy employing the central banks control of supply of money as an instrument for achieving the objectives of general economic policy is a monetary policy.|| G k Shaw, —By monetary policy, we mean any conscious action undertaken by the monetary authorities to change the quantity, availability or cost (rate of interest) of money.||

Aston, D.C. —Monetary policy involves the influence on the level and composition of aggregate demand by the manipulation of interest rates and availability of credit.||

These definitions explain the following points:

- a) Central bank or monetary authority operates monetary policy
- b) Regulation of quantity/ cost/ direction of money supply
- c) Influence on aggregate demand
- d) Specific objectives of monetary policy.

## **8.3 Objectives of Monetary Policy**

1. **Achievement of Full Employment:** Generation of employment is a pertinent issue in all the economies especially in less developed economies. Monetary policy aims at generating

more employment through the expansion of AD, incomes and outputs. For this objective, central bank adopts ‘cheap monetary policy/expansionary monetary policy’ and lowers the rates of interest in order to increase the flow of credit for consumption and investments.

2. **Promote Economic Growth and Development:** Economic growth means the process by which the real national and real per capita income continue to rise for a long period of time. This process will enhance the production capacities, lead to skill formation and capital formation. Less developed economies face the problem of shortage of financial resources and less capital formation. Therefore, monetary policy aims to mobilize the financial resources for more investments and capital formation.
3. **Price Stability:** It refers to lessen the fluctuations in price level. The process of persistent rise in prices is called inflation. Greater flow of Money supply, higher AD and less production of goods are main causes of inflation. Inflation brings social injustice, inequality of income and wealth. It lowers the purchasing power of people and reduces consumption expenditures and AD. The process of falling prices called deflation is also harmful because it discourages investment and production. Monetary policy aims to correct both the situations by regulating money supply and rates of interest.
4. **Exchange Stability:** The issues relating foreign exchange rate, stock of foreign exchange reserves and balance of payments (BOP) are significant for the external price stability. The problems of shortage of foreign exchange reserves and adverse BOP can be solved with monetary policy.
5. **Equitable Distribution of Income and Wealth:** This objective of monetary policy relates to redistribution of national income in such a manner that more incomes and funds flow to the poorer sections of society. Monetary policy aims to provide more loans and funds at low rates of interest to marginalized sections, weaker sections, women and small investors for providing better opportunities of businesses, work and investment in industry and agriculture.

In short, monetary policy works in tune with the main objectives of economic policies and planning for growth and development.

#### **8.4 Types of Monetary Policy**

Following are the main types of monetary policy:



- A. Expansionary Monetary Policy:** Expansionary monetary policy expands the amount of money/credit supply available to consumers, producers and investors. Lowering of rates of interest makes the loans/credits cheaper. It encourages the consumers to borrow more for buying goods like cars, furniture, and house construction and provides boost to the investors to borrow more for starting up businesses, industries and trade activities. This raises the level of aggregate demand in the economy. As a result, levels of income output and employment start rising.
- B. Contractionary Monetary Policy:** Contractionary monetary policy restricts/contract the amount of money/credit supply available to consumers, producers and investors. Raising of rates of interest makes the loans/credits costlier. It discourages the consumers to borrow more for buying goods like cars, furniture, and house construction and restricts the investors to borrow more for starting up businesses, industries and trade activities. This reduces the level of aggregate demand in the economy. As a result, levels of income output and employment start shrinking.

#### **Check Your Progress- IV**

Q1. Define monetary policy.

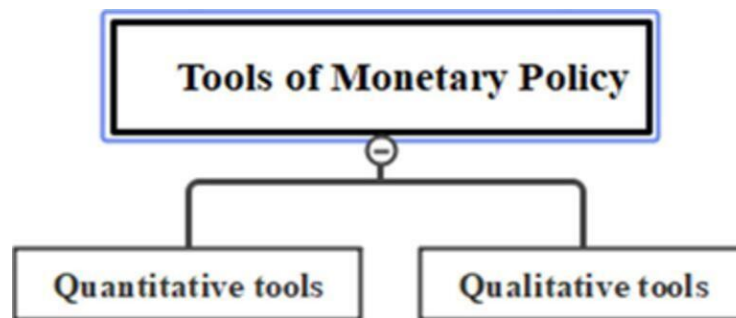
Ans. ....  
-----

Q2. Outline the differences between liberal/cheap monetary policy and restrictive/dear monetary policy.

Ans. ....

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### **8.5 Instruments/Tools of Monetary Policy**



**A. Quantitative Tools:** Quantitative tools are those tools which target at changing the quantity of money supply in circulation. Generally, the use of such tools affects the entire economy. This is a non-discriminatory credit policy operated by central bank. Following are the main quantitative tools of monetary policy.

- Bank Rate;
- Open market operations;
- Cash reserve ratios (cash minimum reserve ratio and statutory liquidity ratio)

Let us analyze these tools in detail.

**1. Bank Rate:** It is defined as that rate of interest at which central bank lends to commercial banks and discounts the securities of banks. Bank rate is positively related to market rate of interest. Market rate of interest is the rate at which commercial banks give loans to the people (investors and consumers). A rise in bank rate increases the market rate of interest (called as Dear money policy or Restrictive monetary policy; and a fall in bank rate decreases the market rate of interest (called as Cheap money policy or Expansionary monetary policy). A rise in bank rate and market rate of interest brings a contraction in credit available to investors and consumers. A fall in bank rate and market rate of interest brings an expansion in credit available to investors and consumers.

**2. Open Market Operations (Omo):** This is the mechanism through which central bank sells and buys the securities in the open market. A) The sale of securities by the central bank to the public has a contractionary effect on money/credit supply in the economy (called as Dear

money policy or Restrictive monetary policy) because when people buy securities from central bank, their money is transferred to central bank. B) When central buys securities from people then money is transferred from central bank to people so that this has an expansionary effect (called as Cheap money policy or Expansionary monetary policy). However, the effectiveness of OMO depends on securities market, excess reserves with commercial banks and such other factors. In India, RBI changes the repo rate and Reverse repo rate. Repo rate is a rate at which commercial banks borrow money by selling their securities to RBI. Reverse repo rate is the rate at which RBI borrows money from commercial banks when there is excess money supply in the market. At the time of inflation, RBI raises the reverse repo rate so that banks give more of their funds to RBI to earn more returns. This has a contractionary effect.

### **3. Changes in Minimum Reserve Ratios:**

- a. Minimum Cash Reserve Ratio (CRR):** It refers to the minimum percentage of the total deposits of each commercial bank which is to be kept with central bank. For example, every commercial bank will deposit/transfer this amount to central bank. This cannot be used by the commercial banks as advancing loans to the investors and consumers. It is a check on the lending capacity of the commercial banks. A higher cash minimum reserve ratio (called as Dear money policy or Restrictive monetary policy) leads to fall in the credit creation capacity of commercial banks through loans to investors and consumers; and a fall in this ratio expands the credit creation capacity of commercial banks (called as Cheap money policy or Expansionary monetary policy).
- b. Change in Statutory Liquidity Ratio (SLR):** It refers to the percent of total deposit of commercial banks which they have to keep in cash or liquid form. For example, every commercial bank will keep a fixed percent of its total deposits in cash and it will not be able to lend this money to investors and consumers. This ratio is a big check on the credit creation capacity of commercial banks. A higher statutory liquidity ratio (called as Dear money policy or Restrictive monetary policy) leads to fall in the credit creation capacity of commercial banks through loans to investors and consumers and a fall in statutory liquidity ratio expands the credit creation capacity of commercial banks (called as Cheap money policy or Expansionary monetary policy).

Remember: a) Expansionary monetary policy means fall in bank rate, buying of securities by central bank, fall in minimum cash reserve ratio and fall in statutory liquidity ratio; and b) Contractionary/restrictive monetary policy means rise in bank rate, selling of securities by central bank, rise in minimum cash reserve ratio and rise in statutory liquidity ratio.

**B. Qualitative Tools/Selective Tools:** Qualitative tools are used as discriminatory credit policy. These tools aim to change the direction of money supply. These tools are used to discriminate between different uses of credit. For example, more credit can be made available to agriculture and export sector and less to car manufacturing industry.

**a. Change in the Margin Requirements of Loans:** The central bank can raise or lower the margin requirements of loans. Margin is the difference between the value of goods pledged as security and amount of loan. It means that proportion of loan amount which is not offered by the bank. Higher margin means low amount of loan and lower margin means more amount of loan. This tool helps to divert financial resources from less important sectors to more and needy sectors. This is done by raising the margin requirements of loans for less important sectors and reducing it for more necessary sectors.

For example, lowering the margin requirements of loans for farmers/agriculture sector and raising it for production of cars.

**b. Rationing of Credit:** Central bank lends money to all the commercial banks. Under rationing, credit is advanced by putting a limit. Central bank can

- directly refuse to give loans;
- it can reduce the amount of loans;
- fix credit quotas for different banks; and
- it can fix quotas for various sectors. Central bank can regulate the consumer credit also.

**c. Moral Persuasion by Central Bank:** Central bank can suggest the commercial banks to work in coordination with the policies of central bank which are adopted time to time. In a way, central bank can exercise some pressure on commercial banks in order to achieve the objectives of monetary policy.

**Remember:** Central bank uses a judicious mixture of these tools for effective implementation of monetary policy. It can use a combination of tools to get the desired results.

### **Check Your Progress-V**

Q1. What is the link between bank rate and market rate of interest?

Ans. ....

Q2. Mention the changes in quantitative tools, under expansionary monetary policy.

Ans. ....

Q3. What is rationing of credit?

Ans. ....

### **8.6 Applications of the Tools of Monetary Policy**

#### **Use of Monetary Policy for Internal and External Stability**

- 1. To Control Inflation:** During inflation, it is necessary to restrict money supply in the economy. For this, following tools can be used.
  - (i) Application of quantitative tools such as increase in bank rate, sale of securities by central bank, increase in CRR and SLR.
  - (ii) Qualitative tools can be used for reallocation of funds into more productive sectors such as increasing the margin requirements of loans and more rationing of credit. One or all the tools can be used as per the requirements.
  - (iii) Besides, central bank can prohibit the printing of new currency. This will help to check the money supply in the economy because the above changes will discourage more borrowing by investors and consumers, leading to fall in AD and this will control the rising prices.
- 2. To Control Deflation:** During deflation, it is necessary to expand money supply in the economy. For this, following tools can be used.
  - a) Application of quantitative tools such as decrease in bank rate, purchase of securities by central bank, reduction in CRR and SLR.



- b) Qualitative tools can be used for reallocation of funds into more productive sectors such as lowering the margin requirements of loans and more credit to banks. This will ease the borrowings by people.

One or all the tools can be used as per the requirements.

- c) Besides, central bank can increase the printing of new currency. This will help to enhance the money supply in the economy because the above changes will encourage more borrowing by investors and consumers. This will increase available money with consumers and investors. It will increase AD in the economy and control the falling prices.

**3. Exchange Rate and Balance of Payments Position:** In simple words, balance of payments (BOP) refers to the account of exports and imports. The deficit BOP means excess of imports over exports. This means more payments for imports are to be made in terms of foreign currency (say Dollar, \$). This raises the demand for foreign exchange (say Dollar, \$). As a result, the value of Dollar, \$ in terms of say, Rupee start rising. It means dollar\$ becomes more costly in exchange of Rupee. This worsens the BOP situation. To tackle this situation, central bank can use tools of monetary policy.

When there is deficit BOP (as sated above), following tools can be used as under.

- (i) Reduction in money supply to lower the level of domestic prices. This will make exports cheaper and lead to rise in demand for exports and discourage imports because cheap goods are available in the home country now. The deficit in BOP will become lesser, requiring less demand for foreign currency (say dollar\$).
- (ii) Lowering the rates of interest and making more credit/money supply available to domestic businesses and investors and foreign investors as well. The increased production of goods and services will lead to fall in demand for imported goods and less demand for foreign exchange.
- (iii) More credit available to exporters will also help to increase the export earnings. This will increase the inflow of foreign exchange in the country and will reduce the demand for foreign currency in world market.

**Remember:** The combination of different tools of monetary policy can be used such as combining OMO, CRR /SLR or qualitative tools.

### **Economic Growth and Development:**

Let us first understand the process of economic development and growth. Economic growth/development is a continuous process whereby the real national income and real per capita income continue to rise for a long time period. This process requires rise in capital formation which in turn involves:

- A) Higher volume of savings;
- B) Mobilization of savings through banking/financial systems; and
- C) Investments of savings.

An effective monetary policy uses its tools for financing the development process. This is very much significant especially for developing economies. Let us know it through an example.

India is a developing economy. More and more funds are required for financing the development activities such as businesses, village industries, small entrepreneurs, women entrepreneurs, factories, farming, infrastructure and alike. For this task, monetary policy aims at following steps

- Better mobilization of savings through large number of financial institutions,
- Lucrative savings schemes
- More finances for investments even for startups, small businesses
- Identification of priority sectors and providing these sectors loans at lower rates of interest
- Easy loans for consumption purposes
- More and easy loans for more and more productive purposes.

### **Check Your Progress-VI**

Q1. Mention the tools of monetary policy for controlling inflation.

Ans. ....  
-----

Q2. What is the difference between CRR and SLR?

Ans. ....  
-----

Q3. What are the steps of tools of monetary policy are needed for the expansion of businessactivities in the economy?

Ans. ....

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### **8.7 Meaning of Fiscal Policy**

Fiscal Policy is the policy related to public revenues, Public Expenditures, Public Debts and also Deficit Financing by the government. It is a policy relating to government tax and non-tax revenues and government expenditures and government borrowings. Let us understand with the help of following definitions.

Rowan, D.C.- *–Fiscal Policy is defined as the discretionary action by the government to change the level of government expenditure on goods and services and transfer payments and the yield of taxation at any given level of output.*

G.K. Shaw- *–Fiscal Policy is defined as any decision to change the level, composition and timing of government expenditure or change the burden, structure and frequency of the tax payment.*

Both the above definitions state the main elements of fiscal policy- Revenues and expenditures. Government can change the magnitude, composition, direction and timings of taxes and expenditures.

Monetary policy is an effective policy for regulating the economy in terms of internal and external stability and generation of employment. It is a policy tool which manages the quantum/size of money supply and growth rate of money supply in an economy. The central bank of the economy generally regulates monetary policy through its financial system/banking system/commercial banks and uses its tool such as Bank rate, Rate of interest adjustments, Cash reserve requirements and Repo rates to change the quantity and direction of money supply to achieve various objectives. It regulates (expand or contract) the flow of credit and money supply to available the public in the economy.

### **8.8 Objectives of Fiscal Policy**

Main objectives can be explained as under:

1. **Price Stability:** Price stability means fewer fluctuations in the general price level. It is measured by rate of inflation. Price stability means when there is no/low rate of inflation or deflation. Let's understand the two situations.

- a. When there is higher rate of inflation, a contraction in aggregate demand and expenditure is required and for this, government reduces the fiscal deficit and public expenditure and raises the taxes, introduces various tax saving schemes. The policy is to use all financial resources in a productive way.
  - b. When there is deflation, an expansion of aggregate demand is required and for this, government increases the public expenditure and reduces the taxes.
2. **Higher Economic Growth and Development:** Economic growth and development is measured by rate of increase in gross domestic Product (GDP) of an economy. Expansionary fiscal policy is needed for this. For economic growth and development, GDP and per capita income must rise for a long time period. Fiscal Policy can raise the levels of investments in an economy. For this, regular investments are required which leads to increase the rate of capital formation. This in turn, helps to increase the levels of output, income and employment in the economy. As a result, the rate of economic growth and development starts increasing.
  3. **Higher Employment Rate:** Fiscal Policy aims to accelerate the rate of employment generation so that economy can move towards full employment level. This is possible by raising the level of aggregate demand. Fiscal policy can help to increase the productive public expenditure and reduce taxes on productive activities like small scale industries. Investments in productive activities and infrastructure generate more employment. This expansionary act will boost up investment in the economy which in turn will increase the level of output, income and employment.
  4. **Economic Equality:** Most economies suffer from the issue of income and wealth inequalities. The society is divided between rich and poor sections. Fiscal policy aims to reduce these inequalities and bring more equal distribution of income and wealth. For this, Government designs fiscal policy in such a manner that money/income is transferred from the rich to poor via government activities. Government imposes progressive taxes like income and wealth taxes on the richer section and collects tax revenue. This amount is spent by the government on provision of welfare activities for the poor and weaker sections.
  5. **Reducing Balance of Payments Deficits:** Balance of Payments (BOP) is a record of all international transactions (current and capital accounts) of a nation during a year. A deficit BOP means that receipts (inflow of money incomes) are less than the Payments (outflow). To reduce this deficit, fiscal policy aims to promote exports by provision of certain fiscal

incentives to producers/exporters like exemption in taxes and provision of subsidies. Rise in exports increases the export receipts which reduces the deficit in BOP.

6. **Balanced Regional Development:** It means more development of backward regions/states so that all the regions/states grow equally. Fiscal policy aims to raise the growth rates of backward regions/states through the allocation of more grants and other funds for creation of infrastructure like roads, power and directly productive activities like small scale enterprises, cottage and villages industries.
7. **Optimum Allocation of Resources:** Fiscal Policy aims to allocate resources mobilized through tax revenues. These allocations are made keeping in view the objectives of fiscal policy like allocation of funds for education, health, development of social and physical infrastructure, investment in small sector, village industries and measures to boost investment in private sector.

To sum up, fiscal policy plays significant role to promote welfare of the people, growth of industries and agriculture and other sectors.

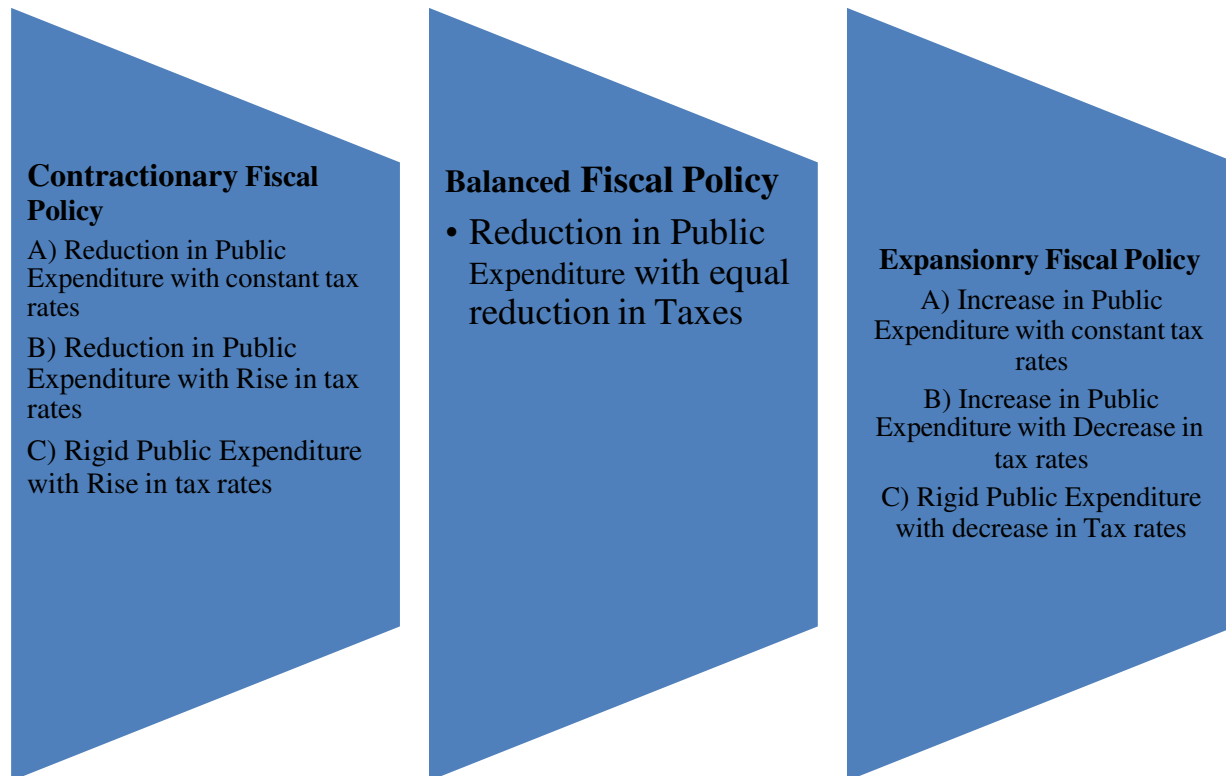
## **8.9 Types and Various Combinations of Fiscal Policy**

- A. Neutral Fiscal Policy
- B. Expansionary Fiscal Policy
- C. Contractionary Fiscal Policy

Neutral Fiscal Policy	Expansionary Fiscal Policy	Contractionary Fiscal Policy
<ul style="list-style-type: none"> <li>• Government expenditure = Tax Revenue</li> <li>• Budget has neutral effect on the economy</li> </ul>	<ul style="list-style-type: none"> <li>• Government Expenditure &gt; Tax Revenue</li> <li>• Boost to investment and production in the economy</li> </ul>	<ul style="list-style-type: none"> <li>• Government Expenditure &lt; Tax Revenue</li> <li>• Control and contraction of expenditures especially unproductive expenditures</li> </ul>

Most often, the Fiscal Policy is either expansionary or Contractionary. We must understand that under different situations, government uses different combinations of the tools of fiscal policy to get the desired results. When there is need to give boost to investments,

government will design and implement expansionary fiscal policy, for example- during the time periods of deflation or recession/depression. When there is need to restrict/contract the expenditures, government will design and implement contractionary fiscal policy, for example- Inflation.



**In Contractionary Fiscal Policy, there are following possibilities mainly,**

- A) Reduction in Public Expenditure with constant tax rates
- B) Reduction in Public Expenditure with Rise in tax rates
- C) Rigid Public Expenditure with Rise in tax rates

**In Expansionary Fiscal Policy, following combinations are:**

- A) Increase in Public Expenditure with constant tax rates
- B) Increase in Public Expenditure with Decrease in tax rates
- C) Rigid Public Expenditure with decrease in Tax rates

Government has to monitor the Fiscal Policy very closely so that price stability as well growth and development and other objectives are achieved. Government will take the decision regarding the combinations of fiscal policy as per the objectives of the policy.

### **Check Your Progress-I**

Q1: What is fiscal policy?

Ans. ....  
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Q2: Mention the name of types of fiscal policy?

Ans. ....  
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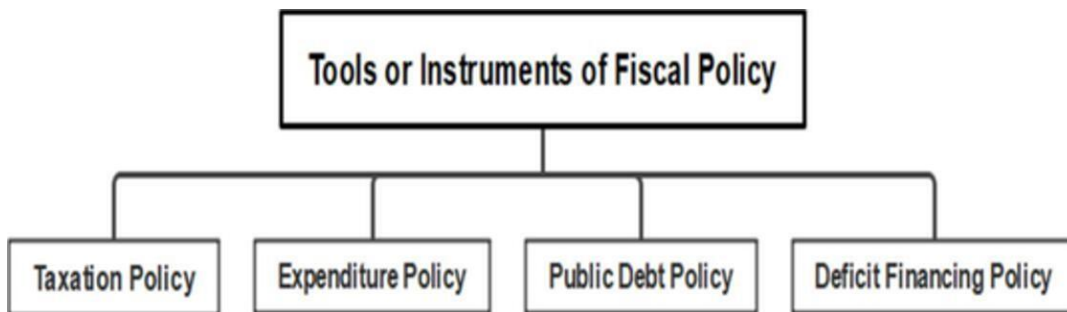
Q3: Differentiate between expansionary and contractionary fiscal policy.

Ans. ....  
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### **8.10 Tools or Instruments of Fiscal Policy**

Here, we will know the main tools/methods which government uses to achieve the various objectives of fiscal policy during different economic situations.

Fiscal Policy is operated and implemented through its main tools explained as under.



#### **A. Taxation Policy**

This tool relates to the revenue side of the fiscal policy. Tax is a compulsory payment made to the government. The aim of taxation policy is to

- (i) mobilize the resources,
- (ii) formation of capital,
- (iii) achievement of economic equality and
- (iv) price stability.

Taxes can be direct taxes like income tax or indirect taxes like sales tax, excise duty, GST etc.

Taxes reduces the disposable income of the household sector (Disposable Income = Personal

Income-Taxes). Direct taxes reduce money incomes and indirect taxes reduces real income via rise in prices (Purchasing Power falls). Therefore, changes in tax rates affect the aggregate demand (AD) in the economy. The extent, to which this change affects AD, depends on tax multiplier.

Tax multiplier is the change in AD or Income caused by a change in taxation levels.

Tax Multiplier =  $\Delta Y / \Delta T$  or change in income divided by change in tax.

$$\text{Tax Multiplier} = \frac{-MPC}{(1-MPC)} \text{ or } \frac{-MPC}{MPS}$$

MPC= marginal propensity to consume

MPS= marginal propensity to save

Tax multiplier shows negative relation between change in income or AD and change in tax. It means a rise in taxes reduces AD or income and a fall in taxes increases AD or income. Government will adopt tax rate policy as per the set objectives. Under expansionary fiscal policy, tax rates generally fall and under contractionary fiscal policy, tax rate rise.

## **B. Expenditure Policy**

Government expenditure policy includes expenditures made by the government on development and non- development activities. The main heads of such expenditure are welfare activities like social security contributions by government, transfer payments like pensions, scholarships, expenditure on social and economic infrastructure like hospitals, roads, bridges, health care, education, defense, public enterprises etc.

A rise in government expenditure leads to increase in AD and a fall in government expenditure leads to decrease in AD. For example: When government spends money, incomes of people rise, their purchasing power rises, AD in the economy rises. It has expansionary effect.

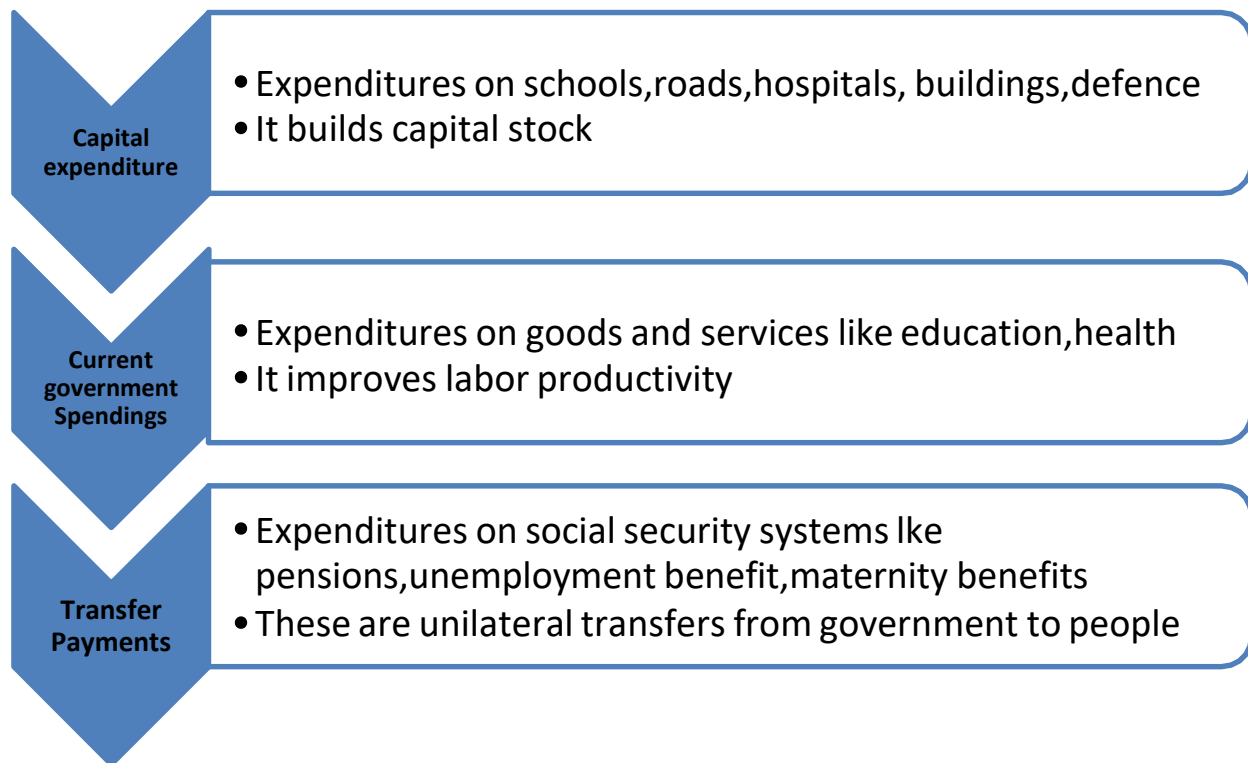
Government can spend in various ways:

- a) Expenditure to buy goods and service which has direct effect on AD.
- b) Expenditure on Transfer payments like pensions, medical facilities which have indirect effect on AD.

Government expenditure is classified into three main parts:

- (i) Capital Expenditure
- (ii) Current government spending and
- (iii) Transfer payments.





The extent to which government expenditure affect AD or income, depends on the Government expenditure multiplier. Government expenditure multiplier measures the ratio of change in income to the change in government expenditure.

Government expenditure multiplier =  $\Delta Y / \Delta G$  or change in income divided by change in government expenditure.

$$\text{Government expenditure multiplier} = \frac{1}{1 - MPC}$$

Where MPC = Marginal Propensity to consume

It shows that there is positive relation between the value of MPC and Government expenditure multiplier. It means a rise in value of MPC will increase the values of Government expenditure multiplier and vice versa. Therefore, a rise in government expenditure will increase income or AD multiplier times and a fall in government expenditure will decrease income or AD multiplier times.

Government will adopt expenditure policy as per the set objectives. Under expansionary fiscal policy, government expenditure rises and under contractionary fiscal policy, government expenditure falls. Government expenditure is directed towards specific groups, practices or goods.

### **C. Public Debt Policy**

Public debt refers to the borrowings taken by the government to meet its expenditures. It can be

- a) Internal debt- borrowings within the country from non-bank financial intermediaries, commercial banks, central bank and from people through bonds and securities. It involves transfer of funds from people to government. These borrowings may reduce the money/incomes available to/with people.
- b) External debt- borrowings from outside the country.

Public debt and AD/income generation in the economy are related. Public debt affects AD/income in many ways.

- a) Expansion of AD and incomes: After public debt, if there are constant expenditures or same AD by private sector along with rise in government expenditures out of amount of public debt, then there will be expansion/rise in AD/incomes in the economy. This will have an expansionary effect in terms of income, output and employment.
- b) Contraction of AD/incomes: After public debt, if there is fall in expenditure or fall in AD by private sector along with rise in government expenditures out of the amount of public debt, then there will be fall in AD/incomes in the economy. This will have a contractionary effect in terms of income, output and employment.

In general, these three tools of fiscal policy are highly significant. However, budget deficits form important part of fiscal policy. Therefore, we can analyze here deficit financing as a tool of fiscal policy.

### **D. Deficit Financing**

Deficit financing is a technique to generate funds to fill the deficit of the budget. This is done by borrowings advanced by central bank by printing new money. Therefore, more deficit financing means more money supply with the government. This tool is used when government expenditures exceed its revenues. When this increased money supply is spent by the government for productive purposes which increase levels of output of goods and services, then it is beneficial for the health of the economy. Otherwise, it may be highly inflationary.

To sum up, government uses combination of various tools per the set objectives for desired results.

### Check Your Progress- II

Q1. What is tax multiplier?

Ans. ....  
.....

Q2. What is Government expenditure multiplier?

Ans. ....  
.....

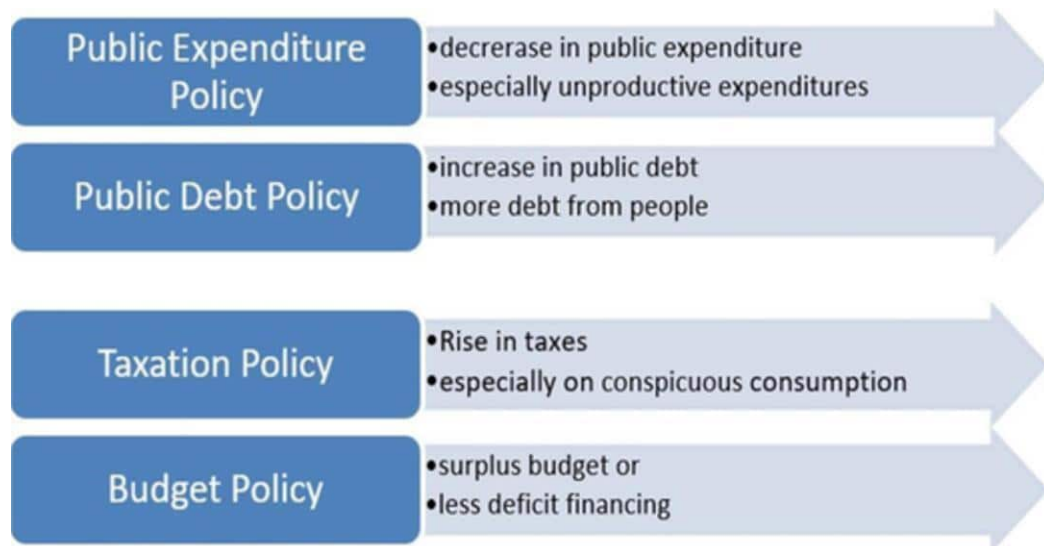
Q3. What is public debt?

Ans. ....  
.....

### 8.11 Application of the Tools of Fiscal Policy to Achieve Objectives

#### **Use of Fiscal Policy for Internal and External Stability:**

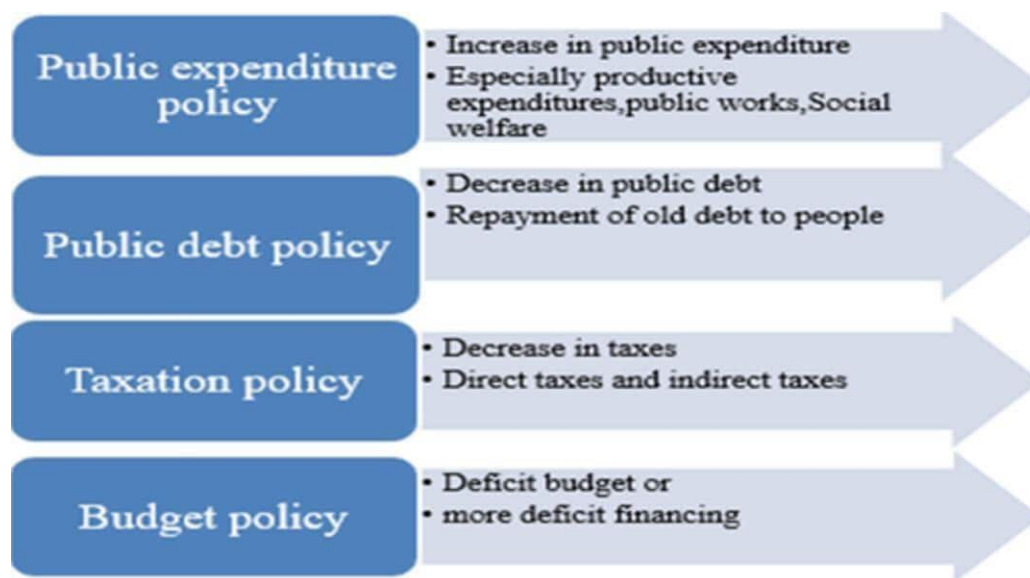
1. **Use of Fiscal Policy During Inflation:** Inflation is the process of continuously rising prices. Price stability is essential to achieve this objective; following tools of fiscal policy can be applied.



- a. **Public expenditure policy:** Government should decrease public expenditure. Higher levels of government expenditures have expansionary money effects in the economy which leads to rise in prices. Therefore, a fall in public expenditure, especially unproductive expenditures will help to control the rising prices.

- b. **Public debt policy:** During inflation, it is essential to reduce the purchasing power of the people or to reduce the available money with the people so as to contract the size of AD in the economy. Therefore, government should borrow more especially from people, so that savings of the people are transferred from people to the government. As a result, total spending by the people or AD will fall.
- c. **Taxation Policy:** During inflation, a rise in rates old taxes and imposing new taxes will help to curtail purchasing power of the people. As a result, the spending by the people or AD will fall. This will help to check the rise in prices.
- d. **Budget Policy/Deficit Financing:** Ideally speaking, a surplus budget policy is needed during inflation. Surplus budget means when revenues of the government exceed its expenditures. It will help to check inflation.

2. **Use of Fiscal Policy During Deflation/Recession:** Deflation is the process of falling prices. To achieve this objective, following tools of fiscal policy can be applied.



Let us analyze each policy one by one.

- a. **Public Expenditure Policy:** Government should increase public expenditure during deflation/recession. Higher levels of government expenditures have expansionary money effects in the economy which will boost the levels of private investment. During times of depression, rise government expenditure acts as *pump priming*. Pump priming means when the increase in government expenditure acts as incentive to private investment.

- i. Government borrows from banks and idle cash with banks gets utilized and investments by government increase.
- ii. Rise in government investments leads to increase in income by multiplier times which in turn boost the private investments.

Therefore, a rise in public expenditure especially on productive activities will help to control the falling prices and profits. Besides this, government can spend more on social welfare activities such as public health, medical services, social security, grants etc. This will raise the levels of AD and investments.

- b. **Public Debt Policy:** During deflation, it is essential to increase the purchasing power of the people or to raise the available money with the people so as to expand the size of AD in the economy. Therefore, government should repay the old debts so that money is transferred from government to people. Government should not borrow from the people. As a result, total spending by the people or AD will increase.
- c. **Taxation Policy:** During deflation, a reduction in rates of old taxes and fewer new taxes will help to increase the purchasing power of the people. As a result, the spending by the people or AD will rise. This will help to check the falling prices.
- d. **Budget Policy/Deficit Financing:** Ideally speaking, a surplus budget policy is needed during inflation. Surplus budget means when revenues of the government exceed its expenditures. It will help to check inflation.

### 3. Exchange Rate Stability

Exchange stability means minimization of the fluctuations in foreign exchange rates. For this, the balance of payments (BOP) situation needs to be monitored. An unfavorable BOP (when import payment exceeds export receipts) leads to more fluctuations in exchange rates. Fiscal policy aims to:

- a. promote exports by provision of certain facilities like subsidies, tax concessions and alike
- b. restrict imports by certain import duties and
- c. encourages import substitution

### Economic Growth and Development

For economic development, fiscal policy acts as powerful tool. With the use of fiscal policy,

1. Level of investment and rate of capital; formation; mobilization of these savings and increasing investment can be raised.
2. Different tools of fiscal policy like taxation, government expenditures, public debts can be used to achieve this objective.
3. Government itself can invest like private entrepreneurs and encourage private investment for the generation of more production, income and employment.
4. The role of fiscal policy for this purpose is to allocate the resources in an efficient and desirable manner. For example, Government can design fiscal policy to divert resources from non-essential/luxurious production to more useful and essential production.
5. At the same time, price stability is maintained.
6. Fiscal policy focuses on the equitable distribution of income simultaneously and diverts money/incomes from richer sections to poorer sections via its expenditure and tax policies.
7. Employment must be generated along with economic development. Fiscal policy is used for enhancing the skills of human resources (human capital formation). It operates to provide work opportunities. For example, government expenditures on construction work generate employment and tax concessions promotes industries/ small enterprises which provide employment to large number of people.

**Remember:** \_Public expenditure in any sector attracts more recourses and investment while taxes imposed in any sector leads to withdrawal of resources and investments from that sector'- Meier and Baldwin.

### **Check Your Progress- III**

Q1. What do you mean by public debt?

Ans. ....  
 -----

Q2. Define deficit financing?

Ans. ....  
 -----

Q3. What is pump priming?

Ans. ....  
 -----

### **8.12 Summary**

Monetary policy involves the influence on the level and composition of aggregate demand by the manipulation of interest rates and availability of credit. The challenge before monetary policy is that many of the objectives are conflicting. For example, acceleration of development process needs more money supply while control of inflation needs less money supply. A judicious mix of various tools and proper timings are essential for the desired results.

Fiscal Policy is the policy related to public revenues, Public Expenditures, Public Debts and also Deficit Financing by the government. It is a policy relating to government tax and non-tax revenues and government expenditures and government borrowings. In other words, fiscal Policy is the policy related to public revenues, public expenditures, public debts and also deficit financing by the government. Fiscal policy aims at price stability, exchange rate stability, economic development, equitable distribution, and employment generation. The tools of fiscal policy i.e., government expenditures, public revenues, public debt are used to achieve all the objectives. Generally, more than one tool is used simultaneously for the effective and desired results of fiscal policy.

Central bank can use various tools simultaneously for achieving various objectives or to control any instability like inflation and deflation/depression and can regulate the quantum and direction of money/credit supply in the economy.

In the end, for achieving various objectives, fiscal and monetary policies are used simultaneously. A judicious blend of these two macro-economic policies will help to get the desired results. The tools of both these policies must operate in tune with each other, i.e., in the same direction.

### **8.13 Questions for Practice**

#### **A. Short Answer Type Questions**

- Q1. What do you mean by fiscal policy?
- Q2. What are the objectives of fiscal policy?
- Q3. Discuss the types of fiscal policy.
- Q4. Explain the government expenditure policy under the tools of fiscal policy.
- Q5. Explain the use of fiscal policy for the economic growth and development.
- Q6. Define monetary policy

Q7.What are the objectives of monetary policy?

Q8.What are the types of monetary policy?

Q9.Explain the quantitative tools of monetary policy

**B. Long Answer Type Questions**

Q1. Define fiscal policy. Also explain its objectives and types.

Q2. Explain the various tools of fiscal policy

Q3. Explain the applications of the tools of fiscal policy

Q4. Discuss the objectives and types of monetary policy

Q5. Explain the quantitative and qualitative tools of monetary policy

Q6. Discuss the applications of the monetary policy for internal and external stability.

**8.14 Suggested Readings**

Blanchard,Oliver.(2016). Macro Economics 7ed.Pearson education Ltd.

Mankiw,Gregory,N. and Taylor,Mark,P.(2016).Macro Economics, W.H. Freeman & Co.

Jones,C.(2016).Macro economics, 5<sup>th</sup> ed. W.W.Norton

Dornbusch,R., Fischer,S., & Startz, R.(2018)Macro economuics,12<sup>th</sup> ed. McGraw-Hill.





**The Motto of Our University  
(SEWA)**

**SKILL ENHANCEMENT**

**EMPLOYABILITY**

**WISDOM**

**ACCESSIBILITY**

**JAGAT GURU NANAK DEV**

**PUNJAB STATE OPEN UNIVERSITY, PATIALA**

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

**MASTER OF ARTS**

**CORE COURSE (CC): ECONOMICS**

**SEMESTER- II**

**MAEC24202T -ECONOMICS OF GROWTH AND INDIAN ECONOMY**

**Head Quarter: C/28, The Lower Mall, Patiala-147001**

**Website: [www.psou.ac.in](http://www.psou.ac.in)**

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**JAGAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY, PATIALA**

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

## **PREFACE**

Jagat Guru Nanak Dev Punjab State Open University, Patiala was established in December 2019 by Act 19 of the Legislature of State of Punjab. It is the first and only Open University of the State, entrusted with the responsibility of making higher education accessible to all, especially to those sections of society who do not have the means, time or opportunity to pursue regular education.

In keeping with the nature of an Open University, this University provides a flexible education system to suit every need. The time given to complete a programme is double the duration of a regular mode programme. Well-designed study material has been prepared in consultation with experts in their respective fields.

The University offers programmes which have been designed to provide relevant, skill-based and employability-enhancing education. The study material provided in this booklet is self-instructional, with self-assessment exercises, and recommendations for further readings. The syllabus has been divided in sections, and provided as units for simplification.

The University has a network of 100 Learner Support Centres/Study Centres, to enable students to make use of reading facilities, and for curriculum-based counselling and practicals. We, at the University, welcome you to be a part of this institution of knowledge.

Prof. G.S  
Batra Dean Academic  
Affair



**JAGAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY,  
PATIALA**  
**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

**M.A(ECONOMICS)**

**SEMESTER - II**

**(MAEC24202T) ECONOMICS OF GROWTH AND DEVELOPMENT AND  
INDIAN ECONOMY**

**MAX. MARKS:100**

**EXTERNAL:70**

**INTERNAL:30**

**PASS:40%**

**CREDITS:6**

**OBJECTIVE:**

This course will enable the students to understand the theories of economic growth and development and then it acquaints the students with the issues of the Indian economy since Independence. It also throws light on how various sectors of the economy have grown and how the policy has created a suitable environment to enhance their potentials.

**INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER:**

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions each from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any 10 questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
5. The duration of each paper will be three hours.

**INSTRUCTIONS FOR THE CANDIDATES:**

Candidates are required to attempt any two questions each from the sections A, and B of the question paper, and any ten short answer questions from Section C. They have to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.

## **Section - A**

**Unit 1: Economic Growth and Development.** Main Features of an Underdeveloped Economy. Determinants of Economic Development.

**Unit 2: Development and Structural Change:** Lewis Theory of Unlimited Supply of Labour; Rostow's Stages of Growth

**Unit 3: Growth Models of Developing Economies:** Theories of balanced and unbalanced growth

**Unit 4: Development Planning:** Project Planning, Investment Criteria. Choice of Techniques.

## **Section - B**

**Unit 5: Demographic features of India:** its problems and demographic dividend; Human development.

**Unit 6: Characteristics of Indian agriculture:** cropping pattern, growth and constraints; Agricultural Policies: Land reforms; Green revolution; recent developments in agricultural policy.

**Unit 7: Indian Industry:** growth and pattern since Independence. Industrial Policy since Independence.

**Unit 8: Service Sector in India:** Growth and Structure; latest policies of the IT and ITES, National policy on Innovations

### **Suggested Readings:**

- G.M. Meier (Ed.): Leading Issues in Development Economics, Oxford University Press, New York, 1964.
- Debraj Ray, Development Economics, Oxford University Press, 2009
- Kaushik Basu, The Oxford Companion to Economics in India, OUP, 2007.
- Michael Todaro: Economic Development, Princeton, 8<sup>th</sup> Edition
- K.S. Gill: Evolution of Indian Economy, NCERT, New Delhi
- Gaurav Datt and Ashwani Mahajan: Datt and Sundharam Indian Economy, S. Chand and Co.
- Charan D. Wadhwa: Some Problems of India's Economic Policy, Tata McGraw Hill, Bombay, 1973, Part Two.
- A.M. Khusro: Readings in Agricultural Development, Allied Publishers, Bombay, 1968.
- P.C. Joshi: Land Reforms in India, Allied Publishers, Bombay, 1976



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**SEMESTER - II**

**MAEC24202T- ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN  
ECONOMY**

**SECTION A**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
UNIT 1	Economic Growth and Development
UNIT 2	Development and Structural Change
UNIT 3	Growth Models of Developing Economies
UNIT 4	Development Planning

**SECTION B**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
UNIT 5	Demographic features of India
UNIT 6	Characteristics of Indian agriculture
UNIT 7	Indian Industry
UNIT 8	Service Sector in India

## **M.A (ECONOMICS)**

### **SEMESTER - II**

#### **ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

---

#### **UNIT 1: ECONOMIC GROWTH AND DEVELOPMENT**

---

##### **STRUCTURE**

##### **1.0 Objectives**

##### **1.1 Meaning of Economic Growth and Development**

##### **1.2 Difference between Economic Growth and Economic Development**

##### **1.3 Features of an Underdeveloped Economy**

##### **1.4 Measures of Economic Development**

##### **1.5 Determinants of Economic Development**

##### **1.6 Difficulties to Measure Economic Development**

##### **1.7 Sum Up**

##### **1.8 Questions for Practice**

##### **1.9 Suggested Readings**

##### **1.0 OBJECTIVES**

After studying the Unit, students will be able to:

- Define the meaning of Economic Growth and Economic Development
- Differences between Economic Growth and Economic Development
- Various factors affecting Economic Growth
- Features of the Underdeveloped countries
- Determinants of Economic Development
- Difficulties in measuring economic growth



## **1.1 Meaning Of Economic Growth and Economic Development**

**Economic Growth:** Economic growth refers to an increase in the production and consumption of goods and services within an economy over a certain period, usually measured in terms of Gross Domestic Product (GDP). It reflects the expansion of the economy's output and is often associated with increased productivity, employment, and standard of living. Economic growth can result from various factors such as increased investment, technological advancements, population growth, and government policies. It is typically seen as a desirable goal for policymakers as it can lead to higher prosperity and well-being for individuals and nations.

**Economic Development:** Economic development is a broader concept than economic growth, which refers to an increase in the size of an economy. Economic development encompasses both the quantitative and qualitative aspects of economic progress, including improvements in the standard of living, access to education, healthcare, and other basic needs, as well as the creation of sustainable and inclusive economic structures that benefit all members of society. Economic development involves creating an environment in which individuals and businesses can thrive, including the development of physical infrastructure, regulatory frameworks, and social institutions. It also involves improving human capital through education, skills training, and other forms of capacity building and promoting innovation and entrepreneurship.

While economic growth is often measured in terms of GDP, economic development is a more holistic concept that takes into account broader measures of well-being such as income distribution, poverty reduction, and environmental sustainability. It is often seen as a long-term process that requires a coordinated effort between governments, businesses, and civil society to achieve sustainable and inclusive economic growth that benefits all members of society.

### **Definition**

As Economists aspired to define the term development, many such definitions emerged. However, no one has identified the human goals of economic development as better as Amartya Sen, perhaps the leading thinker on the meaning of development. Development means ‘freedom’, according to Nobel Laureate Amartya Sen. Development is the process of expanding human freedom. It is —the enhancement of freedoms that allow people to lead lives that they have reason to live. Hence Sen defined —development requires the removal of major sources of unfreedom: poverty as well as

tyranny, poor economic opportunities as well as systemic social deprivation, neglect of public facilities as well as intolerance or overactivity of repressive states<sup>1</sup>.

## 1.2 Difference between Economic Growth and Economic development

Economic growth is a narrow term. It involves an increase in output in quantitative terms but economic development includes changes in qualitative terms such as social attitudes and customs along with quantitative growth of output or national income.

Economic development without growth is almost inconceivable. The comparison between the two concepts is given in the following table:

<b>Elements</b>	<b>Economic Growth</b>	<b>Economic Development</b>
<b>Definition</b>	It refers to the increase in the monetary growth of a nation in a particular period.	Economic development implies changes in income, savings, and investment along with progressive changes in the socioeconomic structure of the country (institutional and technological changes).
<b>Span of Concept</b>	It is a narrower concept than that of economic development.	It is a broader concept than that of economic growth.
<b>Scope</b>	It is a uni-dimensional approach that deals with the economic growth of a nation.	It is a multi-dimensional approach that looks into the income as well as the quality of life of a nation.
<b>Term</b>	Short-term process	Long-term process
<b>Measurement</b>	Economic Growth is measured by quantitative factors such as an increase in real GDP or per capita income	Qualitative measures such as HDI (Human Development Index), gender-related index, Human poverty index (HPI), infant mortality, literacy rate, etc. are used to measure economic development

<b>Effects</b>	Economic growth brings quantitative changes in the economy.	Economic Development leads to qualitative as well as quantitative changes in the economy.
<b>Applicable to</b>	Developed economies	Developing economies
<b>Government Support</b>	It is an automatic process that may or may not require intervention from the government	It requires intervention from the government as all the developmental policies are formed by the government
<b>Kind of changes expected</b>	Quantitative changes	Quantitative as well as qualitative changes
<b>Relevance</b>	Economic growth reflects the growth of national or per capita income.	Economic development reflects progress in the quality of life in a country.

### 1.3 FEATURES OF AN UNDERDEVELOPED ECONOMY

An underdeveloped economy refers to a country or region with a low level of economic development, characterized by low productivity, low per capita income, and low levels of industrialization. The causes of underdevelopment are complex and multidimensional and vary from one country to another. However, some common features of underdeveloped economies include:

- 1. High Rate of Growth of Population:** Population growth in underdeveloped countries neutralizes economic growth. A high population implies greater consumption expenditure and lower investments in productive activities and slows down economic development.
- 2. High Level of Unemployment:** Unemployment levels are very high in underdeveloped countries mainly due to lack of capital and low level of development in various economic sectors, these countries are not able to absorb the rising labor supply.
- 3. Low level of industrialization:** A low level of industrialization is one of the main features of underdeveloped economies. This means that the economy is dominated by the primary sector, which typically has low productivity and low wages. As a result, the majority of the population relies on subsistence agriculture or informal sector jobs, which are often low-paying and unstable. It has a lack of industrialization and also limits the economy's ability to generate jobs

and increase productivity, as the manufacturing sector is relatively small. In addition, underdeveloped economies often rely on the export of primary products, which are subject to price volatility and may not be sustainable in the long run.

4. **Low per Capita Income:** The level of per capita income is very low in underdeveloped countries
5. **Low level of technology:** Technology plays a crucial role in economic growth and development, as it drives productivity gains and innovation. However, underdeveloped economies often have a low level of technology, which limits their ability to compete in the global marketplace. The lack of technology is often due to a lack of investment in research and development, limited access to finance, and inadequate infrastructure. In addition, underdeveloped economies often lack the human capital needed to develop and adopt new technologies, as education and training opportunities are limited.
6. **High level of poverty:** Poverty is a common feature of underdeveloped economies, as most people have low incomes and limited access to basic goods and services. This is due to a combination of factors, including low productivity, limited job opportunities, and inadequate social safety nets. High levels of poverty also have significant social and economic consequences, including poor health outcomes, limited access to education, and reduced social mobility. In addition, poverty can lead to social unrest and political instability, which can further undermine economic growth and development.
7. **Limited infrastructure:** Underdeveloped economies often have limited infrastructure, including poor roads, inadequate transportation systems, and limited access to electricity and clean water. This makes transporting goods, accessing markets, and engaging in economic activity difficult. It limits the ability of underdeveloped economies to attract investment and engage in international trade. This is because investors and trading partners often require reliable infrastructure to transport goods and conduct business.
8. **Low levels of human capital:** Human capital is a critical driver of economic growth and development, as it enables individuals and societies to acquire new skills, knowledge, and capabilities. However, underdeveloped economies often have low levels of human capital, as education and training opportunities are limited. Lack of human capital can limit the ability of underdeveloped economies to adapt to changing economic conditions, innovate, and compete

in the global marketplace. In addition, low levels of human capital can lead to poor health outcomes, limited social mobility, and reduced opportunities for economic advancement.

- 9. Dependence on external aid and loans:** Underdeveloped economies often depend on external aid and loans to finance their development. This is because they lack the resources to invest in their development, such as savings, tax revenues, and private investment. It creates a cycle of debt and dependency, as underdeveloped economies are often required to repay loans with interest, which limits their ability to invest in their development. In addition, external aid and loans can be subject to political and economic conditions, which may not align with the priorities of the underdeveloped economy.
- 10. Limited access to credit:** Underdeveloped economies often have limited access to credit, which limits their ability to invest in their development. This is because they lack the collateral and creditworthiness needed to obtain loans from banks and other financial institutions. It can also limit the ability of underdeveloped economies to engage in international trade, as export-oriented firms often require access to credit to finance production
- 11. Dependence on natural resources:** Underdeveloped countries often rely heavily on natural resources, such as minerals, oil, and agricultural products, for their economic growth and development. While these resources can provide a valuable source of income, they also make the economy vulnerable to price fluctuations and market volatility. Dependence on natural resources can lead to a phenomenon known as the "resource curse," where resource-rich countries experience slower economic growth, higher levels of corruption, and increased inequality. This is because the wealth generated from natural resources often benefits a small elite, while the majority of the population remains impoverished.
- 12. Weak institutions:** Underdeveloped countries often have weak institutions, including the government, judiciary, and civil society. This can lead to a lack of rule of law, corruption, and a lack of accountability. It's difficult to attract investment and foster economic growth, as investors and businesses may be hesitant to operate in a country with unreliable institutions. In addition, weak institutions can also undermine social stability and security, which can further impede economic growth and development.
- 13. Limited access to technology and innovation:** Underdeveloped countries often have limited access to technology and innovation, which can limit their ability to compete in the global marketplace. This is because technology and innovation are critical drivers of productivity and

efficiency, enabling businesses to produce goods and services at a lower cost. Limited access to technology and innovation can also limit the ability of underdeveloped countries to diversify their economies and move up the value chain. This can make them vulnerable to external shocks and fluctuations in global demand.

**14. Poor infrastructure:** Underdeveloped countries often have poor infrastructure, including inadequate transportation systems, limited access to electricity and water, and poor sanitation. This can make it difficult to transport goods, access markets, and engage in economic activity. Poor infrastructure can also limit the ability of underdeveloped countries to attract investment and engage in international trade. This is because investors and trading partners often require reliable infrastructure to transport goods and conduct business.

**15. High levels of inequality:** Underdeveloped countries often have high levels of inequality, with a small elite controlling the majority of the wealth and resources. This can lead to a lack of social mobility, reduced opportunities for economic advancement, and social unrest. High levels of inequality can also destabilize social consistency and stability, which can further impede economic growth and development. In addition, inequality can create a vicious cycle of poverty and exclusion, where the poorest and most vulnerable members of society are unable to access basic goods and services.

### **CHECK YOUR PROGRESS (A)**

Q1: What do you mean by Economic growth?

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q2: Explain the term economic development

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q3: Give any two differences in economic growth and development

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q4: Explain any two features of an underdeveloped economy

Ans: \_\_\_\_\_

---

#### 1.4 Measurement of Economic Development And Growth

Economic development and growth are essential indicators of a country's progress and prosperity. Various measurements and metrics are used to assess and analyze these aspects. Some of the key indicators commonly employed include:

1. **National Income:** GDP is the total value of all goods and services produced within the boundaries of countries over a specific period. It is one of the most widely used indicators to measure a country's economic output and growth. As GDP, GNP measures the total value of goods and services produced within the boundary of countries (including those abroad) over a specific period. GNP is often used in conjunction with GDP to assess a country's economic performance. GNI is the total income earned by a country's residents (both domestically and abroad) over a specific period, which includes GDP along with net income from foreign sources, such as remittances and investments.
2. **Human Development Index (HDI):** The HDI ranges from 0 to 1, with higher values indicating higher levels of human development. A value close to 1 indicates a higher level of development, whereas a value close to 0 indicates lower development.
  - a) **Life expectancy:** Given the importance that people have on living a long and healthy life, life expectancy has been regarded as an essential indication. If people are properly fed, healthy, and educated, they can live for a very long time. The number of years a newborn infant would live if current mortality trends persisted throughout that child's life is known as life expectancy at birth.
  - b) **Education attainment:** The percentage of people, 15 years of age and older, who can understandably read and write is known as the literacy rate. The literacy rate represents the accessibility of education for people. A literate individual can have a fruitful and satisfying life.
    - **Adult Literacy Rate:** indicates the percentage of people above 15 years of age who can read and write.
    - **Mean years of schooling:** The average number of years of education received by people aged 25 years and older.

- **Expected years of schooling:** The number of years of schooling a child entering school at the current age can expect to receive if prevailing patterns of enrolment rates stay the same throughout their life.

It provides a more holistic view of a country's development, combining economic and social indicators.

- c) **Per Capita Income:** Per capita income refers to the average income earned per person in a given region or country during a specified year. It is obtained by dividing the country's national income by its population.

$$\text{Per Capita Income} = \text{National Income} / \text{Population}$$

In general, per capita income is seen as a country's level of development. This is founded on the fundamental tenet that a nation's amount of income determines its rate of development. The standard of living and progress rise with income. National income has several shortcomings, even though it can also be used as a measure of economic development.

3. **PQLI:** PQLI stands for the Physical Quality of Life Index. It is a composite measurement used to assess the overall quality of life and well-being of the population in a particular region or country. The PQLI was introduced as an alternative index to measure human development and living standards beyond traditional economic indicators like Gross Domestic Product (GDP).

The Physical Quality of Life Index was developed by sociologist Morris David Morris in the 1970s. It combines three basic indicators that are crucial for human well-being:

- a. **Life Expectancy at Birth:** This indicator measures the average number of years a newborn is expected to live if current mortality rates remain constant throughout their lifetime. It reflects the overall health and longevity of the population.
- b. **Infant Mortality Rate:** The infant mortality rate represents the number of deaths of infants (under one year of age) per 1,000 live births. It serves as an important measure of the quality of healthcare and the well-being of mothers and children in society.
- c. **Literacy Rate:** The literacy rate indicates the percentage of people above a certain age (usually 15 years and older) who can read and write. It is an essential indicator of educational attainment and human capital development.

The formula for calculating the PQLI is relatively straightforward:



$$\text{PQLI} = (\text{Life Expectancy} + \text{Literacy Rate} + \text{Infant Mortality Rate}) / 3$$

Each component is normalized between 0 and 100, and the PQLI itself is also scaled between 0 and 100. A higher PQLI score indicates a higher overall quality of life and well-being for the population.

4. **Economic Welfare:** Economic welfare is a measure that measures the well-being or standard of living of individuals and households within an economy. It is a broader concept than traditional economic measures like Gross Domestic Product (GDP) or Gross National Income (GNI), as it takes into account not only income and production but also factors that directly impact the quality of life and happiness of the population.
5. **Standard of Living:** Standard of living is an important component in measuring the Human Development Index (HDI). It refers to the level of wealth, comfort, material goods, and necessities available to individuals and households within a specific geographic area, typically a country. It is a broader measure of well-being beyond just income or GDP, as it takes into account various factors that influence the quality of life of a population.
6. **Savings and Investment:** The levels of investment and savings in an economy can indicate the capacity for future economic growth and development. More saving leads to more investment which indicates more economic development.
7. **Economic Welfare:** According to some economists, advancing the general public's economic welfare should be economic development's overarching goal. The improvement in economic welfare is therefore seen as the most effective indicator of economic development in their view. In addition to knowing the size of the national income, understanding how it is produced and spread is essential for estimating economic growth. Understanding the nature of national income is also crucial. It is also necessary to estimate the social cost of the national output. The estimation of each of these components faces numerous practical challenges. As a result, a lot of economists simply use economic welfare as a theoretical yardstick for measuring economic development.
8. **Trade Balance:** The trade balance is the difference between a country's exports and imports. A positive trade balance when exports exceed imports is called a positive trade balance which can contribute to economic growth.

It's important to note that each indicator has its strengths and limitations, and no single measure can provide a complete picture of economic development and growth. Economists and policymakers often use a combination of these indicators to get a more comprehensive understanding of a country's economic performance.

### **1.5 Determinants Of Economic Development**

Economic development refers to the process by which a country or region experiences growth in its economy, leading to an increase in its standard of living and overall well-being. It typically involves improvements in infrastructure, technology, education, and institutions, as well as an expansion in productive capacity, employment opportunities, and income levels.

The determinants of economic development are numerous and complex, and they vary depending on the specific context and country in question. Some of the most important determinants of economic development include:

- 1. Human capital:** This refers to the skills, knowledge, and education of a country's workforce. A highly educated and skilled workforce is better able to innovate, adapt to changing technologies, and engage in productive economic activities. Investments in education and training can help to build human capital and improve a country's productivity, competitiveness, and overall economic growth.
- 2. Technology and innovation:** The adoption and development of new technologies is a critical driver of economic growth and development. Countries that can invest in and utilize advanced technologies are often able to increase productivity and create new industries, leading to higher levels of economic growth. Investments in research and development can help to drive innovation and support the development of new technologies.
- 3. Political stability and institutions:** The quality of a country's institutions, including its legal and regulatory framework, political stability, and governance, can have a significant impact on its economic development. Countries with stable political systems and effective institutions are often better able to attract investment and create an environment conducive to economic growth. Corruption, instability, and weak institutions can all undermine economic development.
- 4. Financial systems:** A well-functioning financial system is essential for economic development, as it allows for the efficient allocation of resources, facilitates investment and

innovation, and provides access to credit and other financial services. Countries with strong financial systems tend to have higher levels of economic growth and development.

- 5. Infrastructure:** Adequate infrastructure, including transportation networks, telecommunications systems, and energy infrastructure, is essential for economic development. Countries with well-developed infrastructure are often better able to facilitate trade and commerce, attract investment, and create employment opportunities. Investments in infrastructure can also improve access to basic services, such as healthcare and education, and help to reduce poverty and inequality.
- 6. Natural resources:** Natural resources can include land, minerals, energy, water, and other resources that are essential for economic development. Countries with abundant natural resources can leverage them to drive economic growth, but it's important to note that simply having natural resources does not guarantee economic development. It's also important to manage these resources sustainably to ensure long-term benefits for the country and its citizens.
- 7. Trade and globalization:** The level of integration with the global economy can also impact a country's economic development. Countries that engage in international trade and are open to foreign investment can often experience higher levels of economic growth and development. However, it's important to note that globalization can also create challenges, such as increased competition and the potential for economic volatility.
- 8. Macroeconomic stability:** Sound macroeconomic policies, including monetary and fiscal policies, can help create an environment of stability and predictability, which can encourage investment and growth. Low inflation, a stable currency, and manageable debt levels can all contribute to macroeconomic stability.
- 9. Social capital:** Social capital refers to the networks, norms, and trust that exist within a society, and it can play an important role in economic development. Strong social capital can support cooperation, collaboration, and collective action, which can help to create a more supportive environment for economic growth.
- 10. Health and nutrition:** Good health and nutrition are essential for economic development, as they can improve productivity, reduce healthcare costs, and increase educational attainment. Investments in healthcare and nutrition can help to improve overall well-being and support economic growth.

- 11. Environmental sustainability:** Environmental sustainability is an important determinant of economic development, as countries seek to balance economic growth with environmental protection. Sustainable development requires managing natural resources in a way that ensures their availability for future generations, while also addressing issues such as climate change and pollution.
- 12. Cultural factors:** Cultural factors, such as attitudes towards entrepreneurship and risk-taking, can also impact economic development. Cultures that value innovation, entrepreneurship, and hard work can help to create an environment that is conducive to economic growth.
- 13. Access to Finance:** Access to credit, savings, and other financial services is critical for individuals and businesses to invest in education, training, and entrepreneurship, which can drive economic growth.
- 14. Quality of Institutions:** The quality of public institutions, such as the legal system, regulatory environment, and public services, can have a significant impact on economic development. Strong institutions can help protect property rights, enforce contracts, and promote social welfare.
- 15. Demographics:** Population growth and demographic factors such as age structure and migration can also influence economic development. For instance, a young population can drive economic growth by creating a large labor force and increasing demand for goods and services.
- 16. Environmental Sustainability:** The impact of economic development on the environment and natural resources is a critical consideration. Sustainable economic growth requires the responsible use of natural resources, the reduction of pollution, and the promotion of green technologies.
- 17. Entrepreneurship and Innovation:** Entrepreneurship and innovation are key drivers of economic growth, creating new products, services, and markets, and driving productivity gains.
- 18. Quality of Education:** A high-quality education system that provides access to knowledge, skills, and training can help develop a skilled workforce that can contribute to economic development.
- 19. Economic Integration:** Integration into regional or global economic systems can help

stimulate economic growth by providing access to larger markets, increasing competition, and promoting specialization.

These factors work in tandem to create an environment that fosters economic growth. Policymakers must carefully balance and prioritize these factors to promote sustainable and inclusive economic development.

## **1.6 Difficulties To Measure Economic Development**

Due to several considerations, including the complexity of economies, the broad range of indicators involved, and the variety of economic activity, measuring economic development can be difficult. The following are some of the main challenges in evaluating economic development:

- (1) Lack of correct index of measurement:** Some of the economist's national income as an ideal index of measurement, while others emphasized the per capita income. However, some economists attach more significance to the level of living with particular emphasis on the consumption of electricity, steel, and food per capita. Thus economists do not have any settled opinion on the index of measurement of economic development.
- (2) Non-economic factors ignored while measuring economic development:** Non-economic factors like social, political, religious, and other factors are ignored, while these factors affect economic growth. However, it is very difficult to exactly account for the significance of these factors in the measurement of economic development.
- (3) Difficulties of International Comparison:** There is no such internationally accepted index of measurement of economic development that facilitates international comparisons. Measuring economic development across countries becomes complicated due to differences in economic structures, cultural contexts, political systems, and levels of institutional development.
- (4) Controversy over National Income and Per Capita Income:** Economists also differ on the point as to whether national income or per capita should be deemed as an appropriate index of growth. Suppose, in countries A and B national income is rising at that same rate. But if country A population rises at a rate twice that of country B, then per capita income in country A would be rising only 1/2 of country B. It is therefore essential that one has the knowledge of both the parameters, viz national income and per capita income.
- (5) Difficulties in the measurement of the standard of living:** It is very difficult to figure out the high and low standard of living, also the standard of living is related to the level of prices. Even when national income and per capita income remain the same, the standard of living

would change following any change in the level of prices. Such a situation, however, may not reflect a true change in the level of development. Hence, standard of living is not so very appropriate index for the measurement of economic development.

- (6) **Regional Differences:** Economic development varies significantly across regions within a country. Therefore, it is difficult to create a one-size-fits-all measurement approach. All the regions are different from each other so they might have different growth rates.
- (7) **Human Development vs. Economic Growth:** Economic development is not only about increasing GDP; it also considers the overall well-being of the population. But focusing on economic growth only may overlook important aspects like education, healthcare, standard of living and quality of life as well.
- (8) **Data Availability and Quality:** In developing countries, obtaining reliable and comprehensive data is an important challenge, especially with limited resources and data collection infrastructure. Some regions may lack the capacity to collect accurate and up-to-date statistics, making it difficult to assess their economic development accurately.

#### **Check Your Progress (B)**

Q1: What do you mean by the Human Development Index (HDI)?

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q2: Explain the term PQLI.

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q3: Give any two Determinants of Economic Development

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q4: Explain any three Difficulties to Measure Economic Development

Ans: \_\_\_\_\_  
\_\_\_\_\_

### **1.7 SUM UP**

Economic development studies the causes and cures of general poverty. Economic development refers to the process by which per capita income and economic welfare of a country increase over

time. It may be noted that the terms Economic Development and Economic Growth are used interchangeably, but economists make a distinction between them. According to them, economic development means growth with change. In this chapter, we shall study the meaning, determinants and obstacles of economic development. Economics development and growth can be measured by national income, per capita income, economic welfare, standard of living, HDI and PQLI.

### **1.8 Questions For Practice**

#### **A. Short Answer Type Questions**

Q1 What is economic growth

Q2 What is economic development

Q3 Give two measures of developmentQ4

Define HDI

Q5 Define PQLI

Q6 Give two measures to examine economic development

#### **B. Long Answer Type Questions**

Q1 What do you mean by economic development? How does it differ from economic growth?Q2

What are the various methods and measures of economic development?

Q3 Give the various features of an Underdeveloped Economy.Q4

What are the determinants of Economic Development?

Q5 Explain the difficulties in measuring economic development.

### **1.9 Further Reading**

- G.M. Meier (Ed.): Leading Issues in Development Economics, Oxford University Press, New York, 1964.
- Debraj Ray, Development Economics, Oxford University Press, 2009
- Gaurav Datt and Ashwani Mahajan: Datt and Sundharam Indian Economy, S. Chand and Co.
- Charan D. Wadhva: Some Problems of India's Economic Policy, Tata McGraw Hill, Bombay, 1973, Part Two.

## **M.A (ECONOMICS)**

### **SEMESTER - II**

#### **ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

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#### **UNIT- 2 DEVELOPMENT AND STRUCTURAL CHANGE**

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##### **Structure**

##### **2.0 Objectives**

##### **2.1 Introduction**

##### **2.2 Lewis Theory of Unlimited Supply Of Labour**

###### **2.2.1 Assumptions**

###### **2.2.2 The Growth Process**

###### **2.2.3 End Of Growth Process**

###### **2.2.4 Criticism of Lewis' Theory Of Unlimited Supply Of Labour**

##### **2.3 Rostow's Theory Of Stages Of Growth**

###### **2.3.1 Stages of Economic Growth**

###### **2.3.2 Criticism Of Rostow's Theory Of Stages Of Growth**

##### **2.4 Questions for Practice**

##### **2.5 Suggested Readings**

##### **2.0 Objectives**

After Reading This Unit, You Will Be Able To:

- Define Structural Changes Approach Of Development
- Critically Evaluate Lewis'S Theory Of Unlimited Supply Of Labour
- Explain Rostow'S Various Stages Of Growth.

##### **2.1 Introduction**

The Term "Structural Change" Refers To Changes In The Composition Of Output And The Use Of Factors Of Production (Labour And Capital) In Economic Activities. The Structure Of Production Changes When The Proportion Of Non-Agriculture Output Rises And As A Result,



Employment Opportunities Are Stimulated In Non-Agricultural Activities. However, This Structural Change Must Occur In A Way That Enhances The Output Of Both The Production Sector As Well As The Agriculture Sectors. Hence, The Structural Approach To Economics Describes Economic Development As *Growth Through Structural Change*. Structure Change Is Evaluated Through Gdp Composition And Industrial Labour Distribution. It Shows Changes In The Demand For Goods And Services, On The One Hand, And Changes In The Demand For Labour In Different Sectors Due To Technological Changes In Production, On The Other Hand. Several Economic Theories Analyze And Explain Growth Through Structural Changes. In This Unit, We Examine Two Major Structural Change Growth Theories For Underdeveloped Economies: (I) Lewis's Theory Of Unlimited Supply Of Labour And (Ii) Rostow'S Stages Of Growth.

## **2.2 Lewis' Theory Of Unlimited Supply Of Labour**

In His Pioneer Work "Economic Development With Unlimited Supplies Of Labour" Prof. W.A. Lewis<sup>1</sup> Propounded A Growth Model Based On Structural Changes. In Underdeveloped Countries, There Is A Shortage Of Capital But The Labour Supply Is Almost Unlimited And By Judiciously Exploiting This Unlimited Supply Of Labour These Countries Can Stimulate Their Growth Process. According To Lewis, If A Country Has To Take Off It Must Invest 15 Per Cent To 20 Per Cent Of Its National Income. But In Underdeveloped Countries, This Range Is 5 Per Cent To 10 Per Cent Of National Income. Thus, The Only Way To Accelerate Capital Formation Is To Utilize Labour, The Other Factor Of Production.

### **2.2.1 Assumptions**

Following Are The Major Assumptions Of Lewis' Theory Of Unlimited Supply Of Labour

- i) There Is A High Density Of Population In Less Developed Countries
- ii) Many People Are Disguised Unemployed With Zero Marginal Productivity.
- iii) The Supply Of Labour Is Perfectly Elastic At The Subsistence Rate Of Wages

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<sup>1</sup> Lewis, W. Arthur (1954). "Economic Development With Unlimited Supplies Of Labour". *The Manchester School*. **22** (2): Pg.139–91.

- iv) There Is The Existence Of Both The Capitalist Sector And The Subsistence Sector. Thus Economy Is Dual.
- v) In The Subsistence Sector, Wage Rates Stagnate At The Subsistence Level.
- vi) Wage Rate Is Higher In The Capital Sector Compared To The Subsistence Sector.

### **2.2.2 The Growth Process**

According To Prof. Lewis, The Unlimited Supply Of Labour Is A Principal Feature Of Less Developed Economies. As There Is A Rapid Increase In Population In These Countries, The Labour Supply Is Over Its Demand. Due To An Excess Supply Of Labour, The Problems Of Unemployment, Underemployment And Disguised Unemployment Are Common In These Countries. Disguised Unemployment Means *More People Are Occupied In Work Than Actually Needed*. The Marginal Productivity Of These Workers Is Zero. It Implies That If These People Withdraw From Work Even Then There Is No Change In Total Output. There Is The Existence Of Two Sectors: The Capitalist Sector And The Subsistence Sector. The Capitalist Sector Has High Productivity, High Wages And A High Level Of Capital Formation. Vice-Versa Is True For The Subsistence Sector. A Large Number Of Labours Are Employed In The Subsistence Or Primary Sector, Where The Wage Rate Is Very Low And Is Almost Stagnant At The Subsistence Level. The Theory Argues That If Some Labour Is Withdrawn From The Subsistence Sector And Is Set To Work In The Capitalist Sector At Their Prevailing Wage Rate, The Marginal Productivity Of These Workers Will Be Higher Than Their Paid-Out Wages. This Will Boost The Capitalist Sector's Profit Which Is Called *Capitalists Surplus*. This Surplus Will Be Reinvested And Will Stimulate The Process Of Capital Formation. There Would Be Continued Growth Until The Labour Pool Shifted From The Subsistence To The Capitalist Sectors, And Workers Are Ready To Work For Wages Less Than Capitalist Average Productivity. It Is Only In These Conditions That A Capital Surplus Can Continue To Be Generated. Prof. Lewis Also Mentions The Significance Of Bank Credit To Stimulate Capital Formation. Initially, Bank Credit Boosts The Production Of Capital Goods, Which In Turn Raises Wage Income. It May Lead To Inflation. But With The Increase In Consumer Goods Production, The Price Settles Down. A Rise In National Income Also Leads To An Increase In Tax Revenue. As A Result, Inflation Facilitates Economic Growth.

### **2.2.3 End of Growth Process**

The Growth Process, According To Prof. Lewis Would Come To An End At A Point When The Primary Sector Workers Are Willing To Work Only At Capitalist Wage Rates. It May Be Due To The Following Reasons:

- a) As The Growth Process Accelerates, Demand For Labour Increases Continuously In The Capitalist Sector. As Demand Rises Above Surplus Labour, Wages Rise As Well.
- b) With Technological Progress, the Marginal Productivity Of Labour In The Subsistence Sector Rises. Workers Demand More Wages.
- c) With The Persistent Shifting Of Labour From The Subsistence Sector To The Capitalist Sector, The Supply Of Labour In This Sector Will Be Less Than The Demand. This Will Also Result In Higher Wages In The Subsistence Sector. As A Result, The Capitalist Sector Needs To Raise Wages In Order To Attract More Labour.
- d) Also, Trade Unions Pressured The Capitalist Sector To Raise Wages.

Thus, In Underdeveloped Countries, The Capitalist Surplus Generated By The Unlimited Supply Of Labour Shrinks And Eventually Disappears. The Rate Of Capital Formation Is Reduced And The Growth Process Of The Economy Is Halted. Prof Lewis Suggested At This Point That The Entrepreneur In An Open Economy Should Try To Migration Of Workers From Other Low-Income Areas Or Countries. These Migrant Workers Will Be Ready To Work At A Lower Wage Rate As The Situation Is Worse In Their Native Areas. A Second Option Is To Export Capital To Other Countries. This Will Reduce Domestic Production, Which In Turn Decreases Labour Demand. As A Result, Wages Are Lowered In The Home Country.

### **2.2.4 Criticism Of Lewis' Theory Of Unlimited Supply Of Labour**

Lewis' Theory Is Criticized By Many Economists On The Following Basis:

1. Lewis' Theory Of Unlimited Supply Of Labour Is Based On The Assumption That There Is An Unlimited Supply Of Labour In The Country And This Labour Is Movable. But In Reality, There Are Certain Underdeveloped Countries In Africa And Latin America Region Where Labour Supply Is Limited. Also, The Underdeveloped Country Has Some Social And Religious Constraints Which Restricted The Free Movement Of Labour From The Subsistence Sector To The Capitalist Sector.

2. Shifting Labour From The Primary Sector To The Industrial Sector Has Some Technical And Practical Constraints As Well. Out Of An Unlimited Supply Of Subsistence Sector Employees, Few Are Skilled And Able To Work In The Capitalist Sector. Others Need Training. This May Require A Lot Of Time And Money. It Is Therefore Impossible To Achieve Growth By Simply Shifting Labour From One Sector To Another.
3. Also, There Is A Lack Of Skilled Entrepreneurs In Underdeveloped Countries. This Prevents Fuller Exploitation Of An Unlimited Supply Of Labour
4. Kuznet Criticizes Lewis' Theory For Its Capitalist Surplus Concept. According To Kuznet, The Theory Encourages An Unequal Distribution Of Wealth. But It Is Not Always Essential That Owners Of Capitalist Surplus Invest It, Rather They Spend It On Conspicuous Consumption. Thus In Underdeveloped Countries, Inequalities Might Not Always Result In Desired Growth.
5. Prof. Olivers Believes That Inflation In Underdeveloped Countries May Not Be Self-Liquidating. It Has Been Shown Empirically That Once Inflation Has Been Triggered, It Is Beyond The Control Of The Government.
6. Lewis In His Theory Neglects The Concept Of Aggregate Demand. Products Of The Capitalist Sector Are Consumed By Different Sectors Including The Subsistence Sector. But As The Income Of The Primary Sector Is Low, Their Propensity To Consume Is Also Low. This Affects The Aggregate Demand In The Country Which Ultimately Leads To A Slow Rate Of Capital Formation.

In Short, Lewis' Theory Of Unlimited Supply Of Labour Has Many Shortcomings But Offers A Clear Understanding Of The Growth Process. Growth Variables, Such As Population Growth, Capital Formation, Inflation, And International Mobility, Are Clearly Viewed In Theory.

### **2.3 Rostow's Theory of Stages of Growth**

Economic Development Is Multidimensional. The Process Of Growth Is Accelerated By Various Economic, Social And Institutional Factors. Economic And Non-Economic Factors Together Cause Structural Changes In An Economy. Development Economists Of The 50s And 60s Viewed Economic Development As A Process Involving Structural Changes In An Economy. American Economist W.

W. Rostow<sup>2</sup> In His First-Of-Its-Kind Work Analysed These Factors And Drew A Series Of Successive

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<sup>2</sup> W.W. Rostow (1953). *The Process Of Economic Growth*. London: Cambridge University Press.

Stages Of Economic Growth That All Countries Must Pass Through. Rostow Discusses The Following Six *Propensities* Of The Peoples Of A Country On Which The Development Of That Country Depends:

- i) Propensity To Develop Fundamental Science
- ii) Propensity To Apply This Science To Economic Ends
- iii) Propensity To Accept Innovations
- iv) Propensity To Search For Material Advances
- v) Propensity To Consume
- vi) Propensity To Have Children.

These Social, Institutional And Financial Propensities Are Governed By The Attitudes, Aspirations And Motivations Of People. These Attitudes, Aspirations And Motivations Originate From A Country's Social, Political And Economic Environment. Therefore, Economic Development Is Dependent On Both Economic And Non-Economic Factors.

### **2.3.1 Stages Of Economic Growth**

Rostow Classifies The Process Of Growth Into Five Successive Stages

- 1) The Traditional Society
- 2) Pre-Conditions Of Take-Off
- 3) Take-Off
- 4) Drive To Maturity
- 5) The Stage Of High Mass Consumption

#### **1) The Traditional Society**

This Is The Initial Stage, Every Economy To Begin With. In Traditional Society, Agriculture Is The Primary Occupation Which Is Traditional In Nature. People Mostly Live In Villages And Are Dependent On Agriculture. Family And Caste Systems Prevail In Society. Social Status Is Determined By Caste And Family Reputation In Society. Economic Decisions Are Always Hindered By Backward Traditions. Political Power Is Captured By A Few Powerful Groups Like Zamindar, Administrators, Religious Leaders Etc. Science And Technological Progress Are Almost Zero At This Stage. Therefore Rostow Called It The *Pre-Newtonian* Stage Of The Economy. There Prevails The Law Of Diminishing Returns In Agriculture. Also, Malthus's Law Of Population Is Applicable. Thus, Per Capita Output Is Very Low. A Huge Part Of The Income Generated Is Spent On Religious Places, Monuments, War And Non- Economic Activities. Therefore, At This Stage, The Economy Remains Traditional And Backward.

## **2) Pre-Conditions Of Take-Off**

This Is The Second Stage Of Growth. It Is During This Stage That Societies In Transition Are Preparing For Take-Off. According To Rostow, The Duration Of This Stage Is Nearly 100 Years. Now, People Start Thinking Beyond Local Issues And Take An Interest In National And International Affairs. Agriculture Is Still The Main Occupation But Dependence On It Has Been Declining Now. Other Sectors Like Industry, Trade, Transport, And Services Start Developing. Economic Activities Are Diversified. Education Expands And Technical Progress Commences. At This Stage, People Are Less Interested To Enlarge Their Families And The Birth Rate Decline. Importance Is Given To Individuality Rather Than Family And Caste. People Gain Confidence And There Is Proper Utilization Of Human Resources. A Part Of National Income Is Spent On Social Overhead Capital. At This Stage, The Rate Of Capital Formation Enhances. Funds Are Mobilized By The Financial Sector. Capital Goods And Final Products Are Imported And Raw Materials And Minerals Are Exported. According To Rostow, Western Europe Went Through This Stage From The End Of The 17th Century To The Beginning Of The 18th Century.

## **3) Take-Off**

This Is A Crucial Stage Of Economic Growth. At This Point, The Economy Is Self-Sustaining And No Longer Dependent On Other Countries. As Technology Advances, Innovations Occur, The Rate Of Investment Increases, The Industry Grows, And Surpluses Are Generated. The Take-Off Stage Has The Following Key Specifications:

- a) At This Stage, The National Product Growth Rate Is Higher Than The Population Growth Rate. Therefore, The Per Capita Income Is Stabilized At A High Level. To Reach This Stage, It Is A Pre- Requisite That Investment Rates Should Be More Than 10 Per Cent Of Gnp. For This, There Is Required An Adequate Supply Of Loanable Funds That May Come From Internal Sources Or Through The Import Of Capital.
- b) The Take-Off Stage Has Witnessed The Growth Of Leading Sectors. Rostow Divides The Economy Into Three Major Sectors: Primary Growth Sector, Supplementary Growth Sector And Derived Sector. The Primary Sector Is The Major Sector Of Every Economy. Each Country Has Its Own Primary Sector. Technological Progress And Advancement Lead To Higher Growth In This Sector. Growth Initiated In The Primary Sector Causes Growth In Other Sectors. These Sectors Are Called Supplementary Growth Sectors. For Example, The Growth Of The Railway As A Primary Sector Leads To The Growth Of The Iron, Coal And Steel Industries As Supplementary Growth Sectors. The Derived Growth Sector Derives Its Growth Potential From Other Economic Components Like National Income, Population, Industry Etc. For Example, A Rise In Income Leads To An Increase In Demand For Luxury Goods. This Results In The Growth Of The Luxury Goods Industry. The Growth Of These Three Sectors Depends On Effective Demand And An Increase In Real Income.
- c) Another Condition At This Stage Is A Change In The Social And Political Framework In Favour Of Modernization. This Will Generate Domestic Capital For New Investment. Government Policies Support Technological Research And Training. New Entrepreneurs Are Encouraged And Investment Is Promoted.

#### **4) Drive to Maturity**

Through The Take-Off Stage, Investments And Technical Progress Lead To Self-Sustainability. The Point Where The Economy Reaches Self-Sufficiency Is Called The Drive To Maturity Stage. At This Stage, Investment And Population Increase Proportionally. The Economy Is Boosted By Exports And Earns A Distinguished Place Internationally. Structural Changes Occurred. Dependence On Agriculture Declined Rapidly. As The Economy Developed, It Became Urban And Modern. People Enjoy Financial And Social Security. Production And Entrepreneur's Role Change. Large Cooperatives Emerge Run By A New Class Of Professional Managers. Per Capita Income And Standard Of Living Both Rise To High Levels. In Rostow's View, An Economy Takes 40 To 60 Years To Reach This Stage. The Uk, Japan, And France Are Examples Of This Stage.

## **5) The Stage of High Mass Consumption**

This Is the Last Stage Of Rostow'S Theory Of Economic Growth. This Stage Is Marked By High Production, High Profit, And Therefore High Per Capita Income. Consumption Of Luxury Reached Its Highest Level. The Country's Motive Has Changed From Maximum Production To Maximum Welfare. In Order To Achieve Equality Of Distribution, The Government Is Implementing Progressive Taxes As Well As Various Social Security And Leisure Measures. Life Becomes Easy And Comfortable In Such Countries. At This Stage, The Amount Of Money Spent On Military Operations Increases. As A Result, The Country Became A World Power. Other Countries Accept Its Political Influence. The USA And China Are Examples Of This Stage.

## **6) Criticism of Rostow's Theory of Stages of Growth**

Rostow Explains His Growth Theory With Historical Evidence But It Is Not Free From Criticism. Rostow'S Theory Of Growth Has Been Criticized On The Following Basis:

1. There Is No Logic Behind Rostow's Claim That All Economies Must Pass Through Five Stages. The USA, Canada And Australia Are Just A Few Examples Without A Traditional Society. They Derived Their Development Preconditions From Great Britain, An Advanced Nation. A Revolution In Agriculture Is Also Not Necessary Before Takeoff. New Zealand And Denmark, For Example, Developed Agriculture During Takeoff.
2. Rostow's Stage Analysis Doesn't Accurately Predict The Direction In Which Economic Growth Will Take. The Theory Is Focused On The Historical Growth Path And Does Not Narrate Various Determinants Of Growth. In Addition, Rostow Fails To Address What Would Happen After A High Level Of Mass Consumption.
3. The Stages Of Rostow'S Theory Seem To Overlap Each Other. It Is Difficult To Determine When One Stage Ends And Another Begins. The Features Of One Stage Are Also Mixed With The Features Of Successive Stages. This Is A Serious Limitation.
4. Rostow'S Take-Off Stage Is Also Controversial. During Take-Off, Investment Is Boosted By Socioeconomic Factors That Change With Time And Place. Rostow Ignores The Aspect Of Time And Place In His Theory. The Concept Of Take-Off Is Derived From Aeronautics. When A Plane Takes Off, It Gets Its Force From Internal Mechanisms. In The Same Way, When A Country Takes Off, Its Economic Force Comes From Within. However,



Underdeveloped Countries Cannot Develop These Forces Internally Due To A Lack Of Resources. Thus, They Need Foreign Assistance Which Is Not Mentioned By Rostow.

5. Rostow'S Theory Is Also Criticised For Its Misleading Drive To Maturity Stage. An Economy Becomes Mature When It Becomes Self-Sufficient During The Take-Off Stage. Consequently, It Is Nothing More Than A Step In The Takeoff Process. Thus, There Is No Need For A Separate Stage.
6. Rostow'S Stages Of Growth Are Not Based On Any Good Theory Of Development Economics. The Theory Reads More Like A Declaration From A Historian Than An Analytical Formulation From An Economist.

In Short, Rostow'S Theory Of Growth Has Many Limitations But It Is Still Considered A Notable Blueprint Of The World Economy's Development History. The Linear Pattern Of His Stages Of Growth Can Still Be Used To Explain The Development Path Of Many Post-Colonial Countries. Also, Rostow Was The First Economist To Incorporate Non-Economic Factors Into His Theory Of Economic Growth. He Should Be Appreciated For This.

## **2.4 Questions for Practice**

### **A. Short Answer Type Questions**

- Q1.What Do You Mean By Concept Of Structural Changes?
- Q2.What Are The Characteristics Of The Stage Of \_Drive To Maturity\_?
- Q3.Define Capitalist Surplus.
- Q4.List The Six Propensities Of People As Given By Rostow.
- Q5.What Do You Mean By Disguised Unemployment?

### **B. Long Answer Type Questions**

- Q1.Critically Evaluate Lewis'S Theory Of Unlimited Supply Of Labour.
- Q2.Discuss The Various Stages Of Economic Growth As Propounded By Rostow.
- Q3.Critically Evaluate The Rostow'S Theory Of Stages Of Growth.

## **2.5 Suggested Readings**

- Richard Peet And Elaine Hartwick (2015), Theories Of Development – Contentions,Arguments, Alternatives. The Guilford Press, New York

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- Lewis W.A. (2003) The Principles Of Economic Planning, Routledge, London.
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## **M.A (ECONOMICS)**

### **SEMESTER - II**

#### **ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

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#### **UNIT- III GROWTH MODELS OF DEVELOPING ECONOMIES**

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##### **Structure**

##### **3.0 Objectives**

##### **3.1 Introduction**

##### **3.2 Theory Of Balance Growth**

###### **3.2.1 Meaning**

###### **3.2.2 Rosenstein Rodan's Theory Of Balance Growth**

###### **3.2.3 Nurkse's Theory Of Balance Growth**

###### **3.2.4 Critical Evaluation Of Theory Of Balance Growth**

##### **3.3 Theory Of Unbalanced Growth**

###### **3.3.1 Meaning**

###### **3.3.2 Critical Evaluation Of Theory Of Unbalance Growth**

###### **3.3.3 Path Of Development**

###### **3.3.4 Explanation Of The Theory Of Unbalanced Growth**

##### **3.4 Questions For Practice**

##### **3.5 Suggested Readings**

##### **3.0 Objectives**

After Reading This Unit, You Will Be Able To:

- Define Balanced And Unbalanced Growth
- Describe Rosenstein Rodan's Theory Of Balanced Growth;
- Explain Rangar Nurkse's Theory Of Balanced Growth.

- Discuss Hirschman's Strategy Of Unbalanced Growth

### **3.1 Introduction**

Economic Development Is Of Utmost Significance To All Economies. Developing Countries Need Large Scale Investment To Get Rid From All His Problems Like: Poverty, Unemployment, Low Living Standard Etc. Investment Is Essential But What Should Be The Strategy Of Investment In Developing Countries? To Answer This Question Development Economist Divided Into Two Groups. Economists Like Rodon, Nurkse And Lewis Etc. Support Instantaneous Investment In All Sectors For The Rapid Development In These Low-Income Economies. However, Some Other Economists Such As Hirschman, Singer, Fleming, Etc., Believe That These Economies Should Create Imbalances By Investing In A Single Sector. As Such, Economic Development Strategy Can Be Analysed According To Two Theories: The Theory Of Balanced Growth And The Theory Of Unbalanced Growth.

### **3.2 Theory Of Balance Growth**

#### **3.2.1 Meaning**

The Idea Of Balanced Growth Was First Propounded By Fredrick List. His Analysis Of Balance Growth Is A Strategy Of Development In Agriculture, Industry And Trade Simultaneously. In 1928, Arthur Young Used The Concept To Show The Interdependence Between Different Industries. Rosenstein Rodan Wrote About This Concept In His 1943 Article Titled "Problems Of Industrialization Of Eastern And South Eastern Europe." After This The Concept Was Examined By Various Economists Like Prof. Nurkse, Prof. Lewis, Stovasky Etc. Balance Growth Means A Simultaneous Investment All Sectors Of Economy For The Rapid Development. It Implies A Balance Between Agriculture And Industry; Domestic Production And Exports; And Vertical And Horizontal External Economies. Balanced Growth Is Based Strictly On Economic Planning.

**According To Lewis,** *“Balanced Growth Means That All Sectors Of Economy Should Grow Simultaneously So As To Keep A Proper Balance Between Industry And Agriculture And Between Production For Home Consumption And Production For Exports. The Truth Is That All Sectors Should Be Expanded Simultaneously”*

#### **3.2.2 Rosenstein Rodan's Theory Of Balance Growth**

Rosenstein Rodan Emphasizes That Large-Scale Investment Is Essential To Make An

Underdeveloped Economy Self-Reliant. This Approach Is Also Known As Rodan's *Theory Of Big Push*. According To

Rodan, *"Balanced Growth Means Investment In Mutually Supporting Industries, Which Would Create The Market For Each Other's Products"*<sup>3</sup> It Will Increase The Market's Size Because Different Industries Will Demand Each Other's Products. Thus, According To This Theory, In Order To Exploit External Economies Of Supply And Demand, A Large-Scale Investment In Numerous Fields Is Essential. To Support His Views Rosenstein Gives An Example Of A Shoe Factory. If There Is Investment In A Shoe-Making Factory, Then All Those Who Work In Factory Will Get Income. But They Cannot Spend All Their Income On Shoes Only. They Need Several Other Goods Which Can Be Produce By Other Factories. Thus, One-Way Development Will Not Succeed. Economies Grow When Multiple Industries Produce Different Products Simultaneously. According To Rodan, External Economies Are Enjoyed By Indivisibilities And There Are Three Types Of Indivisibilities Related To Balance Growth.

- a) **Indivisibility In Production Function:** It Is Also Called Indivisibility Of Supply Of Social Overhead Costs. Social Overhead Capital Means All Type Of Facilities Like Transport And Communication, Irrigation Facilities, Power Supply, Sewerage Etc. Building Social Overhead Costs Is Essential Condition For Industrialization. A Huge Investment Is Needed For This. For Example, If Electricity Is To Be Supplied In The Country, It Will Require A Huge Investment In Thermal Plants, Power Generating Machines, Electricity Wires And Pole Factories, Skilled Engineers And Other Human Resources Simultaneously. Social Overhead Capital Industry Is Indivisible Due To Many Reasons. As A Result, A Developing Country Has To Invest Approximately 30 To 40 Per Cent Of Its Total Investment In Building This Infrastructure. These Indivisibilities Lead To External Economies In Other Industries. With Industrialization, The Demand For Social Overhead Capital Increases And Costs Decreases.
- b) **Indivisibility Of Demand:** Indivisibility Of Demand Means Investment Decisions In Different Industries Are Interrelated To Each Other. Rodan Explain This With The Help Of Example Of Shoe- Making Factory, Discussed Earlier. If There Is Only Shoe-Making Factory In Market, The Labor Of This Factory Cannot Spend Their All Income. Also, The Demand For Shoes Will Be Less Than Its Supply. An Entrepreneur Will Not Take Risk To Set Up Shoe Factory. But If 10 Different Factories Are Set-Up Simultaneously, Then There Will Be More Employment Opportunities And 10 Types Of

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<sup>3</sup> Rosenstein-Rodan, P.N. (1943). "Problems Of Industrialization Of Eastern And South Eastern Europe". *Economic Journal*, 53, Article Id: 202211. <https://doi.org/10.2307/2226317>

Products In Market. Now, Labor Demand Each Other's Products And Demand Will Be Equal To Supply. Hence, Large-Scale Investment In Different Projects Will Prove More Useful.

- c) **Indivisibility Of Supply Of Savings:** Large-Scale Investment Requires Large-Scale Savings Which Ultimately Entails Large Incomes. Raising Income Levels Requires Huge Investment In The Initial Stage. This Will Increase The Marginal Rate Of Savings In The Next Stage. Saving Is More Income Elastic.

Thus, Due To The Above Three Indivisibilities, Large-Scale Simultaneous Investment Is Needed In Developing Economies.

### 3.2.3 Nurkse's Theory Of Balance Growth

Prof. Ragnar Nurkse<sup>4</sup> Has A Clear Vision On Balance Growth Approach. According To Him, In Underdeveloped Countries, The Biggest Obstacle Is The Vicious Circle Of Poverty. Income Is Low In These Countries, So Savings Are Small. Small Savings Mean Less Investment. As A Result, The Output Is Minimal. Low Output Leads To Low Income. With A Small Income, Goods Are In Low Demand. Thus, The Market Size Will Be Small And There Is No Inducement To Invest. To Develop These Underdeveloped Countries, It Is, Therefore, Necessary To Break The Vicious Cycle Of Poverty. In Order To Do So, A Balance Between Supply And Demand Must Be Maintained. According To Nurkse, It Is Possible To Achieve Economic Growth Through Balance Growth In The Following Ways:

- a) **Complementarity Of Demand:** Nurkse Supports Rodan's View That To Expand Demand It Is Necessary To Invest In More Than One Industry. To Put It Another Way, Several Factories Should Be Built Simultaneously To Produce Different Kinds Of Goods. The Demand For Products Would Rise As Workers From Different Industries Bought Each Other's Products. This Will Increase Production On One Side And Market Size On The Other Side. Employment Opportunities Will Increase. Rise In Income Leads To Market Demand. There Is Expansion In Capital Formation And The Vicious Circle Of Poverty Will Be Wrecked.

<sup>4</sup> Nurkse, Ragnar (1961). *Problems Of Capital Formation In Underdeveloped Countries*. New York: Oxford University Press.

- b) **Contribution Of Government:** It Is Nurkse's Belief That The Progressive Industrialists And Entrepreneurs Can Be Easily Motivated To Invest. Thus, Government Has A Limited Role To Play In Economic Progress Of A Country.
- c) **External Economies:** External Economies Refer To Benefits To Other Industries With The Establishment Of Another Industry. It Leads To An Increase In Demand And Widens The Market. It Is Also Assumed That External Economies Increase Production Returns. As A Result, Production Costs Fall And The Economy Grows.

In Short, According To Nurkse, The Vicious Circle Of Poverty Can Be Broken By Balanced Growth.

### 3.2.4 Critical Evaluation Of Theory Of Balance Growth

The Theory Of Balance Growth Is Widely Criticized By Some Economists Like Hirschman, Fleming, Singer, Kurihara Etc. On Following Basis:

- i. Prof. Hirschman Believes That The Concept Of Balanced Growth Is Unrealistic As It Suggests Simultaneous Investment In Several Sectors. For This, A Country Needs Capital And Labor In Huge Amount. But Underdeveloped Countries Already Have Scarcity Of Capital. Hence, The Suggestion Sounds Good But Not Practical.
- ii. According To Prof. Nurkse's Government Has A Limited Role To Play In Economic Progress Of A Country. This Is Not True. For Simultaneous Huge Investment In Several Sectors, There Needs Central Planning Which Is Not Possible Without Government Intervention. The Task Of Investment In Priority Sectors Cannot Be Left In The Hands Of Private Sector. The Overall Growth Is Possible Only Under Planned Economy.
- iii. According To Theory Of Balance Growth, Expansion Of Existing Industry Or Establishment Of A New Industry Increase Demand In Market, Widens The Market Size And Leads To External Economies. But According To Fleming, By Expansion Or Establishment Of An Industry Causes Increase In Demand Of Inputs Which Increase The Costs Of Production. It Leads To Rise In Price Of Goods And Demand Falls. The Industry Might Then Have To Deal With External Diseconomies Instead Of External Economies.
- iv. According To Hirschman, Theory Of Balance Growth Is Not A Theory Of Development.

The Views In This Theory Just Support A *Dual Economy* In An Underdeveloped Country. Backwards Underdeveloped Countries Are Forced To Adopt The Modern Industrial Sector, Which Doesn't Lead To Their Economic Development.

- v. The Economic History Of World Does Not Support The Theory Of Balance Growth. The Empirical Evidence Of Developed Countries Like America, England, Japan Etc. Reveals That They Invest In One Or Two Sectors And Grow. For Example, England Invests, First Of All, In The Textile Industry Whereas Japan Grows Up With The Help Of The Iron And Steel Industry. Thus, It Can Be Said That Their Economic Development Is Due To Unbalanced Growth.
- vi. This Theory Is Against The Concept Of Comparative Costs. The Theory Of Comparative Costs States That A Country Should Produce And Export Only Those Goods In Which It Has Comparative Advantage. The Rest Will Be Imported From Other Countries That Have A Comparative Advantage In Producing Those Goods. Hence, In Every Country, Some Industries Will Expand More While Others Will Not. By Going With The Comparative Advantage Concept, Balanced Growth Is Impossible.

In Short, Policymakers Should Invest In Only Those Projects In Which Available Resources May Expand Demand And Market Size. So That The Balance Between Demand And Supply Is Maintained And Economic Progress Occurs.

### **3.3 Theory Of Unbalanced Growth**

#### **3.3.1 Meaning**

Contrary To The Balanced Growth Approach, Unbalanced Growth Emphasizes Investments In Some Strategic Sectors Rather Than In All Sectors At Once. The Other Sectors Will Automatically Develop Through The 'Linkage Effect'. The Idea Of Unbalanced Growth Is Propounded By Hirschman, Fleming And Singer As Against The Doctrine Of Balanced Growth. According To Hirschman, —*If The Economy Is To Be Kept Moving Ahead, The Task Of Development Policy Is To Maintain Tensions, Disproportions And Disequilibria*<sup>5</sup>.

#### **3.3.5 Explanation Of The Theory Of Unbalanced Growth**

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<sup>5</sup> Hirschman, Albert O. (1958). *The Strategy Of Economic Development*. New Haven, Conn.: Yale University Press. Isbn 0-300-00559-8



Hirschman Believes That Planned Disequilibrium In The Economy Is The Most Effective Way To Achieve Economic Growth Particularly In Underdeveloped Countries. Underdeveloped Countries Have A Chronic Scarcity Of Resources (Especially Capital) And It Is Very Essential To Fully Exploit The Available Resources. For This, Resources Must Be Focused On Strategic Sectors. The Growth Of These Sectors Will Automatically Develop Other Sectors By ‘Linkage Effect’. Hirschman Does Not Deny The Need For A Big Push In Underdeveloped Countries But He Emphasizes That Investment Capacity Is A Major Bottleneck. Investment Ability Depends Mainly On The Amount Of Initial Investment Already Been Made. Investment Or Big Push In Priority Sectors Will Open New Ways Of Development Of Other Sectors Due To Two Types Of Linkages:

- a) **Forward Linkages:** It Refers To Growth Of Certain Industries Owing To The Initial Growth Of Raw Material Suppliers. A Growing Iron Industry, For Example, Would Promote Industries That Use Iron To Make Machines And Tools.
- b) **Backward Linkages:** Growth Of A Specific Type Of Industries Would Develop The Raw Material Suppliers Of That Product. For Example, Setting Up A Textile Industry Would Increase The Income Of Cotton Producers.

Hirschman Argues That Industries Generating Maximum Linkages Should Be Developed First. Therefore, It Is Crucial To Study The Inter-Linkages Of Economic Activities. It Is Believed That The Intermediate Industries Like Steel, Iron, Coal, Etc. Can Generate Maximum Linkages. Hirschman Suggests A Big Push In Such Industries. Growth Of A Set Of Industries Would Stimulate Growth Of Other Sectors Due To Following Reasons:

- I. **External Economies:** According To The Doctrine Of Unbalanced Growth, Disproportional Investment In The Strategic Sector Generates Externalities Through Backward And Forward Linkages. Industry A May Stimulate Industries B And C To Grow. Further Growth Of Industries B And C Will Link Itself To That Industries E, F, And G, Etc. Every Time One Already Grows Industry Stimulates A New Set Of Industries, And A Fresh Array Of Externalities Is Generated.
- II. **Complementaries:** There Are Some Technical Complementaries Also Which Helps To Grow. Production Of Output In Industry A Would Generate The Demand For The Products Of Industries B And C As Inputs. Similarly, Output Of Industry A Would Use As Input In Industry D And E. These Inter-Linkages May Reduce The Marginal Cost Of Production In

These Industries. And Investment Travel From One Industry To Other.

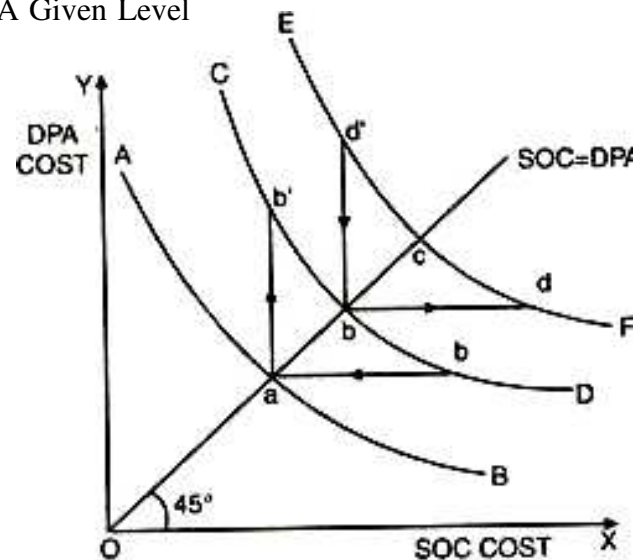
**According** To Hirschman, There Are Two Types Of Investment In Every Economy: Social Overhead Capital (Soc) And Direct Productive Activities (Dpa). Soc Means Expenditure On Infrastructure. This Is A Basic Investment Without Which No Economic Activity Can Work. This Type Of Investment Is Not Induced By Profit And Is Usually Undertaken By Government Agencies. Dpa, On The Other Hand, Is A Direct Investment In Production. This Is An Induced Investment. The Scarcity Of Resources Prevents Simultaneous Investment In Soc And Dpa In Underdeveloped Countries. Thus, It Is Suggested To Unbalance The Economy Through Investment In Soc Or Dpa. Investment In One Will Stimulate The Other As Well. For Example, Cheap Electricity Encourages Small And Medium-Scale Industry Units. Similarly, Roads And Communication Systems Develop Mechanically In Industrial Areas.

### 3.3.6 Path Of Development

**Figure 3.1** Reveals The Path Of Development By Using The Strategy Of Unbalanced Growth. In Diagram Costs Of New Investment In Soc Is Shown On Ox-Axis And Costs Of Investment N Dpa Is Revealed On Oy-Axis. Ab, Cd And Ef Are Equi-Product Curves, Indicating Various Combinations Of Soc And Dpa Corresponding To A Given Level

Of National Income. The 45-Degree Line is Balance Growth Path That Express The Idea Of Balance Investment In Both Dpa And Soc. Hirschman Assumed That Underdeveloped Countries Cannot Invest In Both Simultaneously. If Development Is Placed By Expanding Soc First, The Economy Will Follow Abbd Path Of Development. Increase In Investment In Soc From A To B Will Stimulate Larger Investment In Dpa Up To Point B' Because Infrastructure Become Cheaper And Easily

Available. This Will Bring Economy On Higher Equi-Product Curve. Persistence New Investment



**Figure 3.1**

In Dpa Brings The Economy Up To Point C. Points A, B And C On 45-Degree Line Is Points Of Equilibrium. On The Other Hand, If Initial Investment Is Done In Dpa, The Economy Will Follow The Path Of B'Abc'. It Will Also In Equilibrium At Point C. Figure Reveals That Unbalance Investment In Either Soc Or Dpa Will Leads To Overall Development Of Economy. Hence, Creation Of UnbalanceIs A Pre-Requisite Of Economic Growth.

### **3.3.7 Critical Evaluation Of Theory Of Unbalance Growth**

Paul Streeten And Other Criticized The Doctrine On Following Basis:

- i) Theory Of Unbalanced Growth Is Criticized Due To Its Undue Emphasis To Development Through Industrialization Only. It Ignores Agriculture And Territory Sector. Industry Has A Long GestationPeriod Which May Cause Inflation In Country.
- ii) Theory Pays No Attention To Possible Difficulties In Establishment Of Strategic Industries. In The Preliminary Development Era, It Is Not Possible To Set-Up New Industries. There Involve Several Social, Institutional And Economic Constraints. The Theory Does Not Account For These Obstacles.
- iii) This Theory Suggests That Limited Resources Need To Be Invested In Strategically Important Sectors In Order To Unbalance The Economy. However, It Doesn't Specify What Level Of ImbalanceIs Optimal.
- iv) It Describes An Inducement Mechanism That Can Only Be Implemented Only With Internal Mobilization Of Resources. However, Factors Are Less Mobile In Underdeveloped Countries. Moving Resources And Factors Between Sectors Is Extremely Difficult.
- v) Hirschman'S Linkage Effect Is Not Supported By Any Empirical Data. Such Types Of Linkages Require Mutual Dependence Of Industries Which Is Difficult To Attain In Initial Stage Of Development.

To Sum Up, Hirschman's Unbalanced Growth Theory Realistically Considers All Aspects Of Development Planning. The Theory Suggests That Countries With Limited Resources Can Accelerate Their Economic Development Using Resource Allocation To The Most Strategic Sectors And Industries.However, The Theory Has Certain Limitations, But It Has Been Accepted As A Novel Development Strategy.

### **3.4 Questions For Practice**

### **A. Short Answer Type Questions**

Q1.Differentiate Balance Growth And Unbalance Growth

Q2.Briefly Describe Nurkse'S Vicious Circle Of Poverty.

Q3.Write A Short Note On Rodan'S Concept Of Indivisibilities.

Q4.What Do You Mean By External Economies?

Q5.Briefly Describe Hirschman'S Forward And Backward Linkages.

### **B. Long Answer Type Questions**

Q1.Critically Evaluate Theory Of Balance Growth.

Q2.Explain Unbalanced Growth Theory of Development In Detail. Also Write Its Criticism.

### **3.5 Suggested Readings**

- Higgins, B (1959), Economic Development Principles, Problems And Policies, Norton.
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**M.A (ECONOMICS)**

**SEMESTER - II**

**ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

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**UNIT IV- GROWTH MODELS OF DEVELOPED ECONOMY**

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**Structure**

**4.0 Objectives**

**4.1 What Is Developed Economy?**

**4.2 Meaning of Model**

**4.3 Harrod- Domar's Model Of Growth**

**4.3.1 Introduction**

**4.3.2 Assumptions**

**4.3.3 Harrod Model**

**4.3.3.1 Explanation**

**4.3.3.2 The Growth Process**

**4.3.3.3 State Of Equilibrium**

**4.3.4 Domar's Model**

**4.3.4.1 Some Standard Notions**

**4.3.4.2 Explanation**

**4.3.4.3 The Growth Process**

**4.3.5 Criticism**

**4.3.6 Conclusion**

**4.4 Solow's Model Of Steady State Growth**

**4.4.1 Introduction**

**4.4.2 Assumptions**

**4.4.3 Explanation**

**4.4.4 Limitations**

**4.4.5 Conclusion**

## **4.5 Endogenous Growth Theory**

### **4.5.1 Introduction**

### **4.5.2 Assumptions**

### **4.5.3 Romer's Theory Of Growth**

### **4.5.4 Lucas' Model Of Growth**

### **4.5.5 Critical Evaluation**

### **4.5.6 Conclusion**

## **4.6 Kuznets' Characteristics Of High-Income Countries**

## **4.7 Questions for Practice**

## **4.8 Suggested Readings**

## **4.0 Objectives**

The Study Of This Unit Will Help You To:

- Explain The Meaning Of Developed Economy
- Define The Model
- Describe The Emergence Of Growth Models Of Developed Economy;
- List The Assumptions Of Exogenous And Endogenous Growth Models;
- Discuss And Evaluate The Working Of These Growth Models;
- Identify The Limitations Of These Models; And
- Be Familiar With Kuznets' Characteristics Of High-Income Countries

## **4.1 What Is Developed Economy?**

Typically, A Developed Economy Is One Where Economic Growth And Living Conditions Are Moderately High. Several Factors Are Used To Evaluate A Country's Level Of Development. They Include Income Per Capita, Gross Domestic Product Per Capita, Industrialization, Living Standards, And Technological Infrastructure Etc.

## 4.2 Meaning of Model

Models In Economics Explain A Problem Based On Certain Assumptions. Assuming Certain Assumptions, The Economic Model Illustrates How Various Elements Of Economic Growth Such As Investment, Capital-Output Ratios, Technical Progress, Etc. Interact With Each Other To Achieve The Specific Goal Of Growth And Development. According To Prof. Koutsoyiannis<sup>6</sup>, –A Model Is A Simplified Representation Of A Real Situation. It Includes The Main Features Of The Real Situation Which It Represents. Economic Models Of Growth Have Been Around As Long As Economic Development Itself. Since The Nation's Formation, Economic Growth And Development Have Been Of Concern To Political Thinkers. To Analyse And Explain The Growth Process, Various Theories And Models Are Proposed. In This Chapter, We Examine Growth Models For Developed Economies.

## 4.3 Harrod- Domar's Model Of Growth

### 4.3.1 Introduction

R. F. Harrod and E. D. Domar Developed Dynamic Growth Models Appropriate For Changing Economic Conditions. Both Models Are So Similar In The Sense That Sometimes It Is Said That Domar's Model Is The American Version Of Harrod's Model. Both These Models Emphasize The Conditions For Steady Growth. For A Steady Growth Process, The Harrod-Domar Model Stress On The Growth Of Capital Accumulation Or Investment. Capital Accumulation Has Dual Characteristics. It Generates Income On The One Hand And Increases Productivity On The Other Hand. Income Generation By Changing Investment Rates Is Known As The *'Multiplier'* Effect. The Effect On Production Is Known As The *'Productivity'* Effect. Multiplier Is A Keynesian Tool And Productivity Is A Classical Tool. Thus, In Short, We Can Say That The Harrod-Domar Model Is Partially Keynesian And Partially Classical.

### 4.3.2 Assumptions

The Main Assumptions Of Harrod-Domar Model Are As Follow:

- a) An Initial Full-Employment Level Of Income Has Already Been Achieved. There Is Laissez Faire Economy. The Economic Activities Are Free From Any Government Interference.

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<sup>6</sup> Anna Koutsoyiannis, *Modern Microeconomics*, 2011, Pg.3

- b) The Economy Is Closed One.
- c) There Are No Time Lags, I.E., The Economic Variables Such As Saving, Investment; Income And Expenditure Adjust Themselves In The Same Period Of Time.
- d) The Average Propensity To Save And Marginal Propensity To Save Are Equal To Each Other. In Other Words, The Absolute Change In Savings Is Equal To Relative Change In Savings.
- e) The Law Of Constant Returns Prevails In Economy. In Other Words, Capital-Output Ratio Is Assumed To Be Constant.
- f) There Are Not Any Depreciation Charges. It Means Investment; Income And Savings Are Measured In Net Sense Only.
- g) There Is No Shortage Of Any Resource Including Capital.
- h) As A Proportion Of Aggregate Income, Ex-Ante Aggregate Saving Is Constant.
- i) Technical Progress Has A Neutral Effect.

### **4.3.3 Harrod Model**

#### **4.3.3.1 Explanation**

Sir Roy F. Harrod Illustrated The Conditions For Achieving And Maintaining The Dynamic Equilibrium In His Seminal Paper On ‘An Essay In Dynamic Theory’ Which Later On Published In His Book Called

‘*Towards Dynamic Equilibrium*’ (1939). Harrod Model Deals With Developed Countries Which Have Already Achieved Full Employment. According To Harrod, There Are Three Types Of Growth Rate Namely:

- a) Actual Growth Rate
- b) Warranted Growth Rate
- c) Natural Growth Rate

Let’S Explain These Three Growth Rates Separately.

- a) **Actual Growth Rate:** It Is The Growth Rate Which Is Determined By The Actual Amount Of Saving And Investment In The Country. In Other Words, Actual Growth



Rate (Donated By G) Is Defined As Ratio Of Change In Income To The Total Income I.E.

$$G = \frac{\Delta Y}{Y}$$

As Per Harrod, Actual Growth Rate Is Determined Two Factors, Saving-Income Ratio And Capital-Output Ratio. Second Factor Assumes Constant. Thus,

$$Gc = S \quad \dots\dots\dots(1)$$

Where,

G= Actual Growth Rate

C= Capital- Output Ratio ( $\Delta k/\Delta y$  Or

$I/\Delta y$ ) S = Saving-Income Ratio Or Aps

(S/Y)

Substituting The Values Of G, C And S In Equation (1), We Have

$$Gc = S$$

$$\frac{\Delta y}{Y} \times \frac{I}{\Delta y} = \frac{S}{Y}$$

$$\frac{I}{Y} = \frac{S}{Y}$$

$$I = S$$

Hence, It Is Proved That To Achieve Steady Growth Rate, Ex-Post Savings Should Be Equal Ex-Post Investment.

b) **Warranted Growth Rate:** It Is Defined As The Growth Rate Of An Economy That Is Working At Full Capacity By Optimally Utilizing Its Machines And Manpower To The Fullest Possible Extent. It Is Also Known As *'Full-Capacity Growth Rate'* Or *'Potential Growth Rate'* And Is Denoted By  $G_w$ . Warranted Growth Rate Is Determined By Two Factors: Capital-Output Ratio And Saving-Income Ratio. This Relationship Can Be Expressed In Following Equation:

$$G_w C_r = S$$

Where,

$G_w$  = Warranted Growth Rate

$C_r$  = Required Capital-Output

Ratio  $S$  = Saving-Income Ratio Or

$A_p$

According To Harrod, The Economy Can Achieve The Steady Growth If  $G = G_w$  And  $C = C_r$ .

Hence, Two Conditions Are Required For Dynamic Equilibrium.

- (i) Firstly, Actual Growth Rate Must Be Equal To Warranted Growth Rate. It Implies That Growth Rate Of Income Has To Be Equal To Growth Rate Of Output.
  - (ii) Secondly, Capital-Output Ratio Needed To Get  $G$  Ought To Be Equal To Required Capital-Output Ratio Of  $G_w$ . It Implies That Ex-Post Investment Must Be Equal To Ex-Ante Investment To Attain The Goal Of Steady Growth.
- c) **Natural Growth Rate:** It Is The Maximum Possible Growth Rate Of An Economy With Its Available Natural Resources And Is Denoted By  $G_n$ . Natural Growth Rate Is Measured With The Help Of Macro Variables Like Population, Technological Progress, Natural Resources And Capital Equipments. These Macro Variables Have A Limit To Expand The Production Called ‘Full Employment Ceiling’. Only Voluntary Unemployment Prevails In This Situation. According To Harrod, Natural Growth Rate Is Expressed As:

$$G_n C_r = O_r \neq S$$

Where,

$G_n$  = Natural Growth Rate

$C_r$  = Required Capital-Output

Ratio  $S$  = Saving-Income Ratio Or

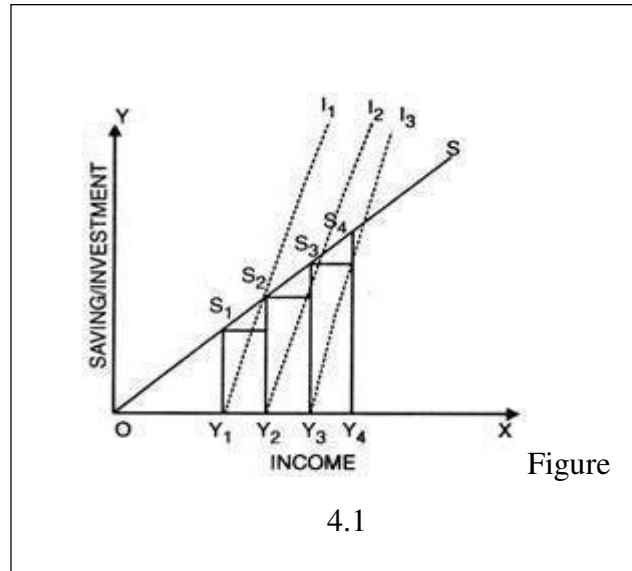
$A_p$

#### 4.3.3.2 The Growth Process

Figure 4.1 Demonstrates The Growth Process Of Harrod’s Model. On X-Axis, Income Is Shown

Whereas On Y-Axis Saving And Investment Is Represented. Os Is Saving Line Which Indicates Different Levels Of Savings At Different Levels On Income. Os Has 45° Slope Which Shows The Equality Between Aps And Mps. The Slopes Of Y1I1, Y2I2 And Y3I3 Represent Capital-Output Ratio Which Remain Constant At Each Income Level Y1, Y2, Y3. In The Beginning,

Income Is Oy1 And Out Of This Income Saving Is S1y1. This Saving Is Invested Which Raise the Income Level To Y1y2. At Oy2 Level Of Income, Saving Is S2y2. This Would Arouse Investment And Income Is Multiplied And Reaches To Oy3 Level. Here Saving Is S3y3. This Growth Process Repeats Itself Continuously.



#### 4.3.3.3 State Of Equilibrium

According To Harrod, Economy Will Be In Equilibrium Only When All The Three Growth Rates Are Equal. I.E.

$$G = G_w = G_n$$

This Equality Is Rarely Found Due To Various Economic And Non-Economic Factors Which Affect Both G And  $G_w$ . A Minor Change In Economic Or Political Conditions Of A Country Would Disturb The Equilibrium. Therefore, This Equilibrium Is Called '*Knife-Edge Equilibrium*' And It Is Inbuilt In Harrod Model. According To Harrod'S Model, Instability Occurs In Economy:

- a) **When  $G > G_w$** , C Will Be Lesser Than  $C_r$ , Demand For Output Is Higher Than Supply Of Output Which Leads To Inflation In Economy.
- b) **When  $G < G_w$** , C Will Be Higher Than  $C_r$ , Supply Of Output Is Higher Than Demand For Output Which Leads To Deflation In Economy.
- c) **When  $G_w > G_n$** , Growth Rate Of Capital Formation Is Greater Than Growth Rate Of Labor Supply Which Adversely Affect The Investment And Causes Depression. (Situation Of World-Wide Depression Of 1930s)

d) **When  $G_w < G_n$**  , Actual Rate Of Growth Increase Which Induce Investment. There Will Be Demand Inflation With Growing Unemployment.

The Stable Growth Is Not Possible In Both Inflation And Depression. Thus, Equality Between Actual And Warranted Rate Of Growth Is Essential Condition For Steady Growth.

#### **4.3.4 Domar's Model**

Prof. Evesy D. Domar In His Book '*Essay In The Theory Of Economic Growth*' (1947) Re-Discovered The Harrod's Model Of Growth. According To Domar, Net Investment Has Dual Characteristics; Firstly It Expands Production Capacity And Secondly It Generates Income. The Fundamental Condition For A Dynamic Equilibrium Is That Productive Capacity Of An Economy Must Be Equal To Its National Income.

##### **4.3.4.1 Some Standard Notions**

To Understand Domar's Model, Let's Examine Some Standard Notions Used Further In The

Study:  $Y_d$  = Level Of National Income Or Level Of Effective Demand At Full Employment

$Y_s$  = Level Of Productive Capacity Or Supply At Full Employment

Level  $K$  = Real Capital

$I$  = Net Investment Which Makes A Change In Real

Stock  $\Delta k$  = Change In Real Stock

$A$  = Marginal Propensity To Save (Also,  $Mps = 1/$

Multiplier)  $\Sigma$  = Productivity Of Capital

##### **4.3.4.2 Explanation**

a) **Demand Side:** Domar Uses Keynesian Multiplier To Explain Demand Side Of Growth Process. The Demand Is A Function Of Income And Income Is Function Of Investment. Change In Investment Implies Multiple Changes In Income. Also, There Is Inverse Relationship Between Effective Demand And Marginal Propensity To Save (Mps). Higher The Mps Lower The Effective Demand And Vice- Versa. The Effective Demand In Domar's Model Can Be Explained With The Equation Originally Given By K. Kurihara<sup>7</sup>:

$$Y_d = \frac{1}{A} \cdot I$$

**b) Supply Side:** Supply Side Of Domar'S Model Is Depends On Two Factors: Productive Capacity ( $\Sigma$ ) And Amount Of Real Capital ( $I$ ). Any Change In These Two Factors Has A Positive Effect On Supply Of Output. Thus, Supply Is Also A Function Of Investment.

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<sup>7</sup> K.K. Kurihara, *The Keynesian Theory Of Economic Development*, 1959, P.67.

$$Y_s = \Sigma \cdot K$$

For Equilibrium,

Demand Side = Supply Side

$$Y_d = Y_s$$

$$\frac{1}{A} \cdot I = \Sigma \cdot K$$

$$I = A \cdot \Sigma \cdot K$$

It Implies That Steady Growth Is Possible When Investment Is Equal To The Product Of Saving- Income Ratio, Capital Productivity And Capital Stock. Now, Let'S Assume, There Is Changes In Demand And Supply Side Of Investment. Then The Two Equations Have Been Changed As Per Following:

$$\Delta y_d = \frac{1}{A} \cdot \Delta i$$

$$\Delta y_s = \Sigma . \Delta k$$

Now, Change In Real Capital Is Equal To Net Investment. Therefore,

$$\Delta y_s = \Sigma . I$$

**The Condition For Steady Growth Or Dynamic Equilibrium Is;**

$$\Delta y_d = \Delta y_s$$

$$\frac{1}{A} . \Delta i = \Sigma . I$$

$$\frac{\Delta i}{I} = A . \Sigma .$$

It Implies That For Dynamic Equilibrium The Growth Rate Of Net Investment Must Be Equal To Product Of Marginal Propensity

#### 4.3.4.3 The Growth Process

The Growth Process Of Domar'S Model Can Be Explained With The Help Of Figure 2. In Figure 4.2, Income Is Shown On X-Axis Whereas On Y-Axis Saving And Investment Is Represented. Os Is Saving Line. The Slope Of Os Indicates The Equality Between Aps And Mps. The Slopes Of Yopo And Y1p1 Represent Capital- Output Ratio Which Remain Constant At Each Income Level Yo, Y1, Y2. At The Full Employment Level, Income Is Oyo And Soyo Is The Level Of Investment. Investment Is Autonomous To Income; Thus It Is Straight Line. Lo Represents The Effect Of Investment On Productive

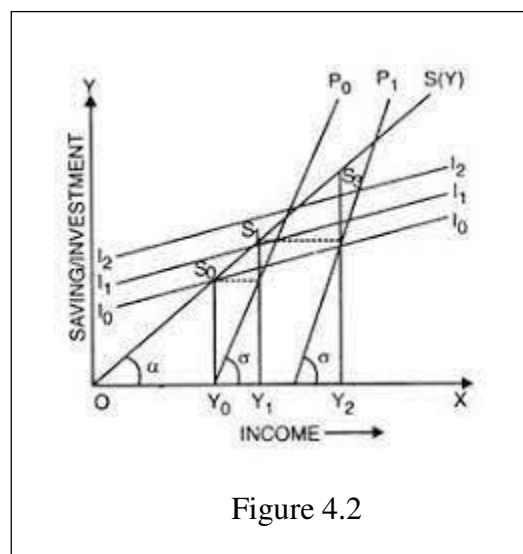


Figure 4.2

Capacity. Its Slope Represents Marginal Capital-Output Ratio. After Initial Investment, Income Raise To The Amount Yoy1. At This Level Investment Is L1. If Investment Increase To S1y1, Income Again Raise By Amount Y1y2. According To Domar, If Increase In Investment Is Uninterrupted, Steady State Growth At Full Employment Level Can Be Achieved.

#### 4.3.5 Criticism

The Harrod-Domar Model Explains The Conditions Of Steady State Growth For Fully Employed Developed Economies. The Model Analyzes The Determinants And Policy Implications Of Economic Development. However, The Model Is Not Without Criticism. Following Are Some Major Criticisms Of The Harrod-Domar Model:

- a) Harrod Assumes That Labor And Capital Are Combined In Fixed Proportion, With No Substitution. But In Long Run, There Is Possibility Of Substitution Of Factors Of Production Due To Changes In Various Technological And Organizational Elements. Harrod's Model Is Therefore Criticized For This Reason.
- b) Another Assumption Of Harrod-Domar Model Of Constant Propensity To Save Is Also Unrealistic. Constant Propensity To Save Means Peoples Have Tendency To Save And Consume In A Fixed Proportion Of Their Income. In Other Words, There Is No Change In Taste, Habits And Living Standard Of Peoples. This Is Not True In Long Run.
- c) It Is Also Not True That Capital-Output Ratio Remains Constant. In Reality, It Is Different In Different Industries. In Long Run, Technical Changes Imply Changes In Capital-Output Ratio.
- d) Harrod-Domar Model Ignores The Significance Of Monetary Factors. Model Assumes That Price Level Remains Constant Which Is Far Away From Realism. In Reality, Monetary Factors Play A Critical Role In Steady Growth
- e) Harrod's Concept Of Natural Growth Rate Is Not Practical. According To Harrod, Natural Rate Is The Maximum Possible Growth Rate That An Economy Can Achieve. Prof. L.B. Yeager<sup>8</sup> Raised Questions On This Concept. He Is Of The Opinion That Output And Growth Rate Can Be Changed With The Help Of Technical Progress Even If Labor And Capital Remain Constant. Harrod's Assumption That There Is Upper Limit Of Total Production Due To Fix Quantity Of Labor And Capital Does Not Hold Good.
- f) Harrod-Domar Model Ignores The Role Of Government In Economic Growth. The Model Pays No Heed To The Fiscal Policy As Tool Of Economic Growth. However, In Modern World, No Economy Could Work Smoothly Without Planning And Government Interference.
- g) Harrod And Domar Assume A Closed Economy Which Is Far Away From Reality In Modern Era.
- h) Harrod-Domar Growth Model Is Restricted In Scope. As This Model Is Applicable Only

In The Presence Of Constant Saving-Income Ratio And Constant Capital-Output Ratio. Thus, The Model Is Not Useful For An Economy That Has An Unbalanced Or Discontinuous Growth Process.

#### **4.3.6 Conclusion**

The Harrod-Domar Growth Model Was Designed Originally For Industrial Economies. However, The Growth Process Of A Developed Economy Can Be Appropriately Framed By This Approach. This Model Successfully Analyses The Interaction Between Income, Investment, And Savings. Investment Is Necessary To Increase Productivity Capacity. It Is Therefore Recommended To Keep Investment Levels As High As Possible In Every Country.

### **4.4 Solow's Model of Steady State Growth**

#### **4.4.1 Introduction**

Modern Economists Like Solow, Meade And Swan Recognized The Problems Caused By Harrod- Domar's Rigid Production Function And To Overcome It They Introduced New Models Of Growth Based <sup>8</sup> Leland B. Yeager, 'Some Questions About Growth Economics', *American Economic Review*, March 1954

On The Neo-Classical Economics That Assumes The Perfect Substitution Between Labor And Capital. In This Section We Will Discuss The Solow'S Model Of Steady State Growth. The Nobel Prize Winner Robert Solow In His Classic Work *-A Contribution To The Theory Of Economic Growth* (1956) Emphasis That By Assuming Flexibility And Substitutability Of Capital And Labor, An Economy Can Maintain Steady State Growth. The Solow Model Was Originally Propounded To Analyze Industrial Economics. Even So, It Is The Cornerstone Of Most Economic Growth Theories In Developed And Developing Countries And Has An Enormous Influence In Development Economics.

#### **4.4.2 Assumptions**

Solow'S Neo Classical Model Is Based On Following Main Assumptions:

- a) There Are Two Factors Of Production: Capital And Labor.
- b) There Is Unitary Elasticity Of Substitution Between The Factors Of Production.
- c) Production Is Under Constant Returns To Scale But Factors Of Production (Viz: Capital And



Labor)Has Diminishing Returns Individually.

d) There Is Full Employment In Economy

e) There Is Perfect Competition In Economy

f) Prices Are Flexible.

#### 4.4.3 Explanation

Solow Expresses All Major Factors In Per Worker Terms E.G., Output Per Worker And Capital Per Worker. Output Is Function Of Capital And Labor. Thus, Production Function Equation Is:

$$Y = F(K, L)$$

Where, Y= Output; K= Capital And L= Labor Supply

Dividing Both Sides Of Production Function Equation By

L

$$Y/L = F(K/L, 1)$$

The Equation Indicates That Output Per Worker (Y/L) Is Function Of Capital Per Worker (K/L). This Equation Can Be Written As:

$$Y = F(K) \quad \dots\dots (1)$$

Where, Y= Y/L And K= K/L

This Is Called First Equation Of Solow'S Model. According To The Above Equation, Capital Per Worker Is Essential Condition Of Steady State Growth. The Model Assumes Diminishing Returns To Capital. It Means That With A Fixed Supply Of Labor, Output Increases At A Diminishing Rate As More And More Capital Is Employed. The Change In Capital Stock Is Determined By Net Investment (Total Level Of Investment Minus Deprecation Of Capital) And Real Income Savings. Level Of Investment, Aggregate Savings And Deprecation All Combined In An Equation Is Expressed As:

$$\Delta k = S y - D \times K$$

Dividing Both Sides Of Equation By K

$$\Delta k/K = S \times Y/K - D \quad \dots\dots (2)$$

Let'S Focus On Growth Rate Of Capital Per Worker (K) Which Is Equal To Growth Rate Of

K Minus Growth Rate Of L. I.E.

$$\Delta k/K = \Delta k/K - \Delta l/L$$

By Rearranging:

$$\Delta k/K = \Delta k/K + \Delta l/L$$

It Has Been Assumed That Labor Force Grows At Rate Of N. Thus,  $\Delta l/L = N$  And Equation Is:

$$\Delta k/K = \Delta k/K + N \quad \dots (3)$$

Substituting Values Of Equation (3) In Equation (2):

$$\Delta k/K + N = S \times Y/K - D$$

By Subtracting N From Both Sides:

$$\Delta k/K + N - N = S \times Y/K - D - N$$

Or 
$$\Delta k/K = S \times Y/K - D$$

– N Multiplying Both Sides By K:

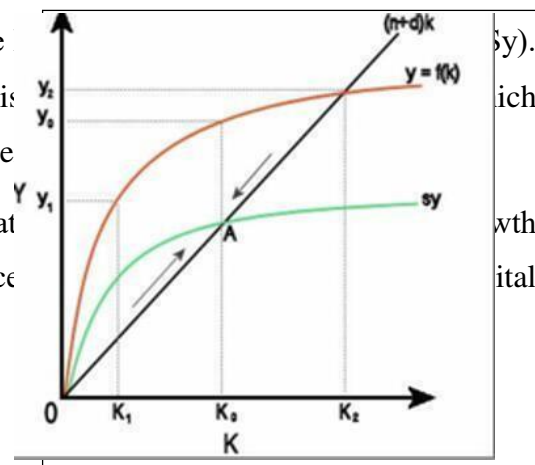
$$\Delta k = S \times Y/K \times K - (D +$$

$$N) K \Delta k = S y - (D + N) K$$

$$\dots (4)$$

Equation (4) Is Called Second Equation Of Solow'S Model. In This Equation:  $\Delta k$  = Change In Capital Per Worker; S = Saving-Income Ratio (S/Y); Y = Output Per Worker; N = Growth Rate Of Labor Force Or Population ( $\Delta l/L$ ); D = Depreciation Of Capital And K = Capital Per Worker (K/L). According To Second Equation Of Solow'S Model, Capital Per Worker (K) Is Determinants Of Three Elements Which Are Followings:

- (i) Change In Capital Per Worker ( $\Delta k$ ) Has Positive Increase In Saving Per Worker Leads To Rise Ultimately Enlarges The Capital Stock Per Worker
- (ii) Change In Capital Per Worker ( $\Delta k$ ) Has Negative ( $Nk$ ). The Increase In Labor Force In The Absence Of Capital Stocks Or Capital Per Worker.



- (iii) Also, The Equation Says That Depreciation Causes The Amount Of Capital Per Worker To Fall Annually By  $-Dk$ .

Hence, According To Solow, Savings And Investment Enhance To Capital Per Worker, While Labor Force Growth And Depreciation Reduce It. The Process Of Increasing The Stock Of Capital Per Worker In Economy Is Called *Capital Deepening*. Contrary To This, *Capital Widening* Occurs When The Increase In Capital Stock As Fast As Labour Force Growth And Depreciation.

The Growth Process In Solow'S Model Can Be Explained With The Help Of Figure 4.3. In Figure, X-Axis Shows Capital Per Worker ( $K$ ) And Y-Axis Represent Output Per Worker ( $Y$ ). There Are Three Curves Shown In Diagram. The First Is Production Function Curve  $Y = F(K)$ , Given By First Equation Of Solow'S Model. The Second Curve  $Sy$

Represents The Saving Per Capita. It Is Saving Function Curve.

Since, Savings Is Assumed To Be Fixed Fraction Of Income,  $Sy$  Curve Is Equivalent To Production Function Curve. The Third Curve  $(N+D)K$  Is A Straight Line Which Shows Changes In Capital Stock As A Result Of Growths In Labor Force And Depreciation. Second And Third Curves Are Depiction Of Second Equation Of Solow'S Model. The Curve  $Sy$  Intersect Straight Line Curve At Point A. At Point A, Capital

Per Worker Remains Constant. On The Left Side Of Point, A, The Saving Will Be Greater Than The Compensation Needed To Hire New Workers And Deal With Depreciation. While Saving Per Person On The Right Side Of Point A Is Less Than The Amount Necessary For New Workers And Depreciation. In Both The Cases, Economy Will Shift Until It Reaches To Point A Again. Hence, A Is Point Of Steady Growth And Output At This Point ( $Y_0$ ) Is Called Steady State Output Per Worker.

#### **4.4.4 Limitations**

Following Are Some Major Limitations Of Solow'S Model Of Steady State Growth:

- a) The Model Laid Major Stress That Capital Accumulation And Productivity Play Major Role

In Growth Process. However, There Is No Mention Of What Determinants Of Capital Accumulation And Productivity Affect More The Steady-State Growth.

- b) Solow'S Model Has Many Unrealistic Assumptions Like Perfect Competition, Full Employment, No Government Interference Etc.
- c) According To Solow'S Model The Process Of Growth Is Gradual, Harmonious And Continuous. But Schumpeter Theory States That The Process Of Growth Is Not Gradual But Spontaneous And Discontinuous.
- d) Solow'S Model Is Criticized Because It Talks About A Single Sector. It Does Not Address How Capital And Labor Are Allocated Across Different Sectors (Such As Agriculture, Industry, Etc.).
- e) Due To Its Many Assumptions Like Full Employment, Perfect Competition Etc. Solow'S Model Is Not Applicable For Developing Economies.

#### **4.4.5 Conclusion**

Despite Some Limitations, Solow'S Model Provides A Strong Approach To The Growth Process In Developed Economies. The Model Simply States That Output Or Income Per Worker Depends On Capital Per Worker. Capital Stock On The Other Hand, Depends On Savings, The Supply Of Labor And

Depreciation.

### **4.5 Endogenous Growth Theory (Romer And Lucas)**

#### **4.5.1 Introduction**

Endogenous Growth Theories Are New Generation Growth Models. These Models Pick Up Where The Solow Model Left Off. They Look Beyond The Neo-Classic Assumptions And Develop More

Sophisticated Models With Increasing Returns To Scale. The New Generation Of Economists Like Paul Romar, Robert Lucas, Kenneth Arrow, Hirofumi Uzawa Etc. Emphasize That Economic Growth Is Primarily Driven By Internal Forces Like Government Policies, Human Capital, Innovation And Investment Capital. It Is Argued That Governments And Private Sectors Should Invest More In Human Capital To Increase Productivity.

### 4.5.2 Assumptions

Endogenous Growth Theories Are Based On Following Main Assumptions:

- i. There Are Two Sectors Of Economy: Household And Production Sector.
- ii. There Are A Number Of Firms In A Market. The Growth Process In Economy Is Initially Started From Firm Or Industry Level
- iii. The Growth Process In Economy Is Initially Started From Firm Or Industry Level
- iv. Each Firm/Industry Individually Produces Constant Returns To Scale And There Are Increasing Returns To Scale At Economy Level
- v. Government Provides Subsidies And Incentives To Private Business Which Help Entrepreneurs To Form New Opportunities Of Employment.
- vi. The Positive Externalities Are Associated With Human Capital Formation.
- vii. Technological Progress Is Non-Rival And Is Based On The Creation Of New Ideas.
- viii. Economy Is Closed One.

### 4.5.3 The Romer Model

In Order To Explain The New Growth Theories, A Simplified Version Of Romer's Model Is Used Here. Romer's Pioneer Work –*Increasing Returns And Long Run Growth* Published In Journal Of Political Economy In 1986. The Simplicity Of This Model Arises From The Fact That He Maintains His Significant Innovations In Predicting Technology Spillovers And Avoids Delving Into Unnecessary Details About Saving Determination And General Equilibrium.

The Aggregate Production Function Of Romer's Model Is:

$$Y = AK^{\alpha+B} \cdot L^{1-A}$$

Here, Y Is Output, K Is Capital Stock Of Economy And L Is Labor Supply And A Is Stock Of Ideas Or Innovation. For A Given Technological Progress, A Is Constant. It Exhibits Constant Returns To Scale.

With Some Knowledge Of Differential Calculus, The Per Capita Growth Rate Of Economy Can Be Derived From Above Equation And It Would Be:

$$G-N = \frac{B}{1-(A+B)} \cdot N$$

Here,  $G$  Is The Output Growth Rate And  $N$  Is The Population Growth Rate. For A Given Technological Progress,  $B = 0$ , Hence Per Capita Growth Rate Would Be Zero. Romer Assumes That Income Per Capita ( $Y/L$ ) Will Increase Only When  $B > 0$ . In Other Words, When The Stock Of New Ideas  $A$  Is Introduced As The Third Input (Along With Labour And Capital) To The Production Process, There Are Increasing Returns To Scale In The Economy. In Romer's Model, Growth Is Endogenous And Not Driven Exogenously By Saving, Investment And Productivity. A Technology Spillover Prevents Romer's Model From Diminishing Capital Returns. However, The Increasing Returns In Model Result From Technological Progress's Non-Rival Nature.

#### 4.5.4 The Lucas Model

R. Lucas In His Work *-On The Mechanic Of Economic Development* (1988) Develop A Growth Model Based On The Role Of Human Capital As The Crucial Endogenous Factor Of Growth. Lucas Assume That Investment In Education Enhance The Human Capital Formation In A Country. Investment In Human Capital Has Two Side Effects: Firstly, With The Help Of Training And Learning By Doing, A Worker Produces More Efficiently And His Individual Productivity And Income Both Increases. It Is Called Internal Effect. And Secondly, Investment In Human Capital Has Spillover Effect And It Increase The Productivity Of Capital And Other Workers In Economy. It Is Called External Effect. According To Lucas, It Is An Investment In Human Capital Instead Of Physical Capital That Increases The Level Of Technology.

The Production Function For Firm  $i$  Is Expressed As Follow

$$Y_i = A(K_i) \cdot (H_i)^e$$

Where,

A - The Technical Coefficient

K<sub>i</sub> - The Input Of Physical Capital Used By Firm I To Produce

Output Y<sub>i</sub>H<sub>i</sub>- The Input Of Human Capital Used By Firm I To

Produce Output Y<sub>i</sub> H - The Economy'S Average Level Of Human

Capital And

E - Stands For Strength Of The External Effects From Human Capital To Each Firm'S Productivity

The Model Exhibits Constant Returns To Scale For Each Individual Firm, While There Are Increasing Returns To Scale Economy Wide. Both Internal And External Effects Of Investment In Human Capital Facilitate The Firms To Grow. Thus, **The Human Capital Of Each Firm Is Valuable**. In Other Words, According To Lucas' Model, The Growth Of The Economy Depends Upon The Average Skills And Knowledge Of The Economy Rather Than The Experience Or Knowledge Of Firms.

#### 4.5.5 Critical Evaluation Of Endogenous Growth Theory

The New Growth Theories Are Considered As Improvement Over The Neo-Classical Growth Models. But Still, It Has Many Limitations. Some Of Them Are Followings:

- a) The Endogenous Growth Theory Adopted Some Neo Classical Assumptions Which Make It Inappropriate For New World. For Example: It Assumes Single Sector Of Production And A Closed Economy.
- b) The New Growth Theory Overlooks The Inefficiency Arise In Human Capital Due To Poor Infrastructure, Inadequate Institutional Structures And Imperfect Capital And Goods Market. These Are Common Problems Of A Less Developed Economy. Thus, The Model Has Limited Applicability In Ldcs.
- c) Endogenous Model Fails To Explain The Causes Of Income Divergence Between Developing And Developed Countries.
- d) The New Growth Models Determine Long Run Growth Process And Ignore The Importance Of Short- And Medium-Term Growth. As A Consequence, The Theory Provides Partial Explanation Of Growth And Therefore Has A Restricted Hold In Empirical Studies.

#### **4.5.6 Conclusion**

The Most Interesting Features Of Endogenous Model Which Differentiate It From Neo Classical Models Are Avoiding Diminishing Returns And Enlighten The Significance Of Public And Private Investment For Generating External Economies. These Models Successfully Answer The Question That Why And How The Advanced Countries Of The World Exhibit Sustained Economic Growth.

#### **4.6 Kuznets Characteristics Of High-Income Countries**

In 1971, Simon Kuznets<sup>9</sup> In His Nobel Memorial Lecture Defines Major Characteristics Of Economic Growth In High Income Countries. Originally, Kuznet Listed Fifteen Characteristics Of A Modern Economic Growth At The End Of A Book Published In 1966<sup>10</sup>.

These Fifteen Characteristics Were Drawn From Quantitative Data Relating To Growth Before The Mid- Nineteenth Century In Three Developed Countries Named Great Britain, The United States And France. In His Famous Lecture In London, He Refines His Longer List Into The Famous *–Six Characteristics*||, Common To All The High-Income Countries. Kuznet’S Six Characteristics Can Be Classified Into Three Major Groups:

##### **1) Aggregate Growth**

- i. Growth Of Per Capita Output And Population
- ii. Growth Of Total Factor Productivity

##### **2) Structural Transformation**

- i. Structural Transformation
- ii. Social And Ideological Transformation

##### **3) International Spread**

- i. International Economic Outreach
- ii. Limited Spread Of Economic Growth

These Characteristics Are Interrelated To Each Other. Let’S Discuss Them One By One:

- i. Growth Of Per Capita Output And Population:** There Is High Rate Of Growth Of Population And Per Capita Income In Modern Economies. Historically, Populations In European Countries Grew After The Industrial Revolution. Gdp Per Capita Is Also Growing



Parallel To Population Growth In High-Income Countries.

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<sup>9</sup> Kuznets, Simon (1971+ (1974a), "Modern Economic Growth: Findings And Reflections", (Nobel Memorial Lecture, In Kuznets, Simon, Population, Capital, And Growth: Selected Essays, London: Heinemann, 165-184.

<sup>10</sup> Kuznets, Simon (1966), Modern Economic Growth: Rate, Structure And Spread, New Haven: Yale University Press

- ii. Growth Of Total Factor Productivity:** An Increase In Gdp In Modern Economies Leads To A Dramatic Increase In Input Productivity Including Labor. Hence, There Is A Rise In Overall Efficiency In Production.
- iii. Structural Transformation:** As An Economy Grows, The Primary Area Of Production Is Changed. For Example: From Agriculture Sector To Industrial Sector And Then Service Sector; Or From Small And Medium Scale Industry To Large Scale Corporations. This Structural Shift Enhances The Output. Historically, The Innovation Of Steam Engine Shift Europe From Feudalism To Capitalism. UK Develops As The 'Workshop' Of The World With This First Industrial Revolution. The Industrial Sector Became The Primary Sector Of The Economy And Generated An Enormous Amount Of Employment. Eventually, The Industrial Sector Gave Way To The Service Sector, Which Now Accounts For A Large Segment Of The Human Capital Of The Country.
- iv. Social And Ideological Transformation:** Structural Transformation In Production Sector Of Economy Open The Way For Urbanization. Rural Society Has A Traditional Way Of Living. They Kept Alive Their Culture And Ideology. But Urban Societies Outline And Follow Their Own Rules And Regulation, As Per Comfort Of Life. Urban Society Is Contemporary Than Rural Society. Thus, The Rate Of Social And Ideological Transformation Is Also High In High-Income Economies.
- v. International Economic Outreach:** Sound Financial Status And Enlarged Industrial Production Shaped The Foreign Relations Of High-Income Economies. Developed Countries Always Hunt For New Source Of Raw Material And New Market For Their Final Products. Also, They Offer Financial Help To LDCs Which Strengthen Their Political Influence On International Level.

**vi. Limited Spread Of Economic Growth:** Modern Economic Growth Has A Limited Spread. The Benefits Of Growth Reach Up To Only 1/3<sup>rd</sup> Of The World Population And A Vast Area Still Struggling For. Initially, The Growth Was Spread In Western Europe, North America, Japan, Australia And New Zealand. The Recent High-Income Economies Include China, South Korea, Singapore, Eastern Europe And In Oil Rich West Asian Countries. Thus, It Can Be Said That When One Economy Experiences Modern Growth, There Is No Guarantee That Other Economies Will Follow Suit. Consequently, There Is A Greater Economic Gap Between Various Regions Of The World.

#### **4.7 Questions for Practice**

##### **A. Short Answer Type Questions**

- Q1.What Do You Mean By Developed Economy?
- Q2.Define Model.
- Q3.Write A Note On Warranted Growth Rate
- Q4.Where Is State Of Equilibrium In Harrod Model Of Growth?
- Q5.What Is Structural Transformation?

##### **B. Long Answer Type Questions**

- Q1.Critically Explain Harrod- Domar'S Model Of Growth.
- Q2.Explain Solow'S Model Of Steady State Growth. Also Write Its Limitations.
- Q3.Critically Evaluate Endogenous Growth Theory.
- Q4.Explain In Detail Kuznets' Characteristics Of High-Income Countries

#### **4.8 Suggested Readings**

- Barro, Robert, And Sala- I-Martin. (2004), Economic Growth (2nd Edition) Mcgrawhill Singapore
- Lucas, Robert E. (2002), Lectures On Economic Growth. Harvard University Press,Cambridge, Massachusetts.
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- Romer, David. (2001), Advanced Macroeconomics (2nd Edition). McGraw-Hill, Singapore.
- Solow, Robert M. (2000), Growth Theory: An Exposition (2nd Edition). Oxford University Press, Oxford And New York.

**M.A (ECONOMICS)**

**SEMESTER – II**

**ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

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**UNIT- V DEMOGRAPHIC FEATURES OF INDIA**

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**Structure**

**5.0 Objectives**

**5.1 Introduction**

**5.2 Demographic Features/ Problems of Population In India**

**5.2.1 Population Growth Rate**

**5.2.2 Birth Rate and Death Rate**

**5.2.3 The Sex Composition**

**5.2.4 The Density of Population**

**5.2.5 Age Composition**

**5.3 Demographic Dividend**

**5.3.1 Meaning**

**5.3.2 Demographic Dividend in India**

**5.4 Human Development**

**5.5 Questions for Practice**

**5.6 Suggested Readings**

**5.0 Objectives**

After Reading This Unit, You Will Be Able To:

- Explain Various Demographic Features Of The Indian Population
- Describe The Meaning Of Demographic Dividends

- Explain The Demographic Dividend Of India
- Explain The Meaning Of Human Development
- Discuss The Situation Of Hdi For India

## **5.1 Introduction**

Demography Refers To The Systematic Study Of The Human Resources Of A Country. The Term Is Derived From Two Greek Words, *Demo* (People) And *Graphein* (Describe). Demography Describes The People. It Analyses Various Characteristics Of The Population, Such As Growth, Size, Births, Deaths And Migration Patterns. It Also Analyses The Structure And Composition Of The Population, Such As Gender And Age Distributions. This Analysis Is Based On Census Data Or Surveys Conducted By Other Organizations. Knowledge Of The Demographic Features Of A Country Is Essential To Understand The Basic Problems Of Its People. The Demographic Features Of The Indian Economy Are Based On The Census Of India, Held Every Ten Years. The Most Recent Was The 2011 Census. Census 2021 Is Under Course Of Action. However, World Bank Data Represent Recent Data.

## **5.2 Demographic Features/ Problems Of Population In India**

The Central Problem Of The Indian Economy Is That Its Population Is Growing Geometrically While Production Is Growing Arithmetically. Some Major Features Of The Demography Of India'S Population Like The Population Growth Rate, Birth And Death Rate, Density Of Population, Age Composition, Sex Ratio Etc. Have Been Discussed Below:

### **5.2.1 Population Growth Rate**

India Holds Only 2.4 Per Cent Of The World's Total Area But It Hosts About 18 Per Cent Of The World'S Population. It Ranks 7th In Terms Of Area And 1st In Terms Of Population. In 2011 The Total Population Of India Was 1.21 Billion; It Increased To 1.4 Billion In 2022. According To Un Projection, India's Population Is Expected To Be 1.5 Billion By 2030, And 1.7 Billion By 2050. However, The Population Of The Country Is Increasing At A Declining Rate. India'S Population's Annual Growth Rate Was 11.90 Per Cent In 2017 Which Was 17.81 Per Cent In 2011. Historically, Major Trends In India'S Population Can Be Categorized Into Four Phases:

1891-1921: Stagnant Phase

1921-1951: Steady Growth

1951-1981: Rapid High Growth

1981 Onward: High Growth With A Declining Rate

**Table 5.1 Growth Of Population In India (1891-2011)**

Census Year	Population (In Millions)	Growth Rate
1891	236	
1901	236	0.0
1911	252	5.7
1921	251	-0.3
(1891-1921) Compound Annual Growth Rate		0.19
1931	279	11.0
1941	319	14.2
1951	361	13.3
(1921-1951) Compound Annual Growth Rate		1.22
1961	439	21.5
1971	548	24.8
1981	683	24.7
(1951-1981) Compound Annual Growth Rate		2.14
1991	844	23.5
2001	1027	21.6
2011	1210	17.81
2022 (Projected)	1428	18.02

Source: Census Of India <https://Censusindia.Gov.In/>

As Clear From Table 6.1, In The First Phase Of 30 Years (1891-1921), The Population Of India Grew From 236 Million In 1891 To 251 In 1921 With A Compound Annual Growth Rate Of 0.91 Per Cent. There Is A High Birth Rate Followed By A High Birth Rate During This Period. Thus, This Era Was

Characterized As A Stagnant Population Era. After 1921, The Second Phase Of Population Growth Is Started. The Population Of India Was 279 Million According To 1931 Census. It Reached To 361 Million In 1951. The Compound Growth Rate Of The Population During The Second Phase Is 1.22. The Population Increased More In This Phase Due To A Decline In The Death Rate From About 49 Per Thousand To 27 Per Thousand. However, There Is A Negligible Decline In The Birth Rate. This Period Marked A Steady But Low Growth Rate Of The Population.

The Third Phase Witnesses A Population Outburst In The Country. The Population Of India Grew From 439 Million In 1961 To 683 Million In 1981. The Annual Compound Growth Rate Is 2.14 Per Cent During This Period. Widespread Health Facilities And Medical Awareness Check The Death Rate And It Reached To 15 Per Thousand In 1971-80. But The Birth Rate Is Not Controlled And It Was 37.2 Per Thousand In The Same Period. From 1981 Onwards India Considered Into The Fourth Phase Of Population Growth. The Population Of The Country Increased From 683 Million In 1981 To 1210 Million In 2011. It Is Projected To Reach To A Level Of 1428 Million In 2022. India Is Presently Ranked As The World'S Most Populace Country.

### **5.2.2 Birth Rate and Death Rate**

The Growth Rate Of The Population Has Two Major Determinants: Birth Rate And Death Rate. The Population Will Be Stagnant If Both Are In Balance; Vice-Versa Is Also True.

**Table 5.2 Average Annual Birth Rates And Death Rates In India**

Census Year	Birth (Per Thousand)	Death (Per Thousand)
1891	45.8	44.4
1901	48.1	42.6
1911	49.2	48.6
1921	46.4	36.3
1931	45.2	31.2
1941	39.9	27.4

1951	40.0	18.0
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1961	41.2	19.2
1971	37.2	15.0
1981	32.6	11.1
1991	29.5	9.8
2001	25.4	8.4
2011	21.8	7.1
2022 (Projected)	17.2	7.4

Source: Census Of India <https://censusindia.gov.in/>

Table 6.2 Reveals Average Annual Birth Rate And Death Rate In India From 1891 To 2022. It Is Clear From The Table That India'S Demography Featured A Variation In Birth Rate And Death Rate Which Accelerated The Growth Of The Population In The Country. There Was A Prevalent High Birth Rate And High Death Rate Up To 1921. But After 1921, There Is A Clear Fall In Death Rate From 48.6 Per Thousand In 1911 To 15.0 Per Thousand In 1971. But The Birth Rate Shows A Slight Decline From 49.2 Per Thousand In 1911 To 37.2 Per Thousand In 1971. During The Fourth Phase Of The Demographic Transition, There Is Awareness Of Family Planning. Also, There Are Improvements In The Marriageable Age Of Girls Due To An Increase In Female Education. As A Consequence, The Birth Rate Registered An Incessant Decline To 21.8 Per Thousand In 2011. While The Death Rate Declined Sharply To 7.1 Per Thousand In The Same Census Year. High Disparity In Birth Rate And Death Rate Causes Population Explosion In India.

### 5.2.3 The Sex Composition

A Disturbing Feature Of India'S Demography Is The Declining Sex Ratio I.E., The Ratio Of Females Per 1000 Males. According To Census Of India Data, There Were 934 Females Per 1000 Males In 1981. There Was A Distinct Improvement In 2011, Reaching 943 Females Per 1000 Males. Nfhs-4 Reveals That In 2015-16, The Indian Population Had 991 Females Per 1,000 Males. Census Presents The Scenario Of Various Mch Programs In The Country. The State Of Kerala Shows The Highest Proportion Of Females At 1084 Per 1000 Males In The 2011 Census. Pondicherry Ranked First Among Uts With 1037 Females Per 1000 Males, In The Same Census Year. The States With A Lower Ratio Than The National Average Include Arunachal Pradesh,

Madhya Pradesh, Rajasthan, Gujarat, Bihar, Punjab Etc. The Situation Is More Severe In Punjab And Haryana Respectively With 846 And 834 Females Per100 Males In The 2011 Census.

#### 5.2.4 The Density of Population

The Density Of Population Implies The Average Number Of Persons Living Per Square Kilometre. The Problem Of Density In India Can Be Described By The Fact That The Country Holds Only 2.4 Per Cent Of The Earth'S Total Surface Area But It Hosts About 18 Per Cent Of The Earth'S Total Population. The Density Of The Population In India Is Escalating Constantly. In 1901 The Density Of Population Was 77 Persons Per Sq. Km. Which Jumped To 216 Persons Per Sq. Km. In 1981. In 1991, There Were 267 People Living Per Sq. Km. Which Shot Up To 324 Persons Per Sq. Km. In 2001 And Further 382 Persons Per Sq. Km. In 2011. Density Of The Population And Its State-Wise Distribution Is Shown In Table 6.4. As Clear From The Table The Density Of The Population Is Distributed Unevenly Among Different Regions And States Of India. The Metropolitan Cities And Uts Like Delhi, Chandigarh, Daman And Diu Are Highly Dense. The Density Of The Population Is Determined By The Availability Of Natural Resources, Economic Development And Opportunities For Employment. People Also Accumulated Near The Banks Of Rivers. It Is The Reason That River Basin Areas Of North India Are Highly Dense.

**Table 6.3 Density Of Population In India (2011 Census)**

S. No.	State/ Union Territory	Area Sq. Km	Density Per Sq. Km (Census 2011)	Density Per Sq. Km (Census 2001)
-	<b>India (Average)</b>	<b>3,287,240</b>	<b>382</b>	<b>324</b>
1	Uttar Pradesh	240,928	829	690
2	Maharashtra	307,713	365	315
3	Bihar	94,163	1,106	881
4	West Bengal	88,752	1,028	903
5	Andhra Pradesh	275,045	308	277
6	Madhya Pradesh	308,252	236	196
7	Tamil Nadu	130,060	555	480
8	Rajasthan	342,239	200	165

S. No.	State/ Union Territory	Area Sq. Km	Density Per Sq. Km (Census 2011)	Density Per Sq. Km (Census 2001)
9	Karnataka	191,791	319	276
10	Gujarat	196,244	308	258
11	Orissa	155,707	270	236
12	Kerala	38,852	860	819
13	Jharkhand	79,716	414	338
14	Assam	78,438	398	340
15	Punjab	50,362	551	484
16	Chhattisgarh	135,192	189	154
17	Haryana	44,212	573	478
18	Delhi	1,483	11,320	9,340
19	Jammu And Kashmir	222,236	56	46
20	Uttarakhand	53,483	189	159
21	Himachal Pradesh	55,673	123	109
22	Tripura	10,486	350	305
23	Meghalaya	22,429	132	103
24	Manipur	22,327	128	103
25	Nagaland	16,579	119	120
26	Goa	3,702	394	364
27	Arunachal Pradesh	83,743	17	13
28	Pondicherry	490	2,547	2,034
29	Mizoram	21,081	52	42
30	Chandigarh	114	9,258	7,900
31	Sikkim	7,096	86	76
32	Andaman And Nicobar Islands	8,249	46	43
33	Dadra And Nagar Haveli	491	700	449
34	Daman And Diu	111	2,191	1,413

S. No.	State/ Union Territory	Area Sq. Km	Density Per Sq. Km (Census 2011)	Density Per Sq. Km (Census 2001)
35	Lakshadweep	30	2,149	1,895

Source: Population Census. <https://www.census2011.co.in/density.php>

### 5.2.5 Age Composition

The Rapid Increase In Population Has A Favourable Feature For India. The Ratio Of The Working Population (15 To 60 Years Of Age) To Other Age Groups Is The Highest In India. Hence, The Country Enjoys A *Demographic Dividend*. The Percentage Age Structure Of India'S Population Is Shown In Table 6.3.

**Table 6.3 Percentage Age Composition Of India's Population (1911-2023)**

Year	0-14	15-60	60 And Above
1911	38.8	60.2	1.0
1921	39.2	59.6	1.2
1931	38.3	60.2	1.5
1961	41.0	53.3	5.7
1971	41.4	53.4	5.2
1981	39.7	54.1	6.2
1991	36.5	57.1	6.4
2001	35.6	58.2	6.3
2011	30.5	64.3	5.1
2021	25.7	67.5	6.8

Source: Census Of India <https://censusindia.gov.in/>

Table 6.3 Indicates That The Percentage Of Working Age Population In India Is Increasing Every Year. While The Percentage Of The Population In 0-14 Years Is Declining This Shows A Check

On The Total Fertility Rate. In The Year 2021, Approximately 25 Per Cent Of The Indian Population Is Aged 0-14 Years, 18 Per Cent Of The Population Is Aged 10-19 Years, 26 Per Cent Is Aged 10-24 Years, 68 Per Cent Is Aged 15 To 64 Years And 7 Per Cent Is Over 65 Years Of Age.

### **5.3 Demographic Dividend**

#### **5.3.1 Meaning**

A Demographic Dividend Refers To A Situation In Which An Economy Grows Due To Changes In Population Age Structure. In Other Words, The Demographic Dividend Is The Phase In Which A Country Has A Significant Number Of Working People Aged Between 15 And 64 Years Relative To The Dependent Or Non-Working Population Which Is Less Than 14 And More Than 65 Years Of Age. Changing Age Composition Is Typically Caused By A Decline In Both Birth And Death Rates. Low Birth Rates And Low Death Rates In A Country Lead To A Proportional Increase In Working Populations In Comparison With Children And Old Age. When There Is A Low Birth Rate Along With A Low Death Rate In A Country, It Leads To A Proportional Increase In The Working Population As Compared To Children And Old Age People. When Fewer People Need To Be Supported And More People Are Employed, Economic Resources Can Be Invested Elsewhere. As A Result, A Country's Economic Development And Future Prosperity Are Accelerated. Demographic Dividend Benefits Can Be Tapped Into In The Following Four Ways:

- 5.3.1.1** The Savings Of Young Labourers Can Stimulate Capital Formation In A Country.
- 5.3.1.2** The Participation Rate Of The Labour Force Including The Female Labour Force Increase
- 5.3.1.3** As There Is A Low Birth Rate, Parents Can Provide Better Health And Education Facilities For their Children. It Leads To Human Capital Development.
- 5.3.1.4** A Decline In Dependency And Improvements In Productivity Resulted In An Increase In GDP per Capita And Further Economic Growth During This Period.

#### **5.3.2 Demographic Dividend in India**

As Clear From Table 6.3, In 2021, Approximately 68 Per Cent Of The Total Population Is Aged

15 To 64 Years In India. Thus, Here The Ratio Of The Youngest People To Other Age Groups Is The Highest.

The Median Age In India Is Less Than In China. As Shown In Table 6.4, During The Year 2021, The Median Age Of An Indian Is 28.7 Years While The Median Age Of A Chinese Is 38.4 Years. In Terms Of Global Rankings, India And China Are Ranked 94th And 170th Youngest Among The 237 Countries. A

Broad-Based Regional Analysis Shows That India'S Median Age Is Significantly Lower Than That Of SriLanka While It Is Older Than Pakistan, Nepal, And Bangladesh.

**Table 6.4 Median Age India And Neighbours (2021)**

<b>Country Name</b>	<b>Median Age</b>	<b>Life Expectancy</b>
India	28.7	70.2
Sri Lanka	33.7	76.5
Pakistan	22.0	66.4
Nepal	25.3	69.3
Bangladesh	27.9	72.1
China	38.4	78.1

Source: Worlddata.Info <https://www.worlddata.info/average-age.php>

The Demographic Dividend In India Is Caused By A Constant Decline In The Birth Rate In The Country. As Clear From Table 6.2, The Birth Rate Is Almost Halved From 1981 Till Now. However, There Are Some Variations, State-Wise. Delhi, Maharashtra, And Tamil Nadu Have Lower Total Fertility Rates Whereas Bihar, Madhya Pradesh, And Uttar Pradesh Have Higher Ones. The Government Of India Implements Various Schemes Like Atmanirbhar Bharat, Make In India, And Startup India Etc. To Fully Tap The Benefits Of Demographic Dividends. But Still, The Country Has To Face The Following Challenges:

**5.3.2.1** The Literacy Rate Is Low In India. Indian Working People, Especially In Rural Areas, Lack Bothskill And Technical Know-How.

**5.3.2.2** There Is A Need To Improve The Human Development Index Perimeter, That Is, Health, Education, And Standard Of Living.

**5.3.2.3** More Than Half Of The Indian Population Still Relies On Agriculture And Allied

Activities. Thus, Disguised Unemployed, Cyclic Unemployed, And Less Unemployed Are Common Problems In India.

**5.3.2.4** Another Challenge Is The Growth Of The Unorganized Sector. There Is A Problem With Low Wages, No Social Security, Long Working Hours And Poor Employment Conditions In This Sector.

**5.3.2.5** Demographic Dividends Are Also Hindered By Gender Inequality. Indian Women Have Much Potential But They Always Work Under Social And Family Pressure. In The Unorganized Sector, Women Face Wage Discrimination. It Discourages Them And Lowers Their Productivity As A Result.

**5.3.2.6** According To The NSSO'S Periodic Labour Force Survey 2017-18, The Labour Force Participation Rate For The Age Group 15 To 59 Years Is Around 53 Per Cent Only. It Indicates That Near To 50 Per Cent Of The Working Population Is Jobless Or Not On The Job Due To Various Reasons.

To Tap Into The Full Benefits Of Demographic Dividends, The Country Must Address The Challenges Listed Above.

## **5.4 Human Development**

### **5.4.1 Meaning**

The Concept Of Human Development Is Defined By The United Nations Development Program In Its Human Development Report (1997) As \_The Process Of Widening People'S Choices And The Level Of Well-Being They Achieve Are At The Core Of The Notion Of Human Development. Regardless Of The Level Of Development, The Three Essential Choices For People Are To Lead A Long And Healthy Life, To Acquire Knowledge And To Have Access To The Resources Needed For A Decent Standard Of Living. Income Clearly Is The Only One Option That People Would Like To Have Though An Important One. Income Is Also A Means, With Human Development The End.<sup>11</sup>

As A Multidimensional Concept Human Development Constitutes Three Key Dimensions. These Are A Long And Healthy Life, Being Knowledgeable And Having A Decent Standard Of Living. By Providing These Key Dimensions At First, Other Areas Of Human Life Will Benefit As Well. UNDP Measures These Three Under Human Development Index, Formed By Mahbub-Ul-Haq.

## 5.4.2 Human Development Index (Hdi)

Hdi Is The Average Of The Three Dimensions Of Life Discussed Above. It Measures Statistically:

### 5.4.2.1 Life Expectancy At Birth: To Assess A Long And Healthy Life

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<sup>11</sup> Undp, Human Development Report (1997), Pg. 13-14

### 5.4.2.2 Adult Literacy Rate: To Assess Access To Knowledge Of The Older Generation

### 5.4.2.3 Gross Enrolment Ratio: To Assess Access To Knowledge Of The Young Generation

### 5.4.2.4 Gdp Per Capita (Ppp Us\$): To Assess The Standard Of Living

An Index For Each Of The Four Matrices Is Formed. Undp Set Maximum And Minimum Limits ForEach Indicator As Below:

Dimension	Indicator	Maximum Value	Minimum Value
Health	Life Expectancy At Birth	85	25
Education	Adult Literacy Rate	100	0
	Gross Enrollment Ratio	100	0
Standard Of Living	Gdp Per Capita (Ppp Us\$)	40,000	100

Performance Of Each Of The Four Metrics Is Expressed In The Index By Applying The FollowingFormula:

$$\text{Dimension Index} = \frac{\text{Actual Value} - \text{Minmum Value}}{\text{Maximum Value} - \text{minimum value}}$$

The Hdi Is Calculated As A Simple Average Of The Dimension Indices. The Value Of The Index Is LiesBetween 0 And 1.

## 5.4.3 Human Development Index (Hdi) For India

- India's Human Development Index Is Not So Impressive. According To Human Development Report (Hdr) 2021, India'S Hdi Value Stood At 0.633 In 2021, Against The World Average Of 0.732. The Value Declines Every Year. In 2020, The Hdi Was 0.642, Which Was Lower Than The Pre-Covid Level Of 2019 I.E., 0.645. As Far As Ranking Is Concerned, There Is No Improvement. According To Hdr, India Ranked 131st Among 189



Countries In 2020 And 132nd Among 190 Countries In 2021. The Decline In The Country'S Performance From Its Previous Level Was Due To A Fall In Life Expectancy. As Per Hdr 2021, Let's Examine The Different Dimensions Of Life.

- a. Life Expectancy: Indians Live 67.2 Years At Birth In 2021. Female Life Expectancy Dropped From 71 Years In The 2020 Report To 68.8 Years In The 2021 Report.
- b. Education: The Number Of Schooling Years Expected In India Is 11.9 Years, Down From 12.2 Years In The 2020 Report. However, The Mean Schooling Years Have Increased To 6.7 From **5.5** In The 2020 Report.
- c. Gdp Per Capita Us\$: According To The Statistics, The Gdp Per Capita Was Usd 6,599.
- d. Gender Inequality Index: India Ranks 122 On The Gender Inequality Index.
- e. Multidimensional Poverty Index (Mpi): Using Mpi As A Measure Of Poverty, India Scored 0.123, With A Headcount Ratio Of 27.9 Per Cent. 8.8 Per Cent Of People Suffer From Severe Multidimensional Poverty. The Report Noted That India Had Lifted 271 Million People Out Of Multidimensional Poverty Over The Last Decade.

**Table 6.5 Hdi (2021) For Top And Important Countries**

<b>Hdi Rank</b>	<b>Country</b>	<b>Hdi Value 2021</b>
1	Switzerland	0.962
2	Norway	0.961
3	Iceland	0.959
4	Hong Kong, China (Sar)	0.952
5	Australia	0.951
6	Denmark	0.948
7	Sweden	0.947
8	Ireland	0.945
9	Germany	0.942
10	Netherlands	0.941
18	United Kingdom	0.929

19	Japan	0.925
21	United States	0.921
79	China	0.768
132	India	0.633

Source: Undp, Human Development Report 2021

Switzerland Has Highest Hdi Value Followed By Norway And Iceland. Almost All European Countries Have Impressive Human Development. Among India'S Neighbours, Sri Lanka (73rd), China (79th), Bangladesh (129th), And Bhutan (127th) Are Ranked Above India, While Pakistan (161st), Nepal (143rd), And Myanmar (149th) Are Worse Off. The 2021 Hdr Has A Disturbing Revelation That Around 90 Per Cent Of Countries Recorded A Decline In Their Hdi Value During The 2020 Or 2021. It May Be The Post-Effect Of Covid-19.

## 5.5 Questions for Practice

### A. Short Answer Type Questions

Q1. Write Meaning Of Demography

Q2. What Is Birth Rate And Death Rate

Q3. When Does A Country Signifies To Have Entered A Phase Of \_Demographic Dividend'?  
What Are Its Implications For Economic Planning?

Q4. What Is Human Development?

Q5. How Do Calculate The Hdi. Discuss.

### B. Long Answer Type Questions

Q1. Explain Various Demographic Features Of Indian Population

Q2. Describe the Meaning Of Demographic Dividends. Write a Detail Note On Demographic Dividend Of India

Q3. Discuss the Situation Of Hdi For India In Detail

## 5.6 Suggested Readings

Cassen, R.H. (1958). India: Population, Economy, Society, Chapter 4, The Macmillan Co. Of India Ltd., Delhi.

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## **M.A (ECONOMICS)**

### **SEMESTER - II**

#### **ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

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##### **Unit 6: Characteristics of Indian Agriculture**

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###### **Structure**

- 6.0 Learning Objectives**
- 6.1 Introduction**
- 6.2 Cropping Pattern of Agriculture In The Indian Economy**
  - 6.2.1 Food Crops**
  - 6.2.2 Non-Food Crops**
- 6.3 Growth Of Indian Agriculture**
- 6.4 Constraints**
- 6.5 Agricultural Policies**
- 6.6 Green Revolution**
- 6.7 Impacts Of The Green Revolution**
- 6.8 Land Reforms**
- 6.9 Recent Developments In Agriculture Policy**
- 6.10 Summary**
- 6.11 Questions For Practice**
- 6.12 Suggested Readings**

###### **6.0 Learning Objectives**

After Studying The Unit, Students Will Be Able To:

- Cropping Pattern
- Growth And Constraints
- Agricultural Policies
- Land Reforms
- Green Revolution

- Recent Developments In Agricultural Policy

## 6.1 Introduction

Agriculture Is The Practice Of Cultivating Land, Raising Animals, And Producing Food, Fiber, And Other Products To Sustain Human Life. It Encompasses A Wide Range Of Activities, Including Planting And Harvesting Crops, Breeding And Raising Livestock, Managing Soil Fertility, Controlling Pests And Diseases, And Managing Water Resources. Agriculture Has Played A Crucial Role In The Indian Economy And Continues To Be A Vital Industry Worldwide, Providing Food And Other Resources For People's Daily Needs. It Has Grown From Subsistence Farming To Modern Industrial Agriculture That Employs Advanced Technologies And Scientific Practices To Increase Productivity And Efficiency.

## 6.2 Cropping Pattern of Agriculture in the Indian Economy

The Cropping Pattern In Indian Agriculture Is Diverse And Varies Across Regions And Seasons. India Is Primarily An Agriculture-Based Economy, With More Than Half Of Its Population Dependent On Agriculture And Related Activities For Their Livelihoods.

The Major Cropping Patterns In India For Food Crops Are Classified Into Four Broad Categories:

### 6.2.1 Food Crops

- Kharif Crops:** Kharif Crops Are Typically Grown In The Monsoon Season, Which Lasts From June To September. The Crops Require Abundant Rainfall And Warm Temperatures To Grow And Mature. Major Kharif Crops Include Rice, Maize, Cotton, Sugarcane, Jowar, Bajra, Tur, Moong, And Urad. Rice Is The Most Important Kharif Crop In India And Is Primarily Grown In The Eastern And Southern States, Such As West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, And Karnataka. Maize Is Another Major Kharif Crop That Is Grown In States Such As Karnataka, Andhra Pradesh, Bihar, And Madhya Pradesh. Cotton Is Primarily Grown In Maharashtra, Gujarat, Andhra Pradesh, And Punjab.
- Rabi Crops:** Rabi Crops Are Typically Grown In The Winter Season, Which Lasts From October To March. The Crops Require Cool Temperatures And Low Humidity To Grow And Mature. Major Rabi

Crops Include Wheat, Barley, Gram, Mustard, Peas, And Lentils. Wheat Is The Most Important Rabi Crop In India And Is Predominantly Grown In The Northern States Such As Punjab, Haryana, Uttar Pradesh, And Rajasthan. Barley Is Another Important Rabi Crop That Is Grown In The Northern And Western States Such As Uttar Pradesh, Rajasthan, Madhya Pradesh, And Gujarat.

- c) **Zaid Crops:** Zaid Crops Are Typically Grown In The Summer Season, Which Lasts From April To June. The Crops Require High Temperatures And Low Humidity To Grow And Mature. Major Zaid Crops Include Watermelon, Cucumber, Bitter Gourd, And Muskmelon. These Crops Are Primarily Grown In The Southern States Such As Andhra Pradesh, Karnataka, And Tamil Nadu, As Well As In The Western States Such As Gujarat, Maharashtra, And Rajasthan.
- d) **High-Value Cash Crops:** In Recent Years, There Has Been A Shift Towards High-Value Cash Crops Such As Fruits, Vegetables, And Spices, Which Have A Higher Economic Value Than Traditional Food Crops. This Shift Has Been Driven By Rising Demand From Domestic And International Markets And The Availability Of Advanced Technologies And Infrastructure. Fruits Such As Mangoes, Bananas, And Apples, Vegetables Such As Tomatoes, Onions, And Potatoes, And Spices Such As Turmeric, Cumin, And Coriander Are Some Of The High-Value Cash Crops That Are Grown In India. These Crops Are Predominantly Grown In States Such As Maharashtra, Karnataka, Andhra Pradesh, And Tamil Nadu.

### **6.2.2 Non-Food Crops:**

Non-Food Crops Such As Cotton, Sugarcane, And Tobacco Are Also Important Crops In India. These Crops Have A Higher Economic Value And Are Primarily Grown For Industrial Purposes. Cotton Is Predominantly Grown In Maharashtra, Gujarat, Andhra Pradesh, And Punjab, While Sugarcane Is Predominantly Grown In Uttar Pradesh, Maharashtra, And Karnataka. Tobacco Is Primarily Grown In Andhra Pradesh, Karnataka, And Gujarat. The Cropping Pattern In Indian Agriculture Is Diverse And Varies Across Regions And Seasons. The Agriculture Sector Plays A Vital Role In The Indian Economy And Is A Major Source Of Employment And Income For Millions Of People.

India Is Primarily An Agriculture-Based Economy, With More Than Half Of Its Population Dependent On Agriculture And Related Activities For Their Livelihoods. The Agriculture Sector

Has Played A Vital Role In The Country's Economic Development And Has Been A Major Source Of Employment And Income For Millions Of People. However, The Sector Has Faced Several Growth Constraints Over The Years, Which Have Limited Its Potential To Contribute To The Country's Economic Growth.

### **6.3 Growth of Indian Agriculture**

The Agriculture Sector In India Has Undergone Significant Changes Over The Years, Driven By Various Policy Initiatives And Technological Advancements. Some Of The Factors That Have Contributed To The Growth Of Indian Agriculture Are:

- 1. Green Revolution:** The Green Revolution, Which Began In The 1960s, Played A Crucial Role In Increasing Agricultural Productivity In India. The Introduction Of High-Yielding Varieties Of Crops, Along With The Use Of Modern Irrigation Methods, Fertilizers, And Pesticides, Led To A Significant Increase In Agricultural Output.
- 2. Technological Advancements:** The Use Of Modern Technologies Such As Biotechnology, Precision Agriculture, And Farm Mechanization Has Helped To Increase Productivity And Efficiency In The Agriculture Sector. The Government Has Also Encouraged The Adoption Of These Technologies By Providing Subsidies And Incentives To Farmers.
- 3. Government Policies:** The Government Has Implemented Various Policies To Support The Agriculture Sector, Such As Minimum Support Prices, Subsidies, And Credit Facilities. These Policies Have Helped To Improve Farmers' Incomes And Reduce Their Dependence On Moneylenders.
- 4. Diversification:** In Recent Years, There Has Been A Shift Towards High-Value Cash Crops Such As Fruits, Vegetables, And Spices, As Well As Non-Food Crops Such As Cotton, Sugarcane, And Tobacco, Which Have A Higher Economic Value Than Traditional Food Crops. This Shift Has Been Driven By Rising Demand From Domestic And International Markets And The Availability Of Advanced Technologies And Infrastructure.
- 5. Export Potential:** Indian Agriculture Has Significant Export Potential, With Rising Demand From International Markets For High-Value Crops Such As Fruits, Vegetables, And Spices. This Provides An Opportunity For Farmers To Earn Higher Incomes And Improve Their Livelihoods.
- 6. Farmer Producer Organizations:** The Government Has Encouraged The Formation Of Farmer Producer Organizations (Fpos) To Help Farmers Collectively Market Their Produce, Access Credit Facilities, And Adopt Modern Technologies And Practices. This Has Helped

To Improve The Bargaining Power Of Farmers And Increase Their Profitability.

- 7. Crop Diversification:** There Has Been A Shift Towards Crop Diversification In Recent Years, With Farmers Cultivating A Wide Variety Of Crops To Reduce Risks And Increase Incomes. This Has Been Facilitated By The Availability Of Advanced Technologies, Market Linkages, And Government Support.

#### **6.4 Constraints of Indian Agriculture**

Despite The Growth In The Agriculture Sector, Several Constraints Continue To Limit Its Potential To Contribute To The Country's Economic Growth. Some Of The Key Constraints Are:

- 1. Fragmentation Of Land:** The Average Size Of Land Holdings In India Is Small, Which Makes It Difficult For Farmers To Adopt Modern Technologies And Practices. The Fragmented Land Holdings Also Result In Low Productivity And High Transaction Costs.
- 2. Lack Of Irrigation:** India Is Highly Dependent On Monsoon Rains For Agriculture, And Only Around 45% Of The Total Cultivated Area Is Irrigated. This Results In Low Crop Yields And Low Agricultural Productivity, Especially In Dryland Areas.
- 3. Soil Degradation:** Soil Degradation Is A Major Problem In India, With Around 30% Of The Total Land Area Affected By Soil Erosion, Nutrient Depletion, And Salinization. This Has Resulted In Declining Soil Fertility, Reduced Crop Yields, And Increased Input Costs.
- 4. Poor Infrastructure:** The Lack Of Adequate Infrastructure, Such As Roads, Storage Facilities, And Market Linkages, Makes It Difficult For Farmers To Transport And Sell Their Produce. This Results In Low Prices For Farmers And High Prices For Consumers.
- 5. Climate Change:** Climate Change Is A Major Threat To Indian Agriculture, With Rising Temperatures, Erratic Rainfall, And Extreme Weather Events Leading To Crop Losses And Reduced Productivity. This Poses A Significant Challenge To The Country's Food Security And Agricultural Sustainability.
- 6. Lack Of Agricultural Credit:** Access To Credit Is A Major Constraint For Farmers In India, Especially Small And Marginal Farmers. The Lack Of Credit Facilities Makes It Difficult For Farmers To Invest In Modern Technologies And Practices, Which Limits Their Productivity And Profitability.
- 7. Input Costs:** The High Cost Of Inputs Such As Seeds, Fertilizers, And Pesticides Is A Major Constraint For Farmers In India, Especially Small And Marginal Farmers. This Limits Their



Ability To Adopt Modern Technologies And Practices, Which Results In Low Productivity And Profitability.

- 8. Inadequate Extension Services:** Extension Services Play A Crucial Role In Disseminating Information On Modern Technologies And Practices To Farmers. However, The Extension Services In India Are Inadequate And Often Fail To Reach The Farmers In Remote And Marginalized Areas.
- 9. Land Tenure Issues:** Land Tenure Issues, Such As Land Disputes And Insecure Land Rights, Are A Major Constraint For Farmers In India. This Limits Their Ability To Invest In Their Land And Adopt Modern Technologies And Practices, Which Reduces Their Productivity And Profitability.
- 10. Lack Of Market Reforms:** The Agriculture Sector In India Is Highly Regulated, Which Limits The Ability Of Farmers To Sell Their Produce In Open Markets And Receive Fair Prices. The Lack Of Market Reforms Also Results In High Transaction Costs And Poor Market Linkages, Which Reduces The Profitability Of Farmers.
- 11. Poor Credit Facilities:** Access To Credit Is A Major Constraint For Farmers In India, Especially Small And Marginal Farmers. The Credit Facilities Provided By Banks And Financial Institutions Are Often Inadequate And Fail To Meet The Needs Of Farmers.

In Conclusion, While Indian Agriculture Has Undergone Significant Growth Over The Years, There Are Still Several Constraints That Limit Its Potential To Contribute To The Country's Economic Growth And Development. Addressing These Constraints Requires A Comprehensive Approach That Involves Policy Reforms, Technological Advancements, And Investments In Infrastructure And Human Capital. By Addressing These Constraints, Indian Agriculture Can Realize Its Full Potential And Contribute To The Country's Economic Growth And Development.

## **6.5 Agriculture Policies**

Agriculture Is One Of The Most Important Sectors Of The Indian Economy, Providing Livelihoods To A Significant Portion Of The Population. To Promote The Growth And Development Of Agriculture, The Indian Government Has Implemented Various Agricultural Policies Over The Years. In This Unit, We Will Discuss The Major Agricultural Policies In The Indian Economy.

- 1. Green Revolution:** The Green Revolution Was A Major Agricultural Policy Introduced In The 1960s To Increase The Productivity Of Food Grains, Especially Wheat And Rice. The

Policy Focused On The Use Of High-Yielding Varieties Of Seeds, Chemical Fertilizers, And Pesticides. The Green Revolution Helped To Increase Food Production And Make India Self-Sufficient In Food Grains.

2. **Land Reforms:** Land Reforms Were Introduced In India After Independence To Address The Issue Of Unequal Distribution Of Land. The Policy Aimed To Redistribute Land To The Landless And Marginal Farmers And To Provide Them With Secure Land Rights. Land Reforms Also Facilitated The Introduction Of Modern Technologies And Practices In Agriculture.
3. **Minimum Support Price (Msp):** The Minimum Support Price (Msp) Is A Policy Introduced By The Government To Ensure That Farmers Receive A Fair Price For Their Produce. The Government Announces Msps For Various Crops Each Year And Procures The Produce From Farmers At The Msp. This Policy Provides Price Stability And Income Security To Farmers.
4. **Agricultural Credit:** The Government Provides Agricultural Credit To Farmers At Subsidized Interest Rates Through Various Institutions Such As The National Bank For Agriculture And Rural Development (Nabard), Regional Rural Banks, And Cooperative Banks. This Policy Helps Farmers To Access Credit At Affordable Rates And Invest In Their Farms.
5. **National Agricultural Policy (2000):** The National Agricultural Policy Was Introduced In 2000 To Promote Sustainable Agricultural Growth And Development In The Country. The Policy Aimed To Increase The Productivity Of Agriculture, Promote Diversification Of Crops, Improve Infrastructure And Market Linkages, And Strengthen Research And Development In Agriculture.
6. **Rashtriya Krishi Vikas Yojana (Rkvy):** The Rashtriya Krishi Vikas Yojana Is A Policy Introduced By The Government In 2007 To Provide Financial Assistance To States For Agriculture And Allied Activities. The Policy Aims To Promote Holistic Growth And Development Of Agriculture In The Country By Focusing On Various Areas Such As Crop Diversification, Infrastructure Development, And Market Linkages.
7. **Pradhan Mantri Fasal Bima Yojana (Pmfby):** The Pradhan Mantri Fasal Bima Yojana Is A Crop Insurance Scheme Introduced By The Government In 2016 To Provide Insurance Coverage To Farmers Against Crop Loss Due To Natural Calamities, Pests, And Diseases. The Scheme Aims To Reduce The Financial Burden On Farmers Due To Crop Loss And Promote Risk Management In Agriculture.

- 8. Soil Health Card Scheme:** The Soil Health Card Scheme Is A Policy Introduced By The Government In 2015 To Provide Farmers With Information On The Nutrient Status Of Their Soil And Recommendations On The Application Of Fertilizers. The Scheme Aims To Promote Balanced And Judicious Use Of Fertilizers And Improve Soil Health.
- 9. E-Nam:** The Electronic National Agriculture Market (E-Nam) Is An Online Platform Introduced By The Government In 2016 To Facilitate The Trading Of Agricultural Produce Across The Country. The Platform Aims To Promote Transparent And Efficient Price Discovery And Improve Market Linkages For Farmers.

In Conclusion, Agricultural Policies Have Played A Significant Role In Promoting The Growth And Development Of Agriculture In The Indian Economy. These Policies Have Helped To Increase Productivity, Provide Price Stability And Income Security To Farmers, And Promote Sustainable Agricultural Growth. However, There Are Still Several Challenges Facing The Agriculture Sector, Such As Low Productivity, High Input Costs, Inadequate Market Linkages, And Climate Change.

#### **Check Your Progress (A)**

Q1: What Do You Mean By Food Crops?

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q2: Explain The Term Non-Food Crops.

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q3: Give Any Two Constraints For The Growth Of Agriculture In The Indian Economy.

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q4: Explain Any Three Agricultural Policies.

Ans: \_\_\_\_\_  
\_\_\_\_\_

## **6.6 Green Revolution**

The Green Revolution Refers To A Series Of Initiatives And Innovations In Agricultural Technology And Practices That Began In The 1940s And 1950s And Aimed To Increase Agricultural Productivity And Achieve Food Security, Particularly In Developing Countries. The Term "Green" Refers To The Increased Use Of Chemical Fertilizers, Pesticides, And Improved Seed Varieties That Led To A Significant Increase In Crop Yields.

It Was Characterized By The Widespread Adoption Of Modern Farming Techniques, Such As The Use Of High-Yielding Crop Varieties, Irrigation, And Mechanization. The Initiative Helped To Alleviate Hunger And Poverty In Many Developing Countries By Increasing Food Production And Reducing Dependence On Imported Food. The Term "Green Revolution" Was Coined By The American Biologist William Gaud In The Early 1960s To Describe The Technological And Policy Changes That Transformed Agriculture In Many Developing Countries. The Primary Focus Of The Green Revolution Was To Increase The Production Of Wheat And Rice, The Two Major Food Grains In India. The Strategy Included The Use Of High-Yielding Varieties (Hyvs) Of Seeds, Chemical Fertilizers, Pesticides, And Irrigation. It Was Successful In Increasing Food Production In India And Making The Country Self-Sufficient In Food Grains. The Introduction Of Hyvs Of Seeds, Which Had Higher Yield Potential Than Traditional Seeds, Played A Major Role In Increasing Productivity. The Use Of Chemical Fertilizers And Pesticides Helped To Control Pests And Diseases And Improve Crop Yields. The Expansion Of Irrigation Facilities Also Helped To Increase Crop Productivity.

The Green Revolution Had An Important Impact On The Agricultural Sector In India. The Production Of Wheat And Rice Increased From 52 Million Tonnes In 1960-61 To 275 Million Tonnes In 2019-20. The Adoption Of New Technologies And Practices Led To The Emergence Of A New Class Of Progressive Farmers Who Were Able To Benefit From The Increased Productivity And Profitability Of Agriculture.

However, The Green Revolution Also Had Some Negative Consequences. The Increased Use Of Chemical Fertilizers And Pesticides Led To Environmental Problems Such As Soil Degradation, Water Pollution, And Health Hazards. The Reliance On A Few High-Yielding Varieties Of Seeds Led To The Loss Of Biodiversity And Genetic Diversity. The Green Revolution Also Exacerbated Income Inequalities, As Large Farmers With Access To Credit And Irrigation Facilities Were Able To Benefit More Than Small And Marginal Farmers.

## **6.7 Impacts of the Green Revolution**

The Green Revolution In India Had A Significant Impact On The Indian Economy, Particularly On The Agricultural Sector.

### **A. Positive Impacts**

- 1. Improved Agricultural Productivity:** The Green Revolution Led To A Significant Increase In Agricultural Productivity In India. The Use Of High-Yielding Varieties Of Seeds, Fertilizers, And Pesticides Helped To Increase Crop Yields And Reduce Crop Losses Due To Pests And Diseases. As A Result, India Was Able To Achieve Self-Sufficiency In Food Grain Production And Even Become A Net Exporter Of Food Grains.
- 2. Better Food Security:** The Green Revolution Helped To Improve Food Security In India By Increasing The Production Of Food Grains. The Increased Food Production Helped To Reduce Food Shortages, Particularly In The 1960s And 1970s When India Faced Severe Food Shortages. The Green Revolution Helped To Ensure That Food Was Available And Accessible To All, Particularly The Poor.
- 3. Emergence Of A New Class Of Farmers:** The Green Revolution Led To The Emergence Of A New Class Of Farmers Who Were Able To Benefit From The Increased Productivity And Profitability Of Agriculture. These Farmers, Often Referred To As Green Revolution Farmers, Were Able To Adopt New Technologies And Practices And Increase Their Income And Standard Of Living.
- 4. Growth Of Agro-Industries:** The Green Revolution Led To The Growth Of Agro-Industries Such As Seed Production, Fertilizer Production, And Pesticide Production. The Increased Demand For These Inputs Led To The Growth Of These Industries And The Creation Of New Jobs.
- 5. Increase In Rural Incomes:** The Green Revolution Led To An Increase In Rural Revenues, Particularly For The Green Revolution Farmers Who Were Able To Adopt New Technologies And Practices. The Increase In Rural Incomes Helped To Reduce Poverty In Rural Areas And Improve The Standard Of Living Of Rural People.

### **B. Negative Impacts**

Green Revolution Also Had A Verse Impact On The Indian Economy, Particularly In The Long Run. HereAre Some Of The Main Negative Influences:

- 1. Environmental Degradation:** The Increased Use Of Fertilizers And Pesticides Led To Soil Degradation And Water Pollution. The Intensive Use Of Groundwater For Irrigation Led To The Depletion Of Aquifers And A Decline In Water Quality. The Overuse Of Chemical Inputs Also Led To The Loss Of Biodiversity And Genetic Diversity.
- 2. Income Inequality:** The Green Revolution Exacerbated Income Inequality, As Large Farmers with Access To Credit And Irrigation Facilities Were Able To Benefit More Than Small And Marginal Farmers. This Led To An Increase In Income Inequality And A Concentration Of Land Ownership.
- 3. Vulnerability To Market Fluctuations:** The Green Revolution Led To The Production Of A Few High-Yielding Varieties Of Crops, Which Made The Agricultural Sector Vulnerable To Market Fluctuations. Any Disruption In The Market Could Have A Significant Impact On The Production And Prices Of These Crops, Leading To Volatility In The Agricultural Sector.
- 4. Dependence On External Inputs:** The Green Revolution Led To A Dependence On External Inputs Such As Seeds, Fertilizers, And Pesticides. This Dependence Made The Agricultural Sector Vulnerable To Fluctuations In Input Prices And Supply Disruptions.

Therefore, Green Revolution Had Both Positive And Negative Impacts On The Indian Economy. While It Helped To Increase Agricultural Productivity And Improve Food Security, It Also Led To Environmental Degradation, Income Inequality, And Vulnerability To Market Fluctuations.

## **6.8 Land Reforms**

Land Reform Refers To The Process Of Redistributing Agricultural Land To Landless Farmers Or Small And Marginal Farmers To Reduce Income Inequality And Poverty In Rural Areas. In India, Land Reforms Have Been An Important Policy Objective Since The Country's Independence In 1947. Here Are Some Of The Key Land Reforms That Have Been Implemented In The Indian Agricultural Sector:

- 1. Abolition Of Intermediaries:** One Of The First Land Reforms Implemented In India Was The Abolition Of Intermediaries Such As Zamindars And Jagirdars, Who Were Feudal Landlords Who Held Large Tracts Of Land And Controlled The Rural Economy. The Abolition Of Intermediaries Was Aimed At Transferring Ownership Of Land To The Actual Cultivators, Which Helped To Reduce The Concentration Of Land Ownership.
- 2. Tenancy Reforms:** Tenancy Reforms Aimed To Protect Tenants From Eviction And Ensure

That They Received A Fair Share Of The Crop Produced On The Land They Cultivated. Tenancy Reforms Varied From State To State, But Generally Involved Setting A Ceiling On The Amount Of Land A Landlord Could Own And Distributing The Surplus Land To Landless Farmers.

3. **Ceiling On Land Holdings:** Ceiling On Land Holdings Refers To The Maximum Amount Of Land That An Individual Or Family Can Own. This Policy Was Aimed At Reducing Land Concentration And Redistributing Surplus Land To The Landless. Ceiling Laws Were Implemented At the State Level And Varied From State To State.
4. **Land Consolidation:** Land Consolidation Involves The Exchange Of Scattered Plots Of Land Among Farmers To Create Larger, More Contiguous Plots. This Policy Aimed To Increase Productivity By Enabling Farmers To Use Modern Machinery And Irrigation Facilities More Efficiently.
5. **Land Records Modernization:** Land Records Modernization Refers To The Computerization Of Land Records To Provide A Transparent And Efficient System Of Land Ownership And Transfer. This Policy Aimed To Reduce Disputes Over Land Ownership And Improve Access To Credit And Other Agricultural Services.

However, Here Are Some Of The Challenges:

1. **Resistance From Landlords:** Land Reforms Have Faced Resistance From Landlords Who Have Opposed The Redistribution Of Land. Landlords Have Used Political Influence And Legal Means To Stall The Implementation Of Land Reform Measures.
2. **Inadequate Implementation:** Land Reforms Have Not Been Implemented Adequately In Some States, Which Has Led To Low Levels Of Land Redistribution And Continued Concentration Of Land Ownership.
3. **Corruption And Fraud:** Land Records Modernization Has Faced Challenges Due To Corruption And Fraud, As Some Officials Have Manipulated Land Records To Benefit Themselves Or Their Acquaintances.
4. **Lack Of Resources:** Land Reforms Require Significant Resources To Implement Effectively, Which Has Been A Challenge In A Country Like India, Where Resources Are Limited.

In Conclusion, Land Reforms Have Been An Important Policy Objective In The Indian Agricultural Sector. While They Have Had Some Positive Impacts, Such As Reducing Income Inequality And Improving Land Productivity, They Have Also Faced Several Challenges,

Including Resistance From Landlords, Inadequate Implementation, Corruption And Fraud, And Lack Of Resources.

## **6.9 Recent Developments In Agricultural Policy**

In Recent Years, India Has Implemented Several Policy Measures To Support The Growth And Development Of The Agricultural Sector. Here Are Some Of The Key Recent Developments In Agricultural Policy:

- 1. The Pradhan Mantri Fasal Bima Yojana (Pmfby):** Pmfby Is A Crop Insurance Scheme Launched In 2016 That Aims To Provide Insurance Coverage And Financial Support To Farmers In Case Of Crop Losses Due To Natural Calamities, Pests, And Diseases. The Scheme Covers Both Yield Loss And Post-Harvest Losses.
- 2. The Soil Health Card Scheme:** The Soil Health Card Scheme Was Launched In 2015 To Provide Soil Health Cards To Farmers, Which Contain Information About The Nutrient Status Of Their Soil And Recommendations For Appropriate Doses Of Nutrients To Maintain Soil Health And Improve Crop Productivity.
- 3. The National Agriculture Market (Enam):** Enam Is An Online Platform Launched In 2016 That Aims To Create A Unified National Market For Agricultural Commodities By Connecting Existing Physical Markets Through An Electronic Trading Portal. The Platform Aims To Provide Transparent Pricing And Reduce The Role Of Intermediaries In The Market.
- 4. The Pradhan Mantri Krishi Sinchai Yojana (Pmksy):** Pmksy Is A Scheme Launched In 2015 That Aims To Expand The Coverage Of Irrigation Infrastructure And Improve Water Use Efficiency In The Agricultural Sector. The Scheme Focuses On Creating New Water Sources, Improving Existing Water Sources, And Distributing Water Through Efficient Micro-Irrigation Systems.
- 5. The Agricultural Produce And Livestock Marketing (Promotion And Facilitation) Act, 2017:** This Act Was Passed In 2017 To Provide A Framework For The Creation Of An Efficient And Transparent Agricultural Marketing System In The Country. The Act Allows Farmers To Sell Their Produce Outside Of The Mandis (Wholesale Markets) And Eliminates The Role Of Intermediaries In The Market.
- 6. The Kisan Credit Card Scheme:** The Kisan Credit Card Scheme Was Launched In 1998 To Provide Credit Facilities To Farmers For Their Agricultural And Related Activities. The Scheme Has Been Recently Expanded To Provide Credit Facilities For Allied Activities Like



Animal Husbandry, Dairy, And Fisheries.

These Recent Developments In Agricultural Policy Have Aimed To Address Some Of The Challenges Faced By The Indian Agricultural Sector, Such As Low Productivity, Lack Of Access To Credit And Insurance, And Inefficient Marketing Systems. However, There Are Still Several Challenges That Need To Be Addressed, Such As Fragmented Land Holdings, Low Adoption Of Modern Technology, And Lack Of Access To Markets For Small And Marginal Farmers. These Policies Have Aimed To Address Some Of The Challenges Faced By The Sector And Improve The Lives Of Farmers. However, There Is Still A Long Way To Go In Achieving Sustainable And Inclusive Growth In The Indian Agricultural Sector.

### **Check Your Progress (B)**

Q1: Explain The Term Green Revolution.

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q2: Give Any Three Impacts Of The Green Revolution On Indian Economy.

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q3: Explain Land Reforms.

Ans: \_\_\_\_\_  
\_\_\_\_\_

Q4: Describe Recent Developments In Agriculture Policies.

Ans: \_\_\_\_\_  
\_\_\_\_\_

### **6.10 Summary**

Food And Other Resources For Daily Requirements Are Provided By Agriculture, An Important Industry That Has Played A Significant Part In The Indian Economy And Continues To Do So Now. Subsistence Farming Has Given Way To Contemporary Industrial Agriculture, Which Uses Cutting-Edge Technology And Scientific Procedures To Boost Productivity And Efficiency.

Major Cropping Patterns Of India Followed By Food Crops And Non-Food Crops. Food Crops Are Classified Into Four Broad Categories As Food Crops, Which Include, Kharif Crops, Rabi Crops, Zaid Crops, And High-Value Cash Crops. The Green Revolution Was Characterized By The Widespread Adoption Of Modern Farming Techniques, Such As The Use Of High-Yielding Crop Varieties, Irrigation, And Mechanization. The Initiative Helped To Alleviate Hunger And Poverty In Many Developing Countries By Increasing Food Production And Reducing Dependence On Imported Food. The Term "Green Revolution" Was Coined By The American Biologist William Gaud In The Early 1960s To Describe The Technological And Policy Changes That Transformed Agriculture In Many Developing Countries.

### **6.11 Questions for Practice**

#### **A. Short Answer Type Questions**

Q1. Explain the Terms

- a) Food Crops
- b) Non-Food Crops

Q2. Define Green Revolution.

Q3. Define The Below Policies

- a) National Agriculture Market (Enam)
- b) Kisan Credit Card Scheme

Q4. Explain Land Reforms.

#### **B. Long Answer Type Questions**

Q1. What Is The Cropping Pattern Of Agriculture In The Indian Economy?

Q2. Explain The Growth Of Indian Agriculture.

Q3. What Are The Various Constraints Of Indian Agriculture?

Q4. Explain Different Types Of Agriculture Policies.

Q5. What Do You Mean By Green Revolution?

Q6. What Are The Good And Bad Impacts Of The Green Revolution?

Q7. Discuss Land Reforms.

Q8. What Are The Recent Developments In Agricultural Policy?

### **6.12 Suggested Readings**

K.S. Gill: Evolution Of Indian Economy, Ncert, New Delhi.

Gaurav Datt and Ashwani Mahajan: Datt And Sundharam Indian Economy, S. Chand AndCo.

A.M. Khusro: Readings In Agricultural Development, Allied Publishers, Bombay, 1968.

P.C. Joshi: Land Reforms In India, Allied Publishers, Bombay, 1976.

**M.A (ECONOMICS)**

**SEMESTER - II**

**ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

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**UNIT7: INDIAN INDUSTRY**

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**Structure**

**7.0 Objectives**

**7.1 Introduction**

**7.2 Growth and Pattern of Industrialization In India**

**7.2.1 Growth And Pattern Of Industrialization In India During The Planning Era**

**7.2.1.1 First Stage (1951- 1965)**

**7.2.1.2 Second Stage (1965-1980)**

**7.2.1.3 Third Stage (1981-1990)**

**7.2.1.4 Fourth Stage (1991-2014)**

**7.2.2 Growth and Pattern of Industrialization in India Year 2015 Onwards**

**7.3 Industrial Policy**

**7.3.1 Industrial Policy Resolution, 1948**

**7.3.2 Industrial Policy Resolution Of 1956**

**7.3.3 The Industrial Policy Statement, 1977**

**7.3.4 The Industrial Policy Statement Of 1980**

**7.3.5 The Industrial Policy, 1991**

**7.4 Questions For Practice**

**7.5 Suggested Readings**

**7.0 Objectives**

After Reading This Unit, You Will Be Able To:

- Explain The Pattern Of Industrial Growth Since Independence
- Discuss Various Industrial Policies

## **7.1 Introduction**

Industrialization Is The Process Of Socio-Economic Transformation Of An Agrarian Society Into An Industrial Society. Throughout This Transformation, Inventions And Innovations Helped The Economy Grow And Prosper Over Time. The First Industrial Revolution In Modern History Occurred In Europe In The Mid-18th Century. The Major Players In This Revolution Were Great Britain, Belgium, Switzerland, Germany, And France. Several Technological And Innovative Changes Were Implemented, Causing A Multiplier Effect On Production Levels. The Result Was The Transformation Of Rural Feudal Workers Into Industrial Workers. Following That, North America's Economy Transitioned From Agriculture To Industry. Asian And African Countries Like Brazil, Russia, India, China, And South Africa Industrialized Between The Mid-19th And 20th Centuries.

## **7.2 Growth and Pattern of Industrialization In India**

The Process Of Industrialization Begins In India In The Mid-19th Century. In 1854, Asia'S First Steam-Powered Cotton Mill Was Set Up In Bombay (Mumbai). After Slow Initial Growth, This Modernized Cotton Mill Industry Only Began Expanding In The Early 80s. A Real Industrial Revolution Took Place In The Country After Independence, During The Planning Era. To Fully Exploit Demographic Dividends, Industrial Growth Is Crucial For Creating New Jobs In The Country Today. It Also Helps To Overcome Trade Deterioration, Bring Technological Progress And Provide The Necessary Elements For Strengthening The Economy.

### **7.2.1 Growth and Pattern of Industrialization In India During The Planning Era:**

Industrial Growth In This Era Was Further Divided Into Four Stages:

- a. First Stage (1951- 1965)
- b. Second Stage (1965-1980)
- c. Third Stage (1981-1990)
- d. Fourth Stage (1991-2014)

The Source Of Data Used In This Chapter Is Taken From Various Five Years Plan Reports Of

The Indian Planning Commission.

#### **7.2.1.1 First Stage (1951-1965):**

It is also called the premature stage. It comprises the first three five-year plans except for the years 1965-66. A strong industrial base is built during this period. The first five-year plan (1951-55) emphasizes on building basic amenities for industrialization like power and irrigation. This way, the first plan only aimed at the full utilization of existing capacity. But the growth rate is significant during this period. It achieved a compound annual growth rate of 7 per cent during the first plan. During the second plan (1956-61), investments were made in heavy industries, including iron, steel, and machine-building sectors. Three steel plants were built in the public sector. These are Rourkela Steel Plant in Orissa, Bhilai Steel Plant in MP and Durgapur Steel Plant in West Bengal. Also, during this time, there is development of manufacturing units like Hindustan Machine Tools, Hindustan Shipyard and Chittaranjan Locomotive Factory. A fertilizer factory was established in Nangal. There is an investment in both existing and new types of industries during this period. The government of India had set up approximately 60 industrial estates, which include more than 1000 small factories. Small entrepreneurship flourished during this period. The first and second five-year plans crafted the base for industrialization in India. The third plan (1961-66) emphasized achieving the maximum rate of investment in industry, power generation and transport. The major goal was to achieve self-sufficiency in the capital goods industry. The industry grows at the rate of

7.6 per cent per annum during the period 1961-65. In total, the compound annual growth rate for this stage ranged between 5.0 and 8.0 per cent.

#### **7.2.1.2 Second Stage (1965-1980):**

The last year of the third plan witnessed a considerable slowdown in the industrial sector of India which lasted till 1980. The growth rate of heavy industries like machinery, transport equipment and basic metals critically decelerated. There were mainly two major reasons behind this slow-down. First of all, there occurred two severe droughts in India in mid-1960s. The state of affairs was so worse that the country had to import wheat from the USA. This leads to a budgetary crunch. Also, there was a decline in foreign aid as India was at war with Pakistan. The worse effect of the deceleration process was on industries related to paper and paper products, rubber products, non-metallic mineral

Products, Basic Metals And Metal Products. Textiles And Food Manufacturing Are Two Industries That Remain Indifferent From This Deceleration Process. The Textile Industry Accounted For 20 Per Cent Of The Total Value Added In Manufacturing Units Of India. But It Has Had A

Modest Growth Rate From The Early Period. It Was 2.3 Per Cent Per Annum During 1956-65 Which Slowly Rise To 4.4 Per Cent Per Annum During 1966-69. However, During This Period The Overall Industry Sector Growth Rate Was Around 5 Per Cent. On The Other Hand, The Food Manufacturing Industry Has A Volatile Growth Rate Which Fluctuates Almost Every Year. However, It Recorded Slow Growth. The Targeted Growth Rate Of The Fourth Plan (1969-74) Was 8 Per Cent. But The Country Achieved Only A 5 Per Cent Growth Rate In The Industrial Sector During This Period. Hence, The Performance Of This Sector Is Far Short Than Expected. The Situation Is Not So Good Even In The Fifth Plan Which Achieves On Average Only A 5.3 Per Cent Annual Growth Rate. However, To Attract Investment From The Private And Foreign Sectors, The Revised Fifth Plan Removed Monopolistic And License-Related Restrictions.

#### **7.2.1.3 Third Stage (1981-1990):**

The Deceleration Period Ended In 1980 And The Indian Industrial Sector Recovered. The Third Stage, Also Known As The Recovery Stage, Includes The Sixth And Seventh Five-Year Plans. This Phase Lasted Until 1991 When Economic Reforms Occurred. During The Sixth Plan (1980-85), The Emphasis Was On Structural Diversification, Modernization And Self-Reliance. Exports Of Engineering Goods And Industrial Products Were Encouraged During This Period. On The Other Hand, Domestic Know-How Substitutes Technology Imports. As A Result, The Country Attempted To Increase Its Foreign Reserves By Encouraging Exports And Substituting Imports. The Expansion Of The Cottage Industry Was Also A Motive In This Period. Overall, The Industrial Growth Rate During 1980-85 Was Just 5.5 Per Cent. The Industrial Sector Showed Signs Of Revival During This Period. The Next Five Years (1985-90) Witnessed A Rapid Recovery, And The Average Growth Rate Reached 8.5 Per Cent. The Industries That Showed Rapid Development In This Period Were Petrochemicals And Chemicals With An Average Growth Rate Of 11.19 Per Cent. This Shifted The Pattern Of Indian Industry From *Heavy Industry* To *Chemical Industry* And The Country Entered A New Era Of Industrialization. This Period Also Saw The Manufacturing Industry Grow By 7.5 Per Cent Per Annum, The Basic Goods Sector By 8.7 Percent Per Annum, While Both The Capital Goods And Intermediate

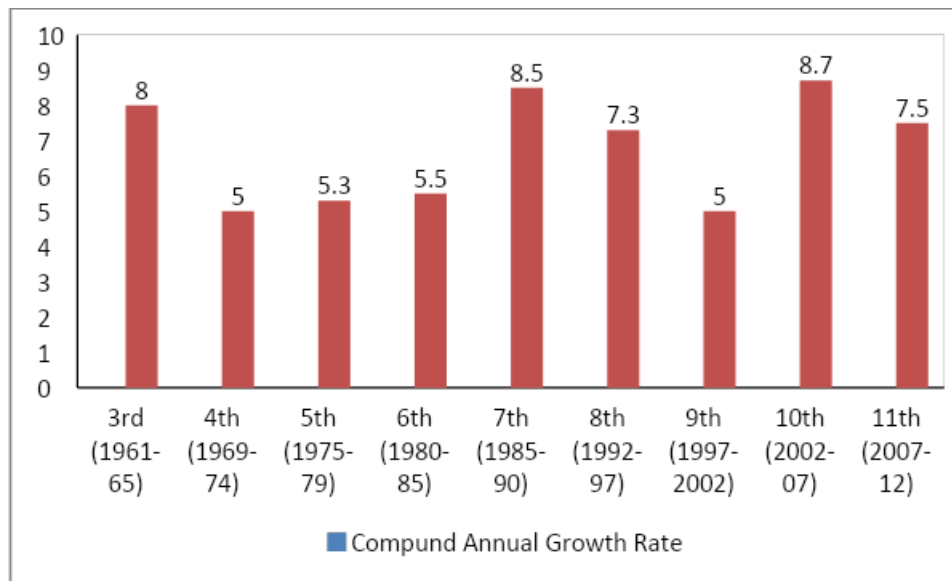
Goods Sectors Grew By Around 6 Percent. Among The Main Reasons For This Rapid Recovery Were: The Restructuring Of Domestic Industrial Policies, Simplification Of Procedures, And Easier Access To Better Technology And Intermediate Materials, As Well As More Flexibility In Utilizing Installed Capacity. This Resulted In A Significant Increase In Factor Productivity.

#### **7.2.1.4 Fourth Stage (1991-2014):**

India's Industrial Revolution During The Planning Era Ended With This Phase. The Fourth Stage Began In 1991 With Economic Reforms In The Country And Lasted Until The Dissolution Of The Planning Commission In 2014. Government Policies And Economic Reforms Caused A Rapid Decline In The Secondary Sector. The Industrial Growth Rate Fluctuates Heavily, During This Phase. Industrial Growth In 1992-93 Was Just 2.3%. In 1993-94, It Increased To 6 Per Cent, In 1994-95 It Increased To 9.1 Per Cent, And In 1995-96 It Reached A Respectable 13 Per Cent. The Growth Rate Again Declined In 1996-97 To 6.7 Per Cent. Hence, Industrial Sector Growth During The Eighth Plan (1992-97) Was 7.3 Per Cent. However, The Ninth Five-Year (1997-2002) Plan Had A Lower Growth Rate, 5 Per Cent Only. In The 1990s, The Indian Economy Began To Undergo Significant Liberalization And Privatization, Which Led To Some Major Changes In The Industrial Sector. Earlier Indian Industry Operated In A Protective Environment. Now, The Sudden Opening Of The Economy To The Private And Foreign Sectors Exposed Indian Industry To Foreign Competition For Which It Was Hardly Prepared. Therefore, The Slowdown Reflects In Earlier Years. Hydrocarbon, Copper, And Paper Industries Are Negatively Affected By The Reduced Import Duties. Dumping By Foreigners Was Another Serious Problem. Also, Inadequate Infrastructure Was A Major Hurdle To Industrialization. The Cyclical Slowdown Covered Almost All Sectors Including Manufacturing, Electricity, Mining, Capital Goods, Intermediate Goods And Even Both Groups Of Consumer Goods (Durable And Non-Durable). After That, The Tenth (2002-07) And Eleventh (2007-12) Five-Year Plans Witnessed A High Growth Rate Of Domestic Production. In The Tenth Plan (2002-07), Industrial Growth Was 8.74 Per Cent, While Service Growth Was 9.28 Per Cent. Manufacturing And Capital Goods Drive This Period's Growth. The Eleventh Plan, However, Witnessed Significant Fluctuations In Industrial Growth Rates. In 2008-09, Growth Collapsed From Over 8 Per Cent To 2.8 Per Cent. The Global Financial Crisis Of 2008 Was The Main Reason For This Collapse. Industrial Growth Recovered In 2009-10 And Reached 10 Per Cent. It Recovered To 8.2 Per Cent In 2010-11 After Some Setbacks.



**Diagram 7.1 Trends In Industrial Growth Rate (Plan Wise)**



Source: Data Extracted From The Planning Commission Of India.

Available At <https://www.india.gov.in/website-planning-commission>

### **7.2.2 Growth And Pattern Of Industrialization In India Year 2015 Onwards**

Since 2014 Government Took Various Policy Measures And Initiatives Under Niti Aayog To Develop The Industrialization To Next Level. For Example, The Make In India Campaign Is Launched To Attract New Start-Ups And Ventures. In 2022-22 There Registered 39,539 New Businesses In The Manufacturing Sector. This Is Almost Double The Last Financial Year I.E. 2020-21. The Government Of India Has A Vision To Make A Usd 5 Trillion Economy Up To 2026-27 Which Can Be Only Possible With The Help Of Industrialization. For This, There Is Identified A Core Sector Including Eight Major Industrial Sectors. These Are Refinery Products, Electricity, Steel, Coal, Crude Oil, Natural Gas, Cement And Fertilizers. The Core Sector Reported A Revival From The Covid Period And Achieved An 8 Per Cent Annual Growth Rate In June 2022. There Is A Pleased Performance Of All The Sectors, Except Steel And Crude Oil. But The Development Of The Industrial Sector Is Still Less The Targeted One. There Are Some Major Reasons For This Slowdown:

- a. Due To Global Recession, The Demand For Indian Exports In European Countries Is

Declining Continuously.

- b. There Is A Decline In Domestic Demand.
- c. High And Persistent Inflation Leads To Tight Monetary Policy By Rbi. This Block The Investment In The Industry.
- d. Returns Are Not So Certain Due To The Global Financial Crisis. Thus, There Is A Slowdown In Private Investment.
- e. Indian Government Policies Encourage Privatization And Unwillingness To Increase Public Investment.
- f. There Is A Lack Of Efficient Human Capital And Infrastructure In India.

### **7.3 Industrial Policy**

Industrial Policy Is Defined As All Those Procedures, Policies, Rules And Regulations Which Control The Industrial Units Of A Country. It Includes Monetary Policy, Fiscal Policy, Tariff Policy, Labour Policy And Other Government Policies Related To Both The Public And Private Sectors.

#### **7.3.1 Industrial Policy Resolution, 1948**

The First Industrial Resolution Was Laid Down In April 1948. This Plan Considered A Mixed Economy Including Both The Public Sector And Private Sector. The Resolution Divided The Industries Into Four Extensive Units:

1. The Central Government Has Exclusive Ownership In Sectors Of Arms And Ammunition, Atomic Energy And Railway.
2. The New Ventures In Sectors Of Coal, Iron, Steel, Aircraft Manufacturing, Shipbuilding, Telephone Manufacturing, Telegraph And Wireless Apparatus Will Be Undertaken Only By The State.
3. The Industries Which The Central Government Feels Are Of Basic Importance Can Be Planned And Regulated.
4. The Remainder Of Industrial Fields Will Be Left Open To Private Individuals And Organizations.

#### **7.3.2 Industrial Policy Resolution Of 1956**

In January 1950, India's Constitution Was Adopted. After That, The Planning Era Started In

India. In 1951, The Industrial (Department And Regulation) Act (Idr Act) Was Enacted. Under This Act, The Government Attempted To Regulate The Industrialization Process Through Licensing. All This Led To

The First Comprehensive Industrial Development Strategy In India, The Industrial Policy Resolution 1956. Under This Resolution, The Revised Three-Tier Industry Classification Was Outlined As Follows:

1. Schedule A: It Consisted Of 17 Sectors Including Railways, Air Transportation, Arms And Ammunition, Iron And Steel, And Atomic Energy Etc. The Ownership Of These Industrial Units Was Owned By The Government.
2. Schedule B: It Consisted Of 12 Sectors Envisaged To Be State-Owned, With The Private Sector Supplementing State Efforts.
3. Schedule C: The Remaining Sectors Were Listed Under Schedule C. These Industrial Units Were Expected To Be Developed By The Private Sector, Though They Remained Open To The State As Well.

It Should Be Noted That The Demarcation Of Industries Was Not So Rigid And There Was Flexibility To Allow Adjustments And Modifications In The National Interest. For Example, The Resolution Provided That The Private Sector Could Produce Goods In Schedule A Under Certain Conditions. The Resolution Directed The State To Develop Cottage And Small-Scale Industries By Restricting Production Volume In The Large-Scale Sector Through Taxes And Other Policies. The 1956 Resolution Recognized The Need For Foreign Capital But Also Stipulated That 'Ownership And Effective Control Should Always Be In Indian Hands'. The Industrial Policy Resolution Of 1956 Formed The Basis Of Successive Industrial Policies.

### **7.3.3 The Industrial Policy Statement, 1977**

A New Industrial Policy Of 1977 Was Announced By Janta Government As A Statement In The Parliament. Therefore, It Is Called \_The Industrial Policy Statement Of 1977'. In This Statement, Decentralization Of The Industrial Sector Was Emphasized, Which Underlines The Importance Of Small, Tiny And Cottage Industries In The Indian Economy. The Policy Divided The Small Sector Into Three Categories:

#### **7.3.3.1 Cottage And Household Industry**

#### **7.3.3.2 Tiny Sector With An Investment Of Rs. 1 Lakh In Machinery And Equipment.**

### **7.3.3.3 Small Scale Industry With An Investment From Rs. 1 Lakh To 10 Lakhs.**

The Number Of Goods Reserved For The Only Cottage, Tiny And Small-Scale Production Was Also Raised From 180 To 807. A Special Place Is Given To Khadi Udyog, With A View To Improving The Earnings Of Spinners And Weavers Related To This Field. There Is A Clear-Cut Demarcation Of The Large-Scale Sector Also. According To The Statement, A Large-Scale Undertaking Would Work In The Field Of Basic Industry, Capital Goods, High Technology Industry And Other Industrial Production Which Is Not Reserved For Small-Scale Enterprises. The 1977 Industrial Policy Statement Expanded The Role Of The Public Sector Also. It Directed The Government To Maintain Essential Supplies For The Consumer.

### **7.3.4 The Industrial Policy Statement Of 1980**

In 1980, Congress Government Announced Its New Industrial Policy. This Policy Put Emphasis On Competition, Technological Gradation And The Reconstruction Of Industries. For This Policy Suggested Following Measures:

1. Revive The Efficiency Of Public Sector Undertakings
2. Integrating Industrial Development In The Private Sector By Promoting The Concept Of Economic Federalism
3. A Capacity Expansion Of Up To 5 Per Cent Per Year Was Allowed In The Core Sectors And Industries With Long-Term Export Potential.
4. To Encourage The Use Of Alternate Energy Sources And Optimum Energy Utilization In Industrial Processes, Special Incentives Were Granted To Industrial Units.
5. To Develop Small Industries, The Investment Limit Was Raised To 20 Lakh Rupees For Small-Scale Units; 15 To 25 Lakh Rupees For Ancillary Units And 2 Lakh Rupees For Tiny Units.
6. To Improve The Performance Of The Public Sector, The Merger Of Sick Units Into Healthy Units Was Encouraged.

The Industrial Policy Of 1980 Made Large Business Houses Free From The Provisions Of The Mrtp Act And Fera. The Industrial Enterprises That Wanted To Achieve Modernization And Economies Of Scale Had Been Permitted A Regular Increase With A Maximum 49 Per Cent Rise In Capacity. Also, It Promoted Large-Scale Industries At The Expense Of Small-Scale Industries By Blurring The Distinction Between Them. It Can Be Said That By Promoting Large-Scale

Enterprises, This Policy Adopted The Capitalistic Way Of Development. Hence The Goal Of Employment Generation Is Underplayed.

### **7.3.5 The Industrial Policy, 1991**

Under Congress Prime Minister Mr P.V. Narsimha Rao, The New Industrial Policy Was Announced In July 1991. The Objectives Of This Policy Were:

- a) To Remove The Unnecessary Bureaucratic Control Over Indian Industry
- b) To Introduce Liberalization  
To Remove Unnecessary Restrictions Such As The Mrtp Act.
- d) To Encourage Fdi
- e) To Reduce The Number Of Public Sector Sick Units.

To Accomplish These Objectives, The Following Policy Measures Have Been Taken:

#### **1. Industrial Licensing Policy**

Under This Policy, It Was Recommended To Abolish The Licensing Requirement For Almost All Industries Except The 18 Industries Listed Under Security And Strategic Concerns, Hazardous Chemicals And Environmental Reasons. The Major Industries Requiring Licenses Now Were: Coal And Lignite; Petroleum (Other Than Crude) And Its Distillation Products; Distillation And Brewing Of Alcoholic Drinks; Sugar; Animal Fats And Oil; Cigars And Cigarettes Of Tobacco; Asbestos And Asbestos Products; Raw Hides And Skins; Leather Products; Motor Cars; Etc. Also, Eight Industries Were Reserved For The Public Sector. These Include Arms And Ammunition And Allied Items Of Defence Equipment, Defence Aircraft; Atomic Energy; Coal And Lignite; Mineral Oils; Mining Of Iron Ore, Manganese Ore, Chrome Ore, Gypsum, Sulphur, Gold And Diamond; Mining Of Copper, Lead, Zinc, Tin, Molybdenum And Wolfram, Minerals Specified In The Schedule To Atomic Energy; Railway.

#### **2. Foreign Investment**

Fdi Was Vital For Modernization And Technological Development In The 1990s. To Attract Fdi In High-Priority Industries, It Was Decided To Expand Foreign Equity Limits Up To 51 Per Cent. The Approval Was For Only Those Foreign Equities That Cover Foreign Exchange Requirements For Imported Capital Goods. For Export Houses, The Limit Of Foreign Equity Was Raised To 74 Per Cent.

### **3. Foreign Technology**

To Achieve The Desired Level Of Technological Development, It Was Suggested To Automatically Approve Technological Agreements Related To High-Priority Industries, Under Specific Conditions. No Permission Will Be Required For Hiring Foreign Technicians And Testing Indigenous Technology In Foreign Laboratories.

### **4. Public Sector Policy**

The Number Of Sick Units Was Increasing Continuously In The Public Sector. These Units Have Become A Burden Rather Than An Asset To Government. Also, The Public Sector Units Related To The Consumer Goods And Service Sector Demanded Extra Attention. The Industrial Policy Of 1990 Tried To Solve These Problems And Adopted A New Approach Toward Public Sector Units. High Priority Is Given To Infrastructure, Exploration And Exploitation Of Oil And Minerals, Building Manufacturing Capability In Areas With Insufficient Private Investment, And Defence Equipment.

The Government Adopted The Policy Of Disinvestment And Privatization For Sick Public Enterprises. Strategically And Essential Services Units Are Retained Under Public Ownership Whereas Other Areas Are Opened To Private Sectors. The Public Sector Was Also Permitted To Enter In Unreserved Areas. Chronically Sick Units Were Referred To Board For Industrial And Financial Reconstruction (Bifr) To Draft The Revival Schemes. There Was Drafted A Social Mechanism Under These Schemes To Protect The Interest Of Workers During The Rehabilitation Process. The Shares Of Public Sector Units Are Issued For Public And Financial Institutions.

### **5. Mrtp Act**

Industries Are Becoming Increasingly Complex And Economies Of Scale Are Vital To Higher Productivity And Competitive Advantage In International Markets. Thus, It Was Recommended To Limit The Mrtp Act's Interference In The Industrial Sector. The Pre-Investment Scrutiny By Mrtp Was Not Required In The Present Scenario. Under The 1991 Industrial Policy, More Emphasis Will Be Given To Controlling The Unfair Practices Of Monopolistic Houses Rather Than Restricting Them To Do Trade In The Market.

In Short, The New Industrial Policy Of 1991 Eliminated The 'Licence, Permit, And Quota Raj' System. By Removing Bureaucratic Barriers To Industrial Growth, It Attempted To Liberalize The Economy.

The Bjp Government Is Now Working On The Draft Of A New Industrial Policy – *‘Industrial Policy 2022—Make In India For The World’*. It Will Be The Third Full Fledge Industrial Policy Of India After 1956 And 1991. Since 1991, The Indian Economy Witnessed A Drastically Changed Over The Years. Thus, The Proposed Industrial Policy Focuses On Changing Conditions And Will Be Tried To Achieve The Objectives Such As Improving Competitiveness, Achieving International Scale, Integration With Global Supply Chains, Facilitating The Movement Of The Local Industry Up The Value Chain, Becoming An Innovative Knowledge Economy, Improving The Ease Of Doing Business, And Creating Skills And Employment.

## **7.4 Questions for Practice**

### **A. Short Answer Type Questions**

- Q1. Write A Brief Note On Industrial Policy Of India 1956
- Q2. What Is Mrtp Act. When Was It Abolished?
- Q3. What Were The Areas In Which The First Phase Of Industrial Development Received A Major Thrust?
- Q4. Write A Brief Note On New Industrial Policy 1991.
- Q5. The Development Of The Industrial Sector In India Is Still Less Than Targeted One. Give Reasons.

### **B. Long Answer Type Questions**

- Q1. Explain The Pattern Of Industrial Growth In India Since Independence.
- Q2. Discuss Various Industrial Policies Adopted By India For Industrialization.

## **7.5 Suggested Readings**

- Bhagwati, J and Desai, P (1970). India: Industrialization. Oxford University Press, Delhi.
- Ghosh, A, (1980). Indian Economy, Calcutta World Press Private Limited.
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- Thakur, B, Gupta, R. & Singh, R. (2012). Changing Face Of India'S Industrial Policies: A Look, International Journal Of Scientific And Research Publications, Volume 2, Issue 12.

- Bhat T. P. (2013). Growth And Structural Change In Indian Industries, Institute For StudiesIn Industrial Development (Isid), 2013/2.



**M.A (ECONOMICS)**

**SEMESTER - II**

**ECONOMICS OF GROWTH AND DEVELOPMENT AND INDIAN ECONOMY**

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**UNIT 8: ROLE OF PUBLIC AND PRIVATE SECTOR IN INDIA**

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**Structure**

**8.0 Learning Objectives**

**8.1 Introduction: Meaning Of Public Sector**

**8.2 Objectives of the Public Sector**

**8.3 Significance Of The Public Sector**

**8.4 Causes of Low Profitability in the Public Sector**

**8.5 Suggestions For Improvement Of Public Sector Enterprises In India**

**8.6 Meaning Of Private Sector**

**8.7 Objectives of Private Enterprises**

**8.8 Significance Of The Private Sector**

**8.9 Causes of Low Profitability In The Private Sector**

**8.10 Suggestions For Improvement Of Public Sector Enterprises In India**

**8.11 Sum Up**

**8.12 Questions For Practice**

**8.13 Suggested Readings**

**8.0 Learning Objectives**

After Studying The Unit, Students Will Be Able To Know:

- Meaning Of Public And Private Sector
- Significance Of The Sectors
- Causes For The Low Productivity

- Suggestion to Improve Both Sectors In The Economy.

### **8.1 Introduction: Meaning Of Public Sector**

Indian Economy Is A Mixed Economy, In Which Both The Public As Well As Private Sector Have Their Distinct Significance. The Public Sector Is The Part Of The Economy That Is Owned, Controlled, And Operated By The Government Or Its Agencies. It Includes Organizations And Activities That Are Funded By Taxpayers And Provide Essential Services To The Public, Such As Healthcare, Education, Law Enforcement, And Public Utilities. The Public Sector Also Includes Government Businesses And Corporations, Such As Postal Services, Public Transportation, And Public Housing. The Prime Objective Of The Public Sector Is To Serve The Public Interest And Ensure That Essential Services And Resources Are Available To All Members Of Society, Regardless Of Their Ability To Pay.

According To S.H. Khera, "Public Enterprises Are Industrial, Commercial And Economic Activities Carried On By The Central Government Or By The State Government Or Jointly By The Central And The State Government".

### **8.2 Objectives Of Public Enterprises/Public Sector**

- 1. Economic Development:** Public Enterprises Often Play A Crucial Role In Fostering Economic Development By Investing In Sectors That Are Vital For The Country's Growth. This Can Include Infrastructure Development, Energy Production, Transportation, And Technology Advancement. These Enterprises Are Expected To Contribute To The Overall Economic Prosperity Of The Nation.
- 2. Increase In Capital Formation:** Savings That Constitute An Important Component Of Capital Formation Are Generally Low In Less Developed Countries. Thus, To Accelerate The Rate Of Economic Growth, Such Industries By The Government May Stimulate Production, Encourage Other Industries, Increase Saving, And Promote Investment.
- 3. Economic Stability:** During Economic Crises Or Times Of Market Volatility, Public Enterprises Can Act As Stabilizing Forces By Ensuring The Availability Of Essential Goods And Services And Preventing Market Failures.
- 4. Promote Economic Equality:** To Avoid Concentration Of Economic Power. Key Industries In The Economy Must Be Run By The State; As Private Sector Enterprises May Result In The Concentration Of Economic Power. Thus, Public Sector Enterprises Help Achieve Economic Equality.

- 5. Welfare Activities:** Public Enterprises Can Be Tasked With Providing Essential Services To The Public, Such As Healthcare, Education, Housing, And Utilities. Their Primary Objective In These Cases Is To Ensure That These Services Are Accessible, Affordable, And Of High Quality, Thereby Promoting The Welfare And Well-Being Of The Population.
- 6. Set Up Defence Industries:** The State Depends Upon Public Sector Enterprises For Its Defense Needs, Defence Industries Cannot Be Left To The Uncertainties Of The Private Enterprises
- 7. Regional Equality:** Public Enterprises May Be Used As Instruments For Regional Development By Establishing Operations In Underdeveloped Or Remote Areas To Stimulate Economic Growth And Reduce Regional Disparities. On The One Hand, There Are Industrially Developed Regions Like Maharashtra, Gujarat, Tamil Nadu And West Bengal. On The Other Hand, Regions Like Odisha, Bihar, Jharkhand, And Rajasthan Are Relatively Backward. As A Result Of It, Regional Equality CanBe Promoted.
- 8. Increase In Income:** Public Enterprises Are Expected To Generate Income For The Government. Public Enterprises Often Generate Revenue For The Government Through Profits, Dividends, And Taxes. This Revenue Can Be Used To Fund Public Services, Infrastructure Projects, And Other Government Initiatives.
- 9. Self-Reliance:** Self-Reliance In The Field Of Capital Goods And Technical Know-How Is Another Objective Of Public Sector Enterprises.
- 10. Increase In Employment:** Public Enterprises Can Serve As Significant Sources Of Employment. Governments Often Establish Or Support These Enterprises To Generate Jobs And Reduce Unemployment Rates In Specific Regions Or Industries. This Objective Is Especially Important InTimes Of Economic Downturns Or High Unemployment.

Central Public Enterprises (Cpes) Are Government-Owned Corporations In India That Operate In A Wide Range Of Industries, From Telecommunications To Heavy Engineering. Here Is A List Of Some OfThe Main Central Public Enterprises Of India:

Oil And Natural Gas Corporation Limited (Ongc)

Bharat Heavy Electricals Limited (Bhel)

National Thermal Power Corporation Limited (Ntpc)

Coal India Limited (Cil)

Steel Authority Of India Limited (Sail)

Indian Oil Corporation Limited (IoCl)

Hindustan Petroleum Corporation Limited (Hpcl)

Bharat Petroleum Corporation Limited (Bpcl) Gas

Authority Of India Limited (Gail)

Power Grid Corporation Of India Limited (Pgcl)

Airports Authority Of India (Aai)

Shipping Corporation Of India (Sci)

Rail Vikas Nigam Limited (Rvnl)

National Hydroelectric Power Corporation Limited (Nhpc)

Hindustan Aeronautics Limited (Hal)

There Are Many Other Central Public Enterprises In India

### **8.3 Significance Of The Public Sector**

- 1. Providing Essential Goods And Services:** The Public Sector Plays A Crucial Role In Providing Essential Goods And Services That May Not Be Profitable Or Practical For Private Companies To Provide. For Example, The Government May Establish Public Schools And Hospitals To Ensure That Everyone Has Access To Education And Healthcare, Regardless Of Their Financial Situation. The Public Sector Is Also Responsible For Providing And Maintaining Essential Infrastructure Such As Roads, Bridges, And Public Transportation, Which Are Vital For Economic Growth And Development.
- 2. Regulation And Monitoring:** The Public Sector Regulates And Monitors Private Entities To Ensure They Comply With Specific Standards And Regulations, Such As Environmental Regulations, Health And Safety Standards, And Labor Laws. For Example, The Government May Set Factory Emission Standards To Limit Pollution Or Establish Minimum Wage Laws To Ensure Workers Are Paid Fairly. The Public Sector Also Plays A Critical Role In Consumer Protection By Ensuring That Products And Services Are Safe, And Advertising Is Truthful.
- 3. Social Welfare:** The Public Sector Is Responsible For Providing Social Welfare Services Such As Social Security, Welfare Programs, And Housing Support To Vulnerable Populations. These Services Are Crucial For Helping People Who Are Unable To Support Themselves, Such As The Elderly, Disabled, And Low-Income Individuals And Families.

- 4. Ensuring Equality And Justice:** The Public Sector Plays A Crucial Role In Ensuring Equality And Justice By Implementing Policies And Programs To Protect Individual Rights And Promote Social Justice. For Example, The Government May Establish Anti-Discrimination Laws To Protect Minorities And Women From Discrimination In The Workplace. They May Also Implement Policies To Reduce Income Inequality, Such As Progressive Taxation Or Minimum Wage Laws.
- 5. Provide Public Health:** Government Agencies Of Health Departments Play A Vital Role In Public Health. They Oversee Disease Control, Vaccination Programs, Health Inspections, And Emergency Responses To Health Crises. Public Health Initiatives Have Historically Led To Increased Life Expectancy And Reduced Mortality Rates.
- 6. Promotion Of Economic Growth:** The Public Sector Can Promote Economic Growth By Investing In Infrastructure, Research And Development, And Strategic Sectors Of The Economy. For Example, The Government May Invest In Building New Highways Or Airports To Promote Trade And Commerce. They May Also Provide Funding For Research And Development In Industries Such As Healthcare, Technology, And Renewable Energy. In Addition, The Government May Provide Incentives Or Tax Breaks To Promote Business Growth And Investment.
- 7. Development Of Infrastructure:** Governments Invest In Infrastructure Projects That Are Essential For Economic Development And The Quality Of Life. This Includes Building And Maintaining Roads, Bridges, Airports, Ports, And Public Transit Systems. These Investments Facilitate Trade, Create Jobs, And Improve The Overall Quality Of Life.
- 8. Economic Stability And Development:** Governments Use Fiscal And Monetary Policies To Manage The Economy, Stabilize Fluctuations, And Promote Economic Growth. The Public Sector Can Invest In Strategic Industries, Support Small Businesses, And Provide Incentives For Research And Development.
- 9. Environmental Protection:** Public Sector Agencies Enforce Environmental Laws And Regulations To Protect Natural Resources And Mitigate The Impact Of Climate Change. They Oversee Initiatives For Clean Air, Water, And Sustainable Land Use Practices.
- 10. Crisis Response:** During Emergencies, Such As Natural Disasters Or Pandemics, The Public Sector Plays A Central Role In Coordinating Relief Efforts, Providing Assistance, And Maintaining Public Order.

**11. Provides Public Infrastructure For Private Enterprise:** Public Sector Investments In Infrastructure Create A Foundation For Private-Sector Businesses To Thrive. Roads, Bridges, And Ports, For Example, Enable The Movement Of Goods And Services, Fostering Economic Growth.

Overall, The Public Sector Is An Essential Component Of Modern Societies And Plays A Crucial Role In The Functioning Of A Democratic Government. The Public Sector Comprises Organizations And Institutions That Are Owned And Operated By The Government To Provide Goods And Services To The Public.

Here Are Some Of The Significant Roles And Importance Of The Public Sector

#### **8.4 Causes Of Low Profitability In The Public Sector**

There Can Be Several Causes Of Low Profitability In The Public Sector, Including:

- 1. Lack Of Efficiency:** Public Sector Organizations Are Often Criticized For Being Organizational And Inefficient, Which Can Lead To Higher Costs And Lower Profitability.
- 2. Political Interference:** In Some Cases, Political Interference Can Prevent Public Sector Organizations From Making Decisions That Would Improve Profitability. This May Be Due To Political Considerations Or Pressure From Special Interest Groups.
- 3. Long Growth Period:** Most Of The Public Sector Enterprises Require Capital On A Large Scale. Also, It Has Taken A Long Period To Grow. There Is A Long Time Lag Between The Establishment Of These Enterprises And The Start Of Production. This Long-Period Requirement Has Higher Costs And Lower Profits.
- 4. Industrial Disputes:** Industrial Disputes In The Public Sector Can Indeed Contribute To Lower Efficiency And Productivity. Strikes, Work Stoppages, Or Slowdowns By Public Sector Employees Can Disrupt Essential Services Such As Transportation, Healthcare, Education, And Public Safety. This Can Inconvenience The Public And Hinder The Smooth Functioning Of Critical Services.
- 5. Lack Of Competition:** Public Sector Organizations May Not Face The Same Level Of Competition As Private Sector Firms, Which Can Lead To Complacency And A Lack Of Focus On Profitability.
- 6. Lack Of Efficient Management:** Poor Management Can Lead To A Range Of Problems, Including Low Profitability. This May Include Inadequate Financial Planning, Ineffective Cost Control, And A Failure To Adapt To Changing Circumstances.

7. **Lack Of Investment:** Public Sector Organizations May Not Receive Sufficient Funding To Invest In New Technologies Or Equipment, Which Can Make It Difficult To Remain Competitive And Profitable.
8. **Legal And Regulatory Constraints:** Public Sector Organizations Are Often Subject To A Range Of Legal And Regulatory Constraints That Can Limit Their Ability To Operate Efficiently And Profitably.
9. **Limited Revenue Streams:** Many Public Sector Organizations Rely On A Limited Range Of Revenue Streams, Such As Taxes Or Government Grants, Which Can Make It Difficult To Generate Profits.
10. **Lack Of Innovation:** Public Sector Organizations May Be Slow To Adopt New Technologies Or Innovate Due To Bureaucratic Structures, Risk Aversion, Or Other Factors. This Can Lead To Higher Costs And Lower Profitability Over Time.
11. **High Overhead Costs:** Public Sector Organizations May Have Higher Overhead Costs Than Private Sector Firms Due To Regulatory Requirements, Reporting Obligations, And Other Factors. This Can Reduce Profitability And Make Competing With Private Sector Firms Difficult.
12. **Demands Of The Public:** Public Sector Organizations May Be Required To Meet A Wide Range Of Demands From The Public, Which Can Be Difficult To Balance With Profitability Concerns. For Example, A Public Hospital May Need To Provide Emergency Care To All Patients, Regardless Of Their Ability To Pay, Which Can Put A Strain On Profitability.
13. **Limited Flexibility:** Public Sector Organizations May Be Subject To Rigid Rules And Regulations That Limit Their Ability To Make Changes Quickly In Response To Changing Market Conditions Or Other Factors.
14. **Lack Of Incentives:** Public Sector Employees May Not Have The Same Incentives To Improve Profitability As Employees In The Private Sector. This Can Lead To A Lack Of Focus On Cost Control And Other Measures To Improve Profitability.

Overall, Low Profitability In The Public Sector Can Stem From A Range Of Factors, Including Bureaucratic Inefficiencies, Political Interference, Limited Revenue Streams, And Regulatory Constraints. Addressing These Issues May Require Significant Reforms And Changes To The Structure And Culture Of The Public Sector

It Is Important To Note That The Public Sector Is Not Always Focused On Profitability As Its Primary Objective. In Many Cases, Public Sector Organizations Are More Concerned With Providing Services To Citizens And Achieving Social Objectives, Rather Than Maximizing Profits.

## 8.5 Suggestions for Improvement Of Public Sector Enterprises In India

There Are Several Ways In Which Public Sector Enterprises In India Can Be Improved:

- 1. Technology Up Gradation:** Technology Is Key To Improving Efficiency And Productivity In Any Industry. Public Sector Enterprises In India Should Invest In Technology Upgradation To Remain Competitive.
- 2. Diversification:** Many Public Sector Enterprises In India Are Too Focused On A Single Product Or Service. Diversification Can Help Them Spread Risk And Become More Resilient To Market Fluctuations.
- 3. Efficient Management:** The Management Of Public Sector Enterprises In India Should Be Professionalized. This Can Be Done By Hiring Professional Managers, Empowering Them With Decision-Making Authority, And Providing Them With Incentives For Good Performance.
- 4. Self-Sufficiency:** Many Public Sector Enterprises In India Suffer From Bureaucratic Red Tape And Political Interference. Granting Autonomy To These Enterprises Can Help Them Make Quicker And Better Decisions.
- 5. Employee Empowerment:** Employees Of Public Sector Enterprises Should Be Empowered To Make Decisions And Participate In The Decision-Making Process. This Will Help Improve Motivation, Productivity, And Innovation.
- 6. Checks On Public Enterprises:** In Order To Check The Performance Of Public Sector Industry, It Should Be Inspected By The Public Accounts Committee And Estimates Committee. High Authorities Control Public Enterprises. They Will Prepare Annual Public Reports, In Order To Check The Functioning Of The Enterprises.
- 7. Corporate Social Responsibility:** Public Sector Enterprises Should Take A More Active Role In Fulfilling Their Social Responsibilities. They Should Contribute To The Development Of The Community And The Environment In Which They Operate.
- 8. Strategic Planning:** Public Sector Enterprises Should Have A Well-Defined Strategic Plan That Outlines Their Long-Term Objectives And How They Plan To Achieve Them. This Will Help Them Make Informed Decisions And Stay Focused On Their Goals.
- 9. Research And Innovation:** Public Sector Enterprises Should Encourage Research Innovation And Creativity Among Their Employees. This Can Be Done Through Incentives, Training, And Providing A Supportive Work Environment.
- 10. Transparency:** Public Sector Enterprises Should Be Transparent In Their Operations, Financial Reporting, And Decision-Making. This Will Help Build Trust Among Stakeholders And Improve Accountability.
- 11. Organization Collaboration:** Public Sector Enterprises Should Collaborate With Other Organizations, Both Within And Outside Their Industry, To Share Knowledge And Resources. This Will Help Improve Efficiency And Innovation.



**12. Risk Management:** Public Sector Enterprises Should Have A Well-Defined Risk Management Strategy That Identifies Potential Risks And Outlines Strategies To Mitigate Them. This Will Help Minimize Losses And Improve Overall Performance.

### **Check Your Progress (A)**

Q1: Explain The Term Public Sector In The Economy.

Ans: \_\_\_\_\_

\_\_\_\_\_

Q2: Give Any Two Objectives Of The Public Sector.

Ans: \_\_\_\_\_

\_\_\_\_\_

Q3: What Are The Reasons For Low Productivity In The Public Sector Economy?

Ans: \_\_\_\_\_

\_\_\_\_\_

Q4: Give Two Suggestions To Improve The Public Sector In The Economy.

Ans: \_\_\_\_\_

\_\_\_\_\_

## **8.6 Meaning Of Private Sector**

The Private Sector Refers To The Part Of The Economy That Is Owned, Controlled, And Operated By Private Individuals Or Entities, Such As Individuals, Corporations, Partnerships, And Non-Profit Organizations. It Includes Businesses And Industries That Are Not Under The Direct Control Of The Government And Are Primarily Motivated By Profit. Private Sector Businesses Include Retail Stores, Manufacturing Companies, Financial Institutions, And Technology Companies.

The Main Objective Of The Private Sector Is To Generate Profit And Increase Shareholder Value By Offering Goods And Services That Meet Consumer Demand. The Private Sector Is Responsible For Creating Jobs, Driving Economic Growth, And Generating Tax Revenue.

Here Are Some Of The Largest Private-Sector Enterprises In India:

- Bharti Airtel Ltd.
- Hdfc Bank Ltd.
- Icici Bank Ltd.

- Infosys Ltd.
- Hindustan Unilever Ltd.
- Itc Ltd.
- Larsen & Toubro Ltd.
- Reliance Industries Ltd.
- Tata Consultancy Services Ltd.
- Tata Motors Ltd.

These Companies Operate In A Variety Of Sectors, Including Telecommunications, Banking, Financial Services, Information Technology, Manufacturing, And Consumer Goods. They Are All Major Contributors To The Indian Economy And Employ Millions Of People.

### **8.7 Objectives of Private Enterprises**

The Primary Objectives Of Private Enterprises Or The Private Sector Are To Generate Profit, Increase Shareholder Value, And Create Wealth For The Owners Or Shareholders Of The Business. These Objectives Are Achieved By Providing Goods And Services That Meet Consumer Demand, And By Maximizing Revenue And Minimizing Costs.

In Addition To The Above Objectives, Private Enterprises Also Aim To:

- 1. Profit Maximization:** Profit Is The Difference Between The Revenue And The Costs. Profits Are Used To Pay Back Investors, Reinvest In The Business, And Reward Employees.
- 2. Employment:** Private Enterprises Create Jobs And Employment Opportunities, Which Helps To Reduce Unemployment And Improve The Standard Of Living For Individuals And Communities.
- 3. Productivity Enhancement:** Private Enterprises Constantly Strive To Improve Their Products, Services, And Processes Through Research And Development, Innovation, And Technology, Which Leads To Increased Productivity And Competitiveness.
- 4. Expand In The Market:** Private Enterprises Aim To Expand Their Operations And Grow Their Business By Entering New Markets, Launching New Products, And Acquiring Other Businesses.
- 5. Creating Value For Stakeholders:** Stakeholders Include Employees, Customers, Suppliers, Investors, And The Community. By Creating Value For Stakeholders, Private Enterprises Can Build A Strong Reputation And Sustainable Business.
- 6. Maximize Efficiency:** Private Enterprises Aim To Maximize Efficiency To Increase Profitability And Remain Competitive In The Market. This Is Achieved Through Effective

Management Practices, Streamlined Processes, And Investments In Technology And Infrastructure.

7. **Manage Risks:** Private Enterprises Manage Risks Effectively By Implementing Risk Management Strategies And Contingency Plans To Protect Against Unforeseen Events Or Changes In The Market.
8. **Build Customer Loyalty:** Private Enterprises Aim To Build Strong Relationships With Their Customers By Providing Excellent Customer Service, Maintaining High Standards Of Quality, And Offering Personalized Solutions.

## 8.8 Significance Of The Private Sector

The Private Sector Plays A Significant Role In Driving Economic Growth And Development, And Its Contributions To Society Are Manifold. Here Are Some Key Reasons Why The Private Sector Is Significant:

1. **Job Creation:** Private Enterprises Are Major Job Creators, Providing Employment Opportunities For Millions Of People Worldwide. This Helps To Reduce Unemployment And Poverty And Contributes To The Overall Well-Being Of Individuals And Communities.
2. **Innovation:** The Private Sector Is A Major Driver Of Innovation, Investing In Research And Development, And Constantly Striving To Improve Products, Services, And Processes. This Has Led To Advancements In Technology, Healthcare, Education, And Other Fields, Improving The Quality Of Life For People Worldwide.
3. **Economic Growth:** The Private Sector Plays A Crucial Role In Driving Economic Growth, Contributing To Gdp And Tax Revenue, And Creating Wealth For Individuals And Businesses. This Growth Leads To Improved Living Standards And Increased Opportunities For Investment And Entrepreneurship.
4. **Efficiency And Productivity:** The Private Sector Operates On Market Principles, Which Encourage Efficiency And Productivity, Leading To Improved Profitability And Competitiveness. This Translates Into Better Products, Services, And Lower Prices For Consumers.
5. **Social Responsibility:** The Private Sector Is Increasingly Recognizing Its Social Responsibility, Engaging In Philanthropic Activities, Promoting Sustainable Practices, And Contributing To Community Development. This Helps To Build Trust And Support For Private Enterprise And Strengthens Its Role As A Key Player In Society.
6. **Investment:** The Private Sector Is A Major Source Of Investment, Providing Funding For New Businesses, Infrastructure, And Research And Development. This Investment Helps To Drive Economic Growth, Create New Jobs, And Expand The Reach Of Innovative Products And Services.

7. **Competition:** The Private Sector Fosters Competition, Which Helps to Drive down Prices and Improve the Quality of Goods and Services. This Competition Helps To Ensure That Businesses Remain Responsive To Consumer Demand, Leading To Increased Efficiency And Innovation.
8. **Flexibility:** The Private Sector Is More Flexible And Adaptable To Changes In The Market Than The Public Sector. This Flexibility Allows Private Enterprises To Respond Quickly To Changes In Consumer Demand, New Technological Advancements, And Other Market Conditions.
9. **Entrepreneurship:** The Private Sector Provides Opportunities For Entrepreneurship, Encouraging Individuals To Start Their Businesses And Pursue Their Ideas. This Fosters Innovation And Creativity And Helps to Create A Dynamic And Vibrant Economy.
10. **International Trade:** Private Enterprises Are Major Players In International Trade, Facilitating The Exchange Of Goods And Services Across Borders. This Trade Helps To Drive Economic Growth, Create Jobs, And Promote Cultural Exchange And Understanding.

So, The Private Sector Is Significant Because It Drives Economic Growth, Creates Jobs, Fosters Innovation, And Promotes Competition And Entrepreneurship. Its Contributions To Society Are Diverse And Far-Reaching, And Its Role In Shaping The Future Of The Global Economy Cannot Be Overstated. The Private Sector Is A Vital Part Of The Economy, Driving Growth And Development, Creating Jobs, And Fostering Innovation And Efficiency. Its Contributions To Society Are Significant, And Its Role In Shaping The Future Of The Global Economy Is Crucial.

## 8.9 Causes of Low Profitability in the Private Sector

There Can Be Several Causes of Low Profitability In The Private Sector, Including:

1. **Excess Competition:** One Of The Main Reasons For Low Profitability Is Intense Competition In The Market. When Many Players Are Offering Similar Products Or Services, It Can Lead To Price Wars And Reduced Profit Margins.
2. **Economic Factors:** Some Of The Economic Factors Such As Inflation, Depression, Recessions, And Changes In Consumer Behavior Can Affect The Demand For Products Or Services Which Will Lead To Reduced Profitability.
3. **Poor Management:** Inefficient Management Practices, Lack Of Strategic Planning, Inadequate Financial Controls, And Poor Decision-Making Contribute To Low Profitability.
4. **Industry Changes:** Technological Advancements, Changes In Regulations, And Shifts In Market Trends Can Create Challenges For Businesses And Reduce Profitability.

5. **High Costs:** High Production Costs, Labor Costs, And Overheads Can All Eat Into Profits, Especially If Prices Cannot Be Increased To Compensate.
6. **Debt And Interest Payments:** High Levels Of Debt And Interest Payments Can Reduce Profitability, As Interest Payments Must Be Made Regardless Of The Company's Profitability.
7. **Inadequate Pricing Strategy:** If A Company's Products Or Services Are Priced Too Low, It May Not Generate Enough Revenue To Cover Its Costs And Make A Profit. On The Other Hand, If The Company's Prices Are Too High, It May Not Attract Enough Customers To Sustain Its Business.
8. **Lack Of Innovation:** If A Company Fails To Innovate And Keep Up With Changing Customer Needs And Preferences, It May Lose Market Share To Competitors And Suffer From Lower Profitability.
9. **Poor Marketing:** If A Company Does Not Effectively Promote Its Products Or Services, It May Not Attract Enough Customers To Generate Sufficient Revenue.
10. **Legal Issues:** Companies Can Face Lawsuits, Fines, Or Other Legal Or Regulatory Challenges That Can Affect Their Profitability, Especially If They Do Not Have Adequate Insurance Or Legal Support.
11. **Natural Disasters:** Natural Disasters, Pandemics, Or Other Unforeseen Events Can Disrupt Supply Chains, Increase Costs, And Reduce Demand, All Of Which Can Affect A Company's Profitability.

Overall, Low Profitability In The Private Sector Can Result From A Combination Of Factors, Including Internal Management Practices And External Economic Conditions.

#### **8.10 Suggestions for Improvement of Public Sector Enterprises In India**

Here Are Some Suggestions For Improving Private-Sector Enterprises In India:

1. **Innovation:** Private Sector Enterprises In India Should Focus On Innovation To Develop New And Better Products Or Services That Can Meet The Changing Needs And Preferences Of Customers. This Can Help Companies Stay Competitive, Attract New Customers, And Increase Profitability.
2. **Investment In Technology:** Private Sector Enterprises Should Invest In Technology To Improve Their Operations, Increase Efficiency, And Reduce Costs. This Can Also Help Companies To Scale Up Their Operations And Expand Into New Markets.
3. **Enhance Customer Service:** Private Sector Enterprises Should Focus On Enhancing Their Customer Service By Providing Better Quality Products Or Services, Addressing Customer Complaints Promptly, And Leveraging Technology To Provide A Better Customer Experience.
4. **Promote Transparency And Accountability:** Private Sector Enterprises Should Promote

Transparency And Accountability By Disclosing Their Financial And Non-Financial Performance, Adhering To Ethical Business Practices, And Complying With Relevant Laws And Regulations.

5. **Sustainability:** Private Sector Enterprises Should Focus On Sustainability By Adopting Environmentally Friendly Practices, Reducing Their Carbon Footprint, And Promoting Social Responsibility. This Can Help Companies To Build A Positive Brand Image And Gain The Trust And Loyalty Of Customers.
6. **Finance Assessment:** Private Sector Enterprises In India Should Have Greater Access To Finance To Support Their Growth And Expansion. This Can Be Achieved Through The Development Of New Financial Products And Services, The Establishment Of Credit Guarantee Schemes, And The Promotion Of Alternative Financing Options Such As Crowd Funding.
7. **Better Infrastructure:** The Government And Private Sector Should Work Together To Improve Infrastructure In India, Including Transportation, Communication, And Energy Systems. This Can Help To Reduce Costs, Increase Efficiency, And Create A More Favorable Business Environment For Private Sector Enterprises.
8. **Promote International Trade:** Private Sector Enterprises In India Should Focus On Promoting International Trade By Expanding Into New Markets And Leveraging India's Competitive Advantages In Sectors Such As Information Technology, Pharmaceuticals, And Renewable Energy.
9. **Workforce Skills:** Private Sector Enterprises In India Should Invest In Training And Upskilling Their Workforce To Enhance Their Productivity, Creativity, And Innovation. This Can Help To Create  
  
A More Skilled Workforce That Can Contribute To the Growth and Success Of Private Sector Enterprises.
10. **Strengthen Supply Chain Management:** Private Sector Enterprises In India Should Strengthen Their Supply Chain Management By Adopting Best Logistics, Inventory Management, And Procurement Practices. This Can Help To Reduce Costs, Increase Efficiency, And Improve Customer Service.
11. **Strengthen Research And Development:** Private Sector Enterprises In India Should Promote Research And Development By Investing In New Technologies, Collaborating With Universities And Research Institutions, And Filing Patents. This Can Help To Create New Products Or Services, Improve Existing Ones, And Enhance Competitiveness.

### **Check Your Progress (B)**

Q1: Explain The Term Private Sector In The Economy.

Ans: \_\_\_\_\_

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Q2: Give Any Two Objectives Of Private Sector.

Ans: \_\_\_\_\_

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Q3: Why Does Private Sector Have Low Productivity?

Ans: \_\_\_\_\_

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Q4: Give Any Three Suggestions To Improve The Private Sector In The Economy.

Ans: \_\_\_\_\_

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### **8.11 Sum Up**

The Indian Economy Consists Of Both The Public Sector And The Private Sector, Each Playing A Significant Role In Shaping The Country's Economic Landscape. However, Public Sector Refers To ThePart Of The Economy That Is Owned And Operated By The Government. It Includes Various GovernmentDepartments, Public Enterprises, And Institutions To Provide Essential Services, Promote Equitable Distribution Of Resources, And Stimulate Economic Development. In India, The Public Sector Is Divided Into Two Main Categories: First Is Central Public Sector Enterprises (Cpses), Which Are Government-Owned Companies That Operate At The National Level, Engaged In Various Industries Such As Energy, Telecommunications, Transportation, Manufacturing, And More. For Example, Cpses Include Bharat Heavy Electricals Limited (Bhel), Oil And Natural Gas Corporation (Ongc), And Air India. Another One Is State Public Sector Enterprises (Spses), Which Are Government-Owned Companies That Operate At The State Level, Covering A Wide Range Of Industries, Including Agriculture,Infrastructure, And Services.

The Private Sector Comprises Privately Owned Businesses And Enterprises That Are Not Under Government Ownership. It Is Helpful In Economic Growth, Creating Employment Opportunities, AndFostering Innovation. Private Sector In India Is Diverse Which Includes Small, Medium, And Large Businesses Across Various Industries. These Are Related To Manufacturing, Services, Information Technology, Retail, Finance, And More.

### **8.12 Questions for Practicelong**

#### **Answer TypeQuestions**

- Q1. What Do You Mean By The Public Sector In The Economy? Give Significance.
- Q2. What Has Been The Role Of Public Enterprises In The Development Of The Economy?
- Q3. Explain The Causes Of Poor Performance Of Public Enterprises In India.
- Q4. What Are Your Suggestions To Improve The Role Of Public Sector In The Economy?
- Q5. Explain The Concept Of Privatization. What Are Its Causes?
- Q6. Discuss The Objectives Of Private Enterprises Of The Economy.
- Q7. Give the Obstacles In The Path Of Privatization.

### **8.13 Suggested Readings**

K.S. Gill: Evolution of Indian Economy, Ncert, New Delhi.

Gaurav Datt and Ashwani Mahajan: Datt And Sundharam Indian Economy, S.Chand Andco.

Charan D. Wadhva: Some Problems Of India's Economic Policy, TataMcgraw Hill, Bombay, 1973, Part Two.

P.C. Joshi: Land Reforms In India, Allied Publishers, Bombay, 1976





**The Motto of Our University  
(SEWA)**

**SKILL ENHANCEMENT**

**EMPLOYABILITY**

**WISDOM**

**ACCESSIBILITY**

**JAGAT GURU NANAK DEV**

**PUNJAB STATE OPEN UNIVERSITY, PATIALA**

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

**MASTER OF ARTS**

**CORE COURSE (CC): ECONOMICS**

**SEMESTER- II**

**MAEC24203T -ENTERPRENEURSHIP DEVELOPMENT**

Head Quarter: C/28, The Lower Mall, Patiala-147001

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**JAGAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY, PATIALA**

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

## **PREFACE**

Jagat Guru Nanak Dev Punjab State Open University, Patiala was established in December 2019 by Act 19 of the Legislature of State of Punjab. It is the first and only Open University of the State, entrusted with the responsibility of making higher education accessible to all, especially to those sections of society who do not have the means, time or opportunity to pursue regular education.

In keeping with the nature of an Open University, this University provides a flexible education system to suit every need. The time given to complete a programme is double the duration of a regular mode programme. Well-designed study material has been prepared in consultation with experts in their respective fields.

The University offers programmes which have been designed to provide relevant, skill-based and employability-enhancing education. The study material provided in this booklet is self-instructional, with self-assessment exercises, and recommendations for further readings. The syllabus has been divided in sections, and provided as units for simplification.

The University has a network of 100 Learner Support Centres/Study Centres, to enable students to make use of reading facilities, and for curriculum-based counselling and practicals. We, at the University, welcome you to be a part of this institution of knowledge.

Prof. G.S  
Batra Dean Academic  
Affair

**M.A (ECONOMICS)**  
**MAEC24203T-ENTREPRENEURSHIP DEVELOPMENT**  
**SEMESTER – II**

**MAX. MARKS:100**

**EXTERNAL:70**

**INTERNAL:30**

**PASS:40%**

**CREDITS:6**

**OBJECTIVES:**

The basic objective of this course is to help the students to understand various issues involved in setting up a private enterprise and develop the required entrepreneurial skills in economic development. It also aims to motivate students to opt for entrepreneurship and self-employment as alternate career options.

**INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER:**

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any ten questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
5. The duration of each paper will be three hours.

**INSTRUCTIONS FOR THE CANDIDATES:**

Candidates are required to attempt any two questions each from the sections A and B of the question paper and any ten short questions from Section C. They have to attempt questions

only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.

### **Section A**

**UNIT 1-** Introduction: Entrepreneurship: Concept, Characteristics, Entrepreneurial mindset. Evolution and Growth of Entrepreneurship in India. Role and Functions of Entrepreneur. Types of Entrepreneurs.

**UNIT 2-** Theories: Economic, Psychological, Sociological, Anthropological, Opportunity-Based, and Resource-Based entrepreneurship

**UNIT 3-** Innovation: Meaning, Types of innovations, features, and needs. Latest innovations in manufacturing and service sectors. Management Skills: Hard Skills, Soft skills, Problem-solving and building relationships, Team building, Empowering and delegating, Managerial Roles

**UNIT 4-** Types of entrepreneurship: Social and commercial entrepreneurship. Women Entrepreneurship- Problems Faced, Suggestions, Role of Government to Promote Women Entrepreneurship

### **Section B**

**UNIT 5-** Design Thinking - Design Thinking-Concept, Origin of Design Thinking, Features, Use of Design Thinking, Applications of Design Thinking. Design Thinking vs. Scientific Method, Problem Focused vs. Solution Focused.

**UNIT 6-** Entrepreneurship: Role of stimulating creativity, Creative teams and managerial responsibilities. Government Schemes & Promotional Agencies in Entrepreneurship development

**UNIT 7-** Start-Ups: Meaning, Types of Start-Ups, Creativity and Innovations in Start-Ups, Benefits. Difference between a Start-Up and Business

**UNIT 8-** Creativity and Entrepreneurship: Characteristics of Creative entrepreneur, Personal traits, Interpersonal skills, Critical thinking, Practical Skills, Business Thinking vs Creative

•

Thinking, Creative Process – Preparation, Thinking outside the box, Incubation, Illumination, Verification, Critical Thinking.

**Suggested readings:**

1. Desai, Vasant (2003). Small-Scale Industries and Entrepreneurship. Himalaya Publishing House, Delhi.
2. Kaulgud, Aruna (2003). Entrepreneurship Management. Vikas Publishing House, Delhi.
3. Chandra, Ravi (2003). Entrepreneurial Success: A Psychological Study. Sterling Publication Pvt. Ltd., New Delhi.
4. .Balaraju, Theduri (2004). Entrepreneurship Development: An Analytical Study. Akansha Publishing House, Uttam Nagar, New Delhi .
5. Taneja, S., & Gupta, S. L. Entrepreneurship Development-New Venture creation. New Delhi: Galgotia Publishing House.



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**M.A (ECONOMICS)**

**SEMESTER-II**

**MAEC24203T-ENTREPRENEURSHIP DEVELOPMENT**

**COURSE COORDINATOR AND EDITOR: DR.KULDEEP WALIA**

**SECTION A**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
<b>UNIT 1</b>	Introduction: Entrepreneurship: Concept, Characteristics, And Entrepreneurial Mindset. Evolution And Growth Of Entrepreneurship In India. Role And Functions Of Entrepreneur. Types Of Entrepreneurs.
<b>UNIT 2</b>	Theories: Economic, Psychological, Sociological, Anthropological, Opportunity- Based, And Resource- Based Entrepreneurship.
<b>UNIT 3</b>	Innovation: Meaning, Types Of Innovations, Features, And Needs. Latest Innovations In Manufacturing And Service Sectors. Management Skills: Hard Skills, Soft Skills, Problem- Solving And Building Relationships, Team Building, Empowering And Delegating, Managerial Roles
<b>UNIT 4</b>	Types Of Entrepreneurship: Social And Commercial Entrepreneurship. Women Entrepreneurship-Problems Faced, Suggestions, Role Of Government To Promote Women Entrepreneurship

**SECTION B**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
<b>UNIT 5</b>	Design Thinking - Design Thinking-Concept, Origin Of Design Thinking, Features, Use Of Design Thinking, Applications Of Design Thinking. Design Thinking Vs. Scientific Method, Problem Focused Vs. Solution Focused.
<b>UNIT 6</b>	Entrepreneurship: Role Of Stimulating Creativity, Creative Teams And Managerial Responsibilities. Government Schemes & Promotional Agencies In Entrepreneurship Development.
<b>UNIT 7</b>	Start-Ups: Meaning, Types Of Start-Ups, Creativity And Innovations In Start-Ups, Benefits. Difference Between A Start-Up And Business



<b>UNIT 8</b>	Creativity And Entrepreneurship: Characteristics Of Creative Entrepreneur, Personal Traits, Interpersonal Skills, Critical Thinking, Practical Skills, Business Thinking Vs Creative Thinking, Creative Process – Preparation, Thinking Outside The Box, Incubation, Illumination, Verification, Critical Thinking.
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**M.A (ECONOMICS)**  
**SEMESTER II**  
**MAEC24203T- ENTREPRENEURSHIP DEVELOPMENT**

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**UNIT -1 ENTREPRENEURSHIP**

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**STRUCTURE**

**1.0 Learning Objectives**

**1.1 Introduction**

**1.2 Concepts and Overview of Entrepreneurship**

**1.3 Characteristics of Entrepreneur**

**1.4 Entrepreneurial Mind set**

**1.5 Evolution and Growth of Entrepreneurship in India**

**1.6 Role of Entrepreneurship in Economic Development**

**1.7 Types of Entrepreneur**

**1.8 Questions**

**1.9 Suggested Readings**

**1.0 LEARNING OBJECTIVES**

**After completing this unit, students will be able to**

- Define : Concepts and overview of Entrepreneurship
- Understand : Characteristics of entrepreneur and entrepreneurial mindset
- Define : Types of Entrepreneurs
- Explain : Role of Entrepreneurship in Economic Development,

**1.1 INTRODUCTION**

Entrepreneurship is the act of creating a business or businesses while building and scaling it to generate a profit. However, as a basic entrepreneurship definition, it's a bit limiting. The more modern entrepreneurship definition is also about transforming the world by solving big problems. Like initiating social change, creating an innovative product or presenting a new life-changing solution.

What the entrepreneurship definition doesn't tell you is that entrepreneurship is what people do to take their career and dreams into their hands and lead it in the direction of their own choice. It 's about building a life on your own terms. No bosses. No restricting schedules. and no one holding you back. Entrepreneurs are able to take the first step into making the world a better place, for everyone in it.

Entrepreneurship is an evolving phenomenon. With the advancement of science and technology it has undergone metamorphosis change and emerged as a critical input for socioeconomic development. Entrepreneurship is the process of being an entrepreneur, of gathering and allocating the resources, financial, creative, managerial or technological, necessary for the success of new ventures. Entrepreneurship is characterized by creative solutions to problems and ingenuity and innovation are the forte of an entrepreneur. Economies have been characterized by innovations and new products that entrepreneurs have brought to the market. Further, entrepreneurship has acted as the catalyst to transfer a segment of new generation of people into self-employed business owners to provide jobs and motivation for the rest. Entrepreneurship is a phenomenon associated with entrepreneurial activity and entrepreneurs who seek to generate value by identifying and exploiting new products, processes, markets and creating or expanding economic activities

## **1.2 Concepts And Overview Of Entrepreneurship**

Definition:

The entrepreneur initiates, organizes, manages and controls the affairs of a business unit. He is in the centre of industrial production system. He is the owner of the business unit and works with the profit motive. The maximization of profit depends on many factors, such as the capital output, quality of the product, demand of the product and the internal management.

But above all it requires entrepreneurial skill in the producer.

Kindly examined various theories of entrepreneurship and called the effort of understanding entrepreneurship —hunting the Heffalump (Heffalump is a large animal which, despite ingenious devices, could not be captured). Likewise, there has always been an unsuccessful search for source of dynamic entrepreneurial performance.

Kilby has evaluated theories of entrepreneurship and suggested some principles on which some traps may be designed. However, the dictionary meaning of the term ‘entrepreneur’ is

—the person, who organizes, manages and assumes the risks of a business.

Originally, the term ‘entrepreneur’ in the French language was used to refer to a person engaged in a leading military operation. Canutillo was perhaps the first to use this concept.

According to him, the essence of the function of an entrepreneur was to bear uncertainty.

Entrepreneur is a person who buys factor services at certain prices and sells them at uncertain prices in future. In the late 18th century, Nicolaus Bandeau called the agricultural cultivator an entrepreneur and credited him with the essential characteristics of risk-taking and innovation.

Yale Brazen, following the terminology of Clarence Dalhoff, mentioned four types of entrepreneurs:

1. Innovating entrepreneurs:

They make aggressive assembling of information and have capacity for putting an attractive combination of factors of production.

2. Imitative entrepreneurs:

They have readiness to adopt successful innovations used by the first group.

3. Fabian entrepreneurs:

They are characterized by caution and skepticism but do imitate if they feel that the failure to do so would cause a decline in the relative position of the enterprise.

4. Drone entrepreneurs:

They are characterized by refusal to make any change even at the cost of reduced returns in comparison to others. Technological advancement, according to Brazen, is possible where innovative and imitative types of entrepreneurs are heavily supplied. The sluggishness of the last two types will frustrate the attempt to advance technology rapidly. This is truer particularly in the case of less developed countries. Redlich himself finds the entrepreneurs of Indian subcontinent to be only imitators and warns them against mere copy and duplication of the American type as it would yield unexpected and detrimental results.

There would hardly be a business leader in the Asian and African countries who is an innovator in the true Schumpeterian sense and perhaps none is visionary enough to strike out for previously unexplored territory. All are imitators and adaptors of experiences gained in the economically more advanced countries keeping in view the existing conditions of their own. The technology they apply is usually borrowed from abroad, the legal marketing practices they employ are adaptations of those developed in advanced countries and often the commodities they produce and sell are selected because of the operation of 'demonstration effect' through which consumption of the more advanced countries becomes popularized and enters the general demand in developing countries.

Subramanyam, however, finds entrepreneurs of England more innovative, whatsoever, than their counterparts in India. Evans also rejects innovation as an essential criterion and defines entrepreneur as —the person or a group of persons in a firm whose function is to determine the kind of business that is to be conducted.

The entrepreneur has to take decisions regarding:

- (a) the kinds of goods and services to be offered,
- (b) the value of these goods and services, and
- (c) The clientele to be served.

It must be borne in mind that the interaction that has advanced between industry and scientific laboratory by now and the growing multiplicity of market and industry-related research institutions has reduced the innovational requirements on the part of entrepreneurs.

Laboratories and market research institutions innovate and explore for entrepreneurs only to employ them in their enterprises.

The entrepreneur now is to be characterized as having a personality formed of strong will to achieve, courage and readiness to utilize resources to the best of capability, ability to arrange and manage the functioning of enterprise and ability to take risk.

The entrepreneur, however, is essentially concerned with small and medium industrial units.

Coleman emphasizes this view and entrusts entrepreneurs with the responsibility of continuously adopting to small changes in the market, both for factors and products. Small enterprise in India is defined in terms of initial investment limit in plant and machinery and the limit is Rs. 10 million (Planning Commission, 2001).

Indian entrepreneurs, in most of the cases, are not even near this limit. Most of industrial units are tiny in terms of both size and turnover and work for large industrial enterprises. Most of the entrepreneurs here are mere imitators. They do not dare to carry out radical changes in enterprises.

The external factors, particularly

market competition and customer needs, were the major motivating factors for small-scale entrepreneurs to engage in innovations.

**Salient Features of Entrepreneurs:**

The entrepreneurs 'motivation for creative activity lies in their intense urge for self-realization.

The following are some of the important characteristics of an entrepreneur:

- (I) High need for achievement
- (ii) Acquisitiveness
- (iii) Self-confidence and autonomous personality
- (iv) Non-dogmatic and non-conformist personality
- (v) Aggressiveness and risk-bearing capability
- (vi) Rationality and pragmatism
- (vii) Creative and technical mind
- (viii) Adaptability
- (ix) Managerial skill and leadership qualities
- (x) Administrative ability

- (xi) Sound decision-making ability
- (xii) High personal efficacy
- (xiii) High commitment to the task

### 1.3 CHARACTERISTICS OF ENTREPRENEUR

To be successful, there are definite characteristics that the entrepreneurship must possess.

A few of them are mentioned as follows: -

- **Risk Taker**- Starting any new venture involves a considerable amount of failure risk. An entrepreneur must be bold enough to take risks, which is an essential part of being an entrepreneur. An entrepreneur normally avoids the situation where risk is low.
- **Innovation**- Entrepreneurship should be highly innovative to generate new ideas and start a company. The entrepreneur brings a change for launching of a new product in the market. He may also develop a process that does the same thing in more efficient and economical manner.
- **Visionary and Leadership quality**- With their Leadership quality, leaders influence their employees towards the right path of success. Furthermore, the entrepreneur should have a clear vision of his new venture. However, to turn the idea into reality, he needs a lot of resources and employees. With Open-Mind, every circumstance as an opportunity can be used for the benefit of a company. For example, Repay, Google pay, and Pat etc. in the wake of demonetization acknowledged the need for online transactions.
- **Flexibility**- An entrepreneur should be flexible enough to change according to the situation. He should be equipped to embrace change in a product and service, according to the market needs.
- **Awareness**- An entrepreneur should know the product offerings and also be aware of the latest trend in the market. For this, he must be knowing of the available product or service on the parameters of the current market. Being able alter the product or service as needed, is a vital part of entrepreneurship.
- **Resilient**- A successful entrepreneur must show resilience to all the difficulties. In the times of failure or rejection they must keep pushing forward. To Start your business is a learning process and any learning process comes with a learning curve, which can be frustrating, especially when money is on the line. It's important never to give up through that's important never to give up through the difficult times if you want to succeed.
- **Focused**- A successful entrepreneur must stay focused and must be free from doubts that come in mind while running a business. By not believing in instincts and ideas, entrepreneur may step forward to failure and lose the end goal. A successful entrepreneur must always remember the vision for starting the business and remain on course to see it through.
- **Business Smart**- An entrepreneur should be smart enough to manage money and financial statements that are critical for running their own business. It is essential for him to check

revenues, costs, and how to increase or decrease them. While implementing a sound business strategy, it is necessary to know target market, competitors, strengths and weaknesses.

- **Communicators-** An entrepreneur must possess efficient communication skills. Successful communication is important in almost every walk of life. It is also of the utmost importance in running a business. Good communication also means that conveying ideas and strategies to potential investors in an efficient manner.

#### **1.4 ENTREPRENEURIAL MIND SET**

The following resources can be helpful in developing the Entrepreneurial Mindset: -

- **Assertive:** The ability and willingness to put his firm foot ahead to overcome challenges and for promotion of his venture.
- **Persuasive:** The ability to clearly express ideas to others by persuading them to work towards a common goal. For this, he must have to use good communication quality
- **Critical Thinking:** It is the capacity to apply process-oriented thinking, consider an issue from a range of possible perspectives, and use that thinking while making decisions.
- **Comfort with Risk:** The capacity to move forward with a decision despite inevitable uncertainty and challenges.
- **Initiative:** an entrepreneur has to initiate a new idea to carry business activity working through obstacles independently. The power to take ownership of a project without any input or guidance.
- **Future Orientation:** An optimistic disposition with a focus on obtaining the skills and knowledge required to transition into a career.
- **Looking for Opportunity:** An entrepreneur must have the practice of seeing and experiencing problems as opportunities. He has to avail these opportunities for profit earning
- **Creative:** An entrepreneur is out to devise most effective strategies to achieve the objectives of his enterprise. The ability to think of ideas and create solutions to problems without clearly defined structures.
- **Comfort with Risk:** For an entrepreneur, he must have the capacity to move forward with a decision despite inevitable uncertainty and challenges. Our attitude to risk shapes our whole life. Behind making business or life decisions, there is always an element of risk. We are all risk takers and take risks every day, driving at 85 when the limit is 70.
- **Persistence:** Continuous efforts describes the notion of taking various unrelated situations and creating something bigger in adverse situations too.

- **Self-confidence:** Entrepreneurs make loads and loads of mistakes. But, they don't get give up by it. With Self-confidence, they just move on to the workaround or next idea swiftly even in case of failure.
- **Learn quick:** The entrepreneur learns quick, but always shares the results whether good or bad with the team for completing the desired task.
- **Work smart:** Entrepreneurs are often gifted with a meticulous planning. He needs to Work smart to plan activities in the light of his strengths and

Weaknesses

## 1.5 EVOLUTION AND GROWTH OF ENTREPRENEURSHIP IN INDIA

The growth and transformation of entrepreneurship in India began in the early times when the 'barter system' was a common means of exchange. However, before proceeding, let us understand what entrepreneurship is and who entrepreneurs are.

Entrepreneurs are those individuals or groups who create new businesses and job opportunities. Entrepreneurship is the ability of an entrepreneur to run and operate a business with goal-oriented objectives. In this article, we will focus on the following:

Evolution of entrepreneurship and their classification into different areas.

The importance of entrepreneurship in India

The need of entrepreneurship

Evolution of Entrepreneurship in India

Medieval Age

To discuss the growth or development of entrepreneurship in India, you must understand that India has one of the oldest and most civilized business histories. During the Harappa civilizations around 2700 BC, there was an internal and external trade culture. Also, due to this, most foreign countries recognize Indian entrepreneurial skills.

Moreover, the increase in trade occurred during the era of Mughal rule. The popularity of Indian products, arts, crafts, Vedic tools, foods, and much more attracted attention from different parts of the world. The Arab mainland, western colonial counties and African countries were the major parties involved in the trade.

At the same time, different countries like UK, France and Portugal expanded their colonies in different parts of the world. However, a significant entrepreneurial change occurred when the East India Company started its business from the Bay of Bengal and later occupied parts of Bengal. It indirectly linked the entire Indian state into one business ecosystem.

There were some major downsides to the colonial mindset of England. However, it also played some good aspects in developing entrepreneurship in India.

Modern and pre-independence



This was the era of industrialization in India, where some of India's best entrepreneurs rise. The major events changed the face of entrepreneurship in India.

The first cotton textile mill was revolutionized in 1854 by an Indian entrepreneur, Awaji Dover. It was one of India's boldest steps in the modern development of entrepreneurship development.

Jamsetji Tata founded the company Tata Group in the year 1868. With the foundation of the Tata Group, he has created a bar for entrepreneurship development in India.

1874 Cotton Mill by JRD Tata, TISCO by Daribi Tata, 1932 Tata Airlines, Tata Steel Plant, and more were high-rate businesses in India. At the same time, it has also played a major role in various independence initiatives.

#### Post-independence

Entrepreneurship in India, along with the national economy, was ground-breaking after independence. There was not much left in the Indian economy at that time. However, the government took major steps to support India's development which is as follows.

Prime Minister Nehru adopted the economic structure line of the Soviet Union. It gave a major push to the New Industrial Policy of 1956. Similarly, this policy liberalized the bar and standards set by the British government, which were the ultimate impediment to industrial development.

Economic reforms were carried out in the initial phase of governance. Also, prominent economists adopted the Mahalanobis model, which primarily aims to support entrepreneurs.

As all these influential policies were in operation, few major industries were established as opposed to the traditional textile and natural resource industries. Since independence, there was a huge growth in entrepreneurship in India.

However, it may seem that most of the top entrepreneurs were already in business. But the reality was different. Economic policies were not giving much support to the entrepreneurs, due to which there was rough growth. However, the transformation of entrepreneurship began in 1990.

#### Transformation of Entrepreneurship in India

The major transformation of entrepreneurship in India began with the 'Economic Policy Reform' in 1991. The policy was further expanded in 2022. So, you can easily categorize the major transformation of entrepreneurs in India by these two policies and events.

### New Economic Policy

The New Economic Policy of 1991 was a huge turning point. This policy has included three major aspects, which are as follows.

Aspects	Role
Liberalization	Providing some provisions in different parts of the industry It boosts the private sector, including banks and the stock market
Privatization	Disinvestment of Public Firms to reduce the burden Promote the national entrepreneurs for good business
Globalization	Welcoming FDIs, and FPI Creating SEZ and Economic

### **Aftermath**

The major objective was economic reform, which has also served in the transformation of entrepreneurship in India. Before the policy, India's entrepreneurship was based on the model of traditional industries and agro-industries.

However, after the implementation of the policy, major changes were seen in the technology. The rise of Infosys, TCS, Wipro, HCL, and more. Also, in automobiles, Maruti, Tata, Mahindra, Bajaj, and more were emerging. But there is a limitation to this policy as it favors a lot of big companies and does not give a chance to a small and new startup to take off.

### **Growth of Startups**

In 2016, startups started to grow. There are some key aspects of this startup initiative whose main objective is to provide and lend support for entrepreneurship development in India. By the year 2015, startups were rampant in India. Moreover, India is also known as the 'poster child of an emerging market'. Some of the key aspects of the 2016 Startup Initiative are as follows.

The MSME ministry swung into action by supporting small and micro startups and firms.

The Make in India initiative allows entrepreneurship to live in India and work on its growth.

The NITI Analog scheme was also launched. Its objective is to develop skills and provide training to become a skilled resource.

New innovators and potential entrepreneurs are helping their businesses in the Indian market daily. If you consider the growth of entrepreneurship since 1990, you will see a sharp growth every year.

The current Indian entrepreneurship world is becoming a highly favorable market for any company to invest in. Also, most Indian companies have marked their potential in international trade and shown the growth of entrepreneurship in India. However, among all other top start-ups and companies, the IT sector of India is on the boom. It alone handles a large part of the development of the entrepreneur representing India.

## **1.6 ROLE OF ENTREPRENEURSHIP IN ECONOMIC DEVELOPMENT**

An Entrepreneur should possess all such characteristics with help of which he/she can perform successfully. Entrepreneurs have a wide variety of roles and responsibilities to take care of. The more time and energy that an entrepreneur puts into a project, the better are the chances for its success. The following points highlight the role of an entrepreneur.

### **Role of Entrepreneur**

#### **1. Founder of a company**

An entrepreneur is an individual who initiates the creation of a business with an idea and develops a plan to make it a reality. They work to identify existing and trending marketing opportunities, launch a business plan, raise funds, and oversee complete operations.

Entrepreneurs sell their business products and services to users not only to earn money, but to experience the joy of fruitful results. Their primary responsibilities are product and market knowledge, building client relationships, managing finances and ensuring smooth operations. The entrepreneur craves out opportunities for himself.

The entrepreneur is the bearer of the highest risk and the key person responsible for securing the capital to support the idea and is primarily responsible for bearing the consequences if the idea fails.

An entrepreneur can be successful if work and personal life are balanced

## **2. Hire the right candidates**

Entrepreneurs play a key role in making significant economic changes in addition to making money. As the business needs grow, entrepreneurs need to hire more employees. Entrepreneurs play a key role in minimizing risk by employing people who can work on the idea and contribute to growth. Such people can be investors or shareholders. That's why they help businesses succeed. The entrepreneur allocates the organization's resources and the primary one is the workforce. They are essential in recruiting the right staff for effective decision making. It also includes the design of the organizational structure and divisions for efficient workflow. An entrepreneur must first of all build trust and create a great team. Importantly, they must act to establish healthy communication between different departments. They must know how to assess the skills of candidates.

## **3. Create a strategy**

Preparing a business strategy is a key role of an entrepreneur. It helps to stay in tune with market trend. A good entrepreneur must accept challenges, whether it is to finance a new project or to improve an existing company policy that is not suitable. A good strategy is to find the right market and customers that initiate success and create value for customers and employees.

## **4. The visionary**

The role most people associate with entrepreneurship is that of a "visionary". Entrepreneurs are imaginative people who are always looking for opportunities to innovate and find new ways to tackle old challenges. This role doesn't go away once your business takes off. You will need to constantly look for new ways to improve and new directions for your company to grow.

An effective visionary performs two key roles:

(a) A charismatic role which involves establishing support for a vision and direction

(b) He plays an architectural role in order to build an appropriate organization structure. He has to look after various functions of management and discharge them effectively

## **5. Know about the field**

Entrepreneurs must be aware of the ongoing market and recognize methods that help their organization stand out from the competition. The best way to develop it is to be a part of different forums, participate in more events, etc.

## **6. Develop marketing methodologies**

Entrepreneurs need to learn about sales and marketing to stay competitive. Understanding your customers drives you to create information that can garner massive applause through social media platforms and other marketing means.

Advertising, content optimization and branding are different marketing methodologies. A sale is a later marketing event. A good team can guide the process from cold calling to closing deals.

## **7. Develop a financial budget**

An entrepreneur's financial budget is the allocation of funds to meet various expenses such as salaries, rent, etc. To make your business thrive, be clear about how resources and money are distributed. He just has to figure out how the money flows. He could be betrayed depending on other people knowing the financial activities.

## **8. Courage to face adversities**

Entrepreneur face the adversities boldly and bravely. He has faith in himself and attempt to solve the problem even under pressure. Every unpredictable situation is a challenge before him which he overcome and survives through.

**Entrepreneurship is important because it improves the standard of living and generate capital. Let us look at some of the reasons for the importance of entrepreneurship.**

### **Economic Development by Entrepreneurs**

It shows the importance of entrepreneurship in the best possible way. New products and services produced by entrepreneurs can fuel the economic development of the companies concerned. This is also true for areas that need to support new business.

For example, the boom of IT industries during the 1990s. The industry grew rapidly and it helped many other businesses. Businesses have grown in related sectors, such as call centre operations, network repair firms and hardware suppliers.

### **Contribution of Entrepreneurs to National Profit**

Entrepreneurial projects help create fresh wealth. Established companies may remain confined to existing markets and reach a threshold in terms of profits. Better goods, services or technology from businesses enable the development of new markets and the creation of new wealth.

Entrepreneurial projects help create new capital. Better goods, services or technology from businesses enable the development of new markets and the creation of new wealth. Also, higher income in the form of increased jobs and higher tax revenue and expenditure leads to better national income.

So, this importance of entrepreneurship helps in making the national income of a country. The government will use these proceeds to invest in the country.

### **Social Change by Entrepreneurs**

This importance of entrepreneurship breaks with tradition and reduces reliance on outdated systems by providing unique products and services. This will improve the quality of life. Such as the smartphone industry continues to grow, tech entrepreneurship will have a huge, long-term impact on the planet.

The indirect effects of entrepreneurship are not so visible, yet they are equally important for economic development. The following are indirect effects:

### **Money Flow in the Market**

The flow of money in an economy is as important. The more it flows, the healthier the economy. Enterprises help in the flow of money in the market by creating employment and increasing production and consumption.

### **Infrastructural Development**

Start-ups thrive in the ecosystem. When an ecosystem is formed in a particular city, there is an increase in the infrastructure of the city or particular area. For example, startups growing in Bangalore, Hyderabad and Delhi. These cities were developed strategically to create a better environment to support start-ups to meet the need for entrepreneurship.

### **Indirect Employment**

Direct employment is the employment created by entrepreneurship within the business. But it is not the only employment. Entrepreneurship also creates a lot of indirect jobs. For example, in an area like Poway in Mumbai, infrastructural development creates a need for hotels, restaurants, transportation, etc.

### **Increase in Related Services**

When entrepreneurs grow and expand their operations, it requires many services. These services may be outside their core expertise. For example, an end-tech start-up would require several services like human resources, marketing, consulting, legal services, etc. Therefore, when the number of entrepreneurs increases, so does the demand for related services.

### **Need of Entrepreneurship for Economic Growth**

Entrepreneurship is an instrument of social change and economic development. Entrepreneurs firmly believe that it is entrepreneurship that will beat and transform the market with new-age technologies.

The following factors define why entrepreneurship is needed in economic development.

## **1. Innovation**

Innovation is the primary element of entrepreneurship. New-age entrepreneurs are passionate about innovations in technology and business models. Some of the primary examples of this are Airbnb, Innova8, Ola, Zinger etc. These companies not only bring innovation in technology but also created unique business models that never existed before. It helps in making your life much easier.

Policymakers of an economy consider innovation while creating a road map for the country's economic development. Innovation creates market ease and new opportunities and encourages consumption. Therefore, entrepreneurship in India is important as it inspires innovation.

## **2. Employment**

Employment is an important factor in the development of any economy. A low employment rate indicates the poor health of an economy. An economy needs to generate more jobs and wage opportunities to accelerate growth. It plays an important role in job creation.

The bigger the enterprise, the more job and salary opportunities are created. Therefore, the need for entrepreneurship in India becomes important for economic development.

## **3. Living standard**

The standard of living is, in a way, directly proportional to employment. Because employment pays people, they spend their money on the purchase of goods and services. Therefore, the consumption rate increases in an economy and so does the production rate. This eventually raises the basic wage, and people become able to consume higher quality goods and services.

If entrepreneurship in an economy is sector agnostic, it will go a long way in raising the standard of living of the people. Therefore, the need for entrepreneurship in India becomes important for overall economic development.

## **4. Social change**

Social entrepreneurship is a modern term that encourages entrepreneurs to bring about change in society. For example, crowdfunding companies are usually involved in social work such as raising funds for NGOs. Their businesses bring positive changes to society. They not only help the needy but also spread social awareness.

A prosperous society facilitates the path of community development. Therefore, the need for entrepreneurship in India is important as it brings together social reform and economic development.

## **5. Research and Development**

Research and development are the progress of innovation. When an entrepreneur comes up with innovative ideas and builds a business from them, they need to continuously develop their innovation to keep up with the market and improve the user experience. As the enterprise grows, they spend more resources on research and development, which leads to technological progress.

Technological advancement not only supports a particular company but the entire nation. It contributes to the growth of science and technology. The economy further utilizes these developments to implement in various sectors to make progress. Therefore, the need for entrepreneurship in India is necessary for the progress of science and technology.

## **1.7 TYPES OF ENTREPRENEUR**

The various types of entrepreneurs are classified on certain parameters. Some important classifications are described below:

**I. According to the Type of Business:** Depending on the type of business, entrepreneurs are found in different types of business concerns of different sizes. We can broadly classify them as follows

**Business Entrepreneur:** Business entrepreneurs are individuals who get an idea for a new product or service and then create a business to make their idea a reality. In search, they use both production and marketing resources to create a new business opportunity. They can set up a large establishment or a small business unit. They are called small entrepreneurs when they are in small business units such as a printing house, a textile processing house, an advertising agency; ready-made garments or confectionery. In most cases, entrepreneurs are found in small business and manufacturing businesses and business thrives when the size of the business is small.

**Industrial Entrepreneur:** An industrial entrepreneur is essentially a manufacturer who identifies potential customer needs and adapts a product or service to marketing needs. He is a product-oriented man who starts in an industrial unit because of the possibility of making some new product. An entrepreneur has the ability to transform economic resources and technology into a highly profitable enterprise. It is found in industrial units such as electronics industry, textile units, machine tools or video cassette factories and the like.

**Corporate entrepreneur:** A corporate entrepreneur is a person who demonstrates his innovative abilities in the organization and management of corporate business. A corporate enterprise is a form of business organization that is registered under some law or statute that gives it a separate legal entity. A trust registered under the Trusts Act or a company registered under the Companies Act are examples of corporate undertakings. A corporate entrepreneur is therefore a natural person who plans, develops and manages a legal entity.

**Agricultural Entrepreneur:** Agricultural entrepreneurs are those entrepreneurs who engage in agricultural activities such as cultivation and marketing of crops, fertilizers and other agricultural inputs. They are motivated to develop agriculture through mechanization, irrigation and the application of technologies for land-based agricultural products. They cover a wide spectrum of the agricultural sector and include its related occupations.

**II. According to the use of technology** The application of new technologies in various areas of the national economy is essential for the future growth of business. We can broadly classify entrepreneurs based on the use of technology as follows:

**Technical Entrepreneur:** A technical entrepreneur is basically likened to a "craftsman". Thanks to its craftsmanship, it develops better quality goods. It focuses more on production than marketing. Not much sales generation and not doing various sales promotion techniques. It demonstrates its innovative capabilities in the field of production of goods and provision of services. The greatest strength a technical entrepreneur has is his skill in manufacturing techniques.

**Non-Technical Entrepreneur:** Non-Technical Entrepreneurs are those who are not concerned with the technical aspects of the product they are dealing with. They are only concerned with developing alternative marketing and distribution strategies to support their business.

**Professional entrepreneur:** A professional entrepreneur is a person who is interested in starting a business, but is not interested in managing or operating it once established. A professional entrepreneur sells a running business and starts another business with the proceeds of the sale. Such an entrepreneur is dynamic and comes up with new ideas for the development of alternative projects.

**III. According to the entrepreneur and motivation:** Motivation is a force that affects the efforts of an entrepreneur to achieve his goals. An entrepreneur is motivated to achieve or demonstrate excellence in work performance. He is also motivated to influence others by demonstrating his business skills.

**Pure Entrepreneur:** A pure entrepreneur is an individual who is motivated by psychological and economic rewards. He is in business for his personal satisfaction in work, ego or status.

**Induced Entrepreneur:** An entrepreneur who is induced to undertake entrepreneurial work as a result of government policies that provide support, incentives, concessions, and necessary overhead and equipment to start a business. Most of the induced entrepreneurs enter the business for a variety of financial, technical and other benefits provided by governmental entrepreneurship promotion agencies. Now a day, import restrictions and the allocation of production quotas have led many to set up small-scale industries.

**Motivated Entrepreneurs:** New entrepreneurs are motivated by a desire for self-actualization. They arise because of the opportunity to manufacture new products and sell them to consumers. Entrepreneurs are further motivated by profit-oriented rewards once the product is developed to the point where it is ready for sale.



**Self-motivated entrepreneurs** These entrepreneurs start their businesses as entrepreneurs. They are individuals with initiative, courage and confidence in their ability to inspire entrepreneurship in underage people. Such entrepreneurs have strong beliefs and beliefs in their innate abilities.

#### **IV. According to Growth and Entrepreneurship: New business**

development is more likely to be successful. A new open business field for entrepreneurs. Customer approval of a new product brings psychological satisfaction and huge profits to the customer. Industrial units are identified as high, medium, and low-growth industrial units. So there are growth entrepreneurs and super-growth entrepreneur.

**Growth Entrepreneur:** Growth Entrepreneurs are those who are forced to enter high-growth industries with significant growth potential.

**Super Growth Entrepreneurs:** Super Growth Entrepreneurs are people who have made phenomenal growth in their businesses. Growth performance is identified by liquidity, profitability and leverage of funds.

#### **V. According to entrepreneurs and stages of development:**

Entrepreneurs can also be divided into first generation entrepreneurs, modern entrepreneurs and classical entrepreneurs according to their stage of development.

**First Generation Entrepreneurs:** First generation entrepreneurs are industrial units with innovative power. He is an innovator at heart, combining different technologies to create marketable products and services.

**Modern Entrepreneurs:** Modern entrepreneurs are those who undertake ventures that successfully respond to changing market demands. They undertake ventures that meet current marketing needs.

**Classic Entrepreneur:** A Classic Entrepreneur is someone who addresses customer and marketing needs through the development of an independent business. He is the quintessential entrepreneur whose goal is to maximize financial profit at a level consistent with the survival of the business, with or without a growth factor.

### **1.8 QUESTIONS**

#### **Long Answer Questions**

1. Explain the various concepts of Entrepreneurship
2. Explain Evolution and Growth of Entrepreneurship in India
3. Elaborate need of entrepreneurship
4. How does growing entrepreneurship effect the economy of the country
5. Classify entrepreneurs on the basis of use of technology

### **Short Answer Questions**

1. Give an overview of entrepreneurship
2. What is the role of entrepreneurship in economic development of the country
3. Define characteristics of entrepreneurial mindset
4. List down the characteristics of Entrepreneurs
5. List down the various types of entrepreneurs

### **B. Multiple Choice Question**

1. The owner of the business unit and works with the profit motive
  - a. Entrepreneur
  - b. Employee
  - c. Manager
  - d. CEO
2. They have readiness to adopt successful innovations used by the first group.
  - a. Imitative entrepreneurs
  - b. innovative entrepreneurs
  - c. Drone
  - d. Executive
3. These are entrepreneurs that are very careful in their approaches and cautious in adopting any changes.
  - a. Imitative entrepreneurs
  - b. innovative entrepreneurs
  - c. Fabian entrepreneurs
  - d. Executive
4. Which of these actions of an entrepreneur will most likely result in creative destruction?
  - a. Lowering prices of your product or service
  - b. Issuing shares to individuals and institutions
  - c. Taking over a competitor's business
  - d. Developing a new product
5. According to Schumpeter, innovative entrepreneurs would
  - a. Thrive in the market
  - b. Get absorbed within larger innovative businesses
  - c. Not survive and disappear from the market.
  - d. Get absorbed within non-innovative businesses

**Answers:**

1.a, 2.a, 3.c, 4.d, 5.b

**1.9 SUGGESTED READINGS**

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## **M.A (ECONOMICS)**

### **SEMESTER II**

#### **MAEC24203T- ENTREPRENEURSHIP DEVELOPMENT**

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#### **UNIT 2- THEORIES**

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##### **STRUCTURE**

##### **2.0 Learning Objectives**

##### **2.1 Introduction**

##### **2.2 Economic theory of entrepreneurship**

##### **2.3 Sociological theory of entrepreneurship**

##### **2.4 Psychological theory of entrepreneurship**

##### **2.5 Anthropological theory of entrepreneurship**

##### **2.6 Questions**

##### **2.7 Suggested Readings**

#### **2.0 LEARNING OBJECTIVE**

**After completing this unit, students will be able to**

Define: Concepts and overview of Entrepreneurship theories

Understand: Economic theory of entrepreneurship

Define: Psychological theory of entrepreneurship

Explain: Sociological and Anthropological theory of entrepreneurship

#### **2.1 INTRODUCTION**

It is a well-known fact that entrepreneurship plays a significant role in economic growth. An entrepreneur takes risks and operates in an unpredictable environment. However, economists made no attempts to develop a systematic theory of entrepreneurship. William J. Baume asserts that the economic theory has not adequately analyzed either the function of entrepreneurship or its supply.

The traditional notion of an entrepreneur is that he brings together the factor inputs and organizes productive activity. The traditional models treat the entrepreneurial function like a managerial function.

Similarly, in modern growth theory also, any contribution of entrepreneurship is typically contained in a residual factor. This residual, variously termed as 'technical change' or 'coefficient of ignorance'. It includes among other things, technology, education, institutional organisation and entrepreneurship.

There are different types of entrepreneurs and the term entrepreneurship has been defined differently by many authors. Thus, some of the theories of entrepreneurship evolved over a period of time, have been described as follows: -

### **1. Economic theories: Schumpeter's Theory of Innovation, Mark Caisson Theory**

According to this theory, an entrepreneur executes all activities due to economic incentives. The main aim of this theory is profit motive.

### **2. Sociological theories: Max Weber's Theory of Social Change, E. E. Hagen's Theory**

Entrepreneurship is a sociological concept and process. According to this concept, the sociological factors are the secondary source of entrepreneurship development. As such, the social factors like social attitudes, values and institutions significantly influences the entrepreneurial supply in a society.

### **3. Psychological theories: (Kunkel's Theory)**

Entrepreneurship is a psychological process and concept. According to this concept, psychological factors are the primary source of entrepreneurship development. When there are sufficient number of persons having the same psychological characteristics in the society, then there are bright chances of development of entrepreneurship.

Let us explain theories of entrepreneurship in detail: -

## **2.2 ECONOMIC THEORY OF ENTREPRENEURSHIP**

1. **Economic theories:** Economists such as Schumpeter and Mark Caisson have contributed towards theories of entrepreneurship as follows: -

#### **• Schumpeter's theory of innovation:**

Joseph Schumpeter originated innovative theory of entrepreneurship. He takes the case of a capitalist closed economy which is in stationary equilibrium. He believed that entrepreneurs take the economy to a new level of development by introducing innovation and thereby, bring changes in the circular flow of the economy. According to Schumpeter the entrepreneur is not a man of ordinary managerial ability, but having the ability to introduce something entirely new. Schumpeter also differentiated between invention and innovation. He described that invention refers to creation of new materials and by innovation means the application of new materials into practical use in industry. Similarly, between an innovator and an inventor; The inventor is the one who invents new materials and new methods, whereas, the innovator is the one who utilizes these inventions and discoveries in order to make new combinations.

**In practice, new combination theory covers five cases which are given below:**

- (I) The introduction of a new good which consumers, are not yet familiar—or of a new quality of a good.
- (ii) The introduction of a new method of production, that one not yet tested by experience in the branch of manufacture concerned, which need by no means be founded upon a discovery scientifically new and can also exist in a new way of handling a commodity commercially.

(iii) The opening of a new market i.e. a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before.

(iv) The conquest of a new source of supply of raw materials or half manufactured goods, irrespective of whether this source already exists or whether it has first to be created.

(v) The carrying out of the new organisation of any industry like the creation of a monopoly position (for example, through russification) or the breaking up of a monopoly position.

**Criticism:** Schumpeter's theory has been subjected to the criticism that it ignored the organizing aspects of entrepreneurship and over emphasized on innovative functions of the entrepreneur only.

**However, Schumpeter's theory suffers from following limitations:**

(I) It excludes individuals who merely operate an established business without performing innovative functions.

(ii) Innovating entrepreneur represents the most vigorous type of enterprise. However, this type of entrepreneur is rarely available in developing countries like India.

(iii) It laid too much emphasis on innovative functions. But it ignores the risk taking and organizing aspects of entrepreneurship.

(iv) It assumes an entrepreneur as a large scale business man. He is a person who creates something new. But in practice, an entrepreneur cannot have large scale operations from the very beginning,

(v) It fails to provide a suitable answer to question like— why some countries had more entrepreneurial talent than others?

• **Mark Caisson Theory:**

According to Mark Caisson's theory, there is no established economic theory of the entrepreneur. Entrepreneur can be a property developer or a small businessman. He provided a balanced view on the topic of entrepreneur.

The Mark Caisson's book the Theoretical Reconstruction proceeds on two fronts. The first one describes that the individuals differ not only in their tastes but in their access to information. Individuals with similar taste but with different information may take different decisions. The second one describes that the area of reconstruction stems from recognition of the difficulty that is inherent in organizing a market. Mark Caisson suggested that in reality transaction involves a significant resource cost, therefore, the entrepreneur's success depends on how he minimizes the transaction cost. Thus, according to Mark Caisson, the entrepreneur is defined as someone who specializes in taking judgmental decisions about the coordination of scarce resources.

### **2.3 Sociological theory of entrepreneurship**

Sociological theories: These theories are comprised of Max Weber's Theory of Social Change (Emphasis on Impact of Religion), E. E. Hagen's Theory (Emphasis on Withdrawal of Status Respect) discussed as follows: -

#### **• Max Weber's Theory of Social Change:**

According to Max Weber, religion had a profound influence on the growth of entrepreneurship. He felt that sociological explanation for the growth of entrepreneurship must also be considered. He opined that the entrepreneurial energies of a society generated and supplied by religious believes. According to some religions, it is the foremost duty to earn and acquire money. Whereas, some religions put less emphasis on it. Max Weber claimed spirit of capitalism as a fundamental concept. Capitalism means the economic system where market forces of demand and supply play freely. Therefore, the spirit of capitalism promotes the entrepreneurs to engage in entrepreneurial pursuits and earn more and more profits. Weber felt that the belief systems of Hinduism didn't encourage entrepreneurship. Because, Hinduism laid less emphasis on wealth accumulation and materialism. Weber was of the opinion that the Protestant ethic provided the mental attitude in a society for capitalism and favors entrepreneurship. The Protestants advanced in establishing capitalism in Europe. Protestant ethic granted them the attitude of accumulating assets, and materialism

Criticism: Max Weber's theory is based on unrealistic and invalid assumptions and have been found empirically invalid. He has been criticized by many sociologists on his assumptions about Hinduism and entrepreneurship. As in the post-independence period in India, the expansion of entrepreneurship disproved his views about Hinduism. Also, the views on Protestant ethic were disapproved. Capitalism also flourished where Protestant ethic was not present.

#### **Critical Evaluation:**

The theory of social change propounded by Max Weber is based on the invalid assumptions. So expected results are not valid in all cases.

#### **These assumptions are as follows:**

- (I) There is a single system of Hindu value.
- (ii) The Indian community internalized those values and translated them in to day to day behavior and
- (iii) These values remained immune to and insulated against external pressures and change. The studies further show that Hinduism is not averse to the spirit of capitalism and to adventurous spirit. The Hinduism has contributed a lot in entrepreneurship development in India which is based on capitalism.

#### **• Hagen's Theory:**

E. E. Hagen presumes a general model of the society. His theory viewed the entrepreneur as a creative trouble shooter who contributes to economic development. The entrepreneur brings about social transformation and economic development. He didn't encourage the entrepreneurs to imitate western technology. According to Hagen, the social group that experiences the withdrawal of status respect turns into aggressive entrepreneurship. In such a situation the status losing group its members try to regain their status by an entrepreneurial drive.

Hagen described four possible reactions to the 'Withdrawal of status respect': -

- (i) The retreats – An individual working in the society but indifferent to the work and position.
- (ii) The ritualist – An individual who works according to the manner approved by the society but does not hope for improving his/her position.
- (iii) The reformist – A person who fights against the injustice and tries to form a new society.
- (iv) The innovator – An individual who makes efforts to bring about new changes. This personality has bearing upon the personality of an entrepreneur.

Criticism: Hagen's Theory has been criticized on the grounds that the social groups must behave in the manner proposed in the theory does not always hold true. This theory ignores other factors which can be accountable for development of entrepreneurship

agent opined that creative innovation or change is the basic feature of economic growth. He describes an entrepreneur as a creative problem shooter interested in things in the practical and technological realm. Such type of individual feels a sense of increased pleasure when facing a problem and tolerates disorder without discomfort. In traditional societies, position of authority is granted on the basis of status, rather than individual ability. That is why he visualized an innovative personality.

There are 4 responses:

- (1) One who combines to work in the society but remains indifferent to work and position is called Retreats.
- (2) One who adopts a kind of defensive behavior and acts in the ways accepted and approved in his society but with hopes on of improving his position is called Ritualist.
- (3) One who forms a rebellion and attempts to establish a new society is called Reformist.
- (4) A creative individual who is likely to be an entrepreneur is called Innovator.

Innovation requires creative and such creative individuals cause economic growth. Whenever there is a withdrawal of status respect, it would give rise to birth of innovation of a creative individual who is likely to be an entrepreneur.

### **Critical Evaluation of E. Hagen's Theory:**

This theory acts as distinction between entrepreneurship and intrapreneurship. There are different factors within the organisation which motivate the executives and professionals to do some innovative behavior leading to new product and services.



Actually, they are not governed by status withdrawal. The theory only suggests that the people who had enjoyed social standing at some stage in their histories fall into a retreats phase with an urge to regain the lost status and emerge as an entrepreneurship personality.

## **2.4 Psychological theory of entrepreneurship**

### **Kunkel's Theory**

(Emphasis on Entrepreneurial Supply) John H. Kunkel advocated the theory on the edifice of entrepreneurship supply. He was of the opinion that the sociological and psychological are the main determinants for the emergence of entrepreneurs. Supply of entrepreneurs has a functional relationship with the social, political and economic structure. According to Kunkel, the supply of entrepreneurship depends on the following factors of the economy: -

**(I) Demand Structure:** It means the demand situation prevailing in the economy. The demand structure of an economy can be enlarged by rewarding the entrepreneurs with material rewards for their entrepreneurial activities. The demand structure is of economic nature. This structure is changing day by day according to economic progress and government policies. The behavior of individual can be made enterprising by affecting the main elements of demand structure.

**(ii) Limitation Structure** It means the entrepreneurs and other members of a society restricts specific activities. We can say that the limitation structure is social and cultural. This structure affects the development of an entrepreneur.

**(iii) Opportunity Structure:** This structure includes the existing market structure, the available managerial and technical skills, information about production techniques, supply of labor and capital. The opportunity structure is formed by combination of supply of capital, managerial and technical skill production methods, labor and market, training opportunity establishment of an enterprise and conducting different activities.

**(iv) Labor Structure:** This structure includes the availability of skilled labor willing to work. In Kunkel's theory, the behavior of the individuals is highly subjected to the conditioning procedure surrounding the environment of the individuals. The labor structure is directed by several factors such as source of livelihood, traditional outlook and life ambitions. The quality of labor influences the emergence and growth of entrepreneurship. Rather than capital intensive, labor intensive will serve our interest in a better manner. The problem of labor immobility can be solved by providing infrastructural facilities including efficient transportation wherever an entrepreneurship is promoted.

### **Criticism:**

Kunkel's theory is based on unrealistic postulates. The different structures that influence supply of entrepreneurship are not realistic. It also ignored the ambiguous concepts like values, personality etc. social networks.

### **Assumptions of Kunkel Theory:**

The theory assumes the ideal structures for the supply of entrepreneur. But generally there is discrepancy between objectives, structures and the actual incidence of entrepreneurs. It is due to the fact that there are inadequate or incorrect perception. In practice, entrepreneurship is also governed by the specific combination of circumstances which are generally not available in the environment.

At last but not the least, we conclude that all the authors i.e., J. A. Schumpeter, David C. McClelland, Everett E. Hagen and John H. Kunkel have given their own opinion on concept of psychological theory of entrepreneurship. This theory presents the certain psychological motives that are responsible for the evolution of entrepreneurship.

Schumpeter's theory is one of the most important concepts of entrepreneurship which is richer and relevant. He has laid emphasis on innovativeness or creativity of an individual which makes him an entrepreneur.

McClelland theory has numerous practical implications. The person with high need achievement needs great concern for exercising influence and control.

Hagen's theory laid more stress on technological changes which is the result as individual's creativity. His concept depended upon withdrawal of status.

John H. Kunkel theory laid more stress on types of structure i.e., demand, opportunity, labor and limitation. All the structure affects development of an entrepreneur.

### **Opportunity based Entrepreneurship: Peter Drucker's View on Entrepreneurship:**

Peter Drucker explained the entrepreneur as a unique agent of change and "the entrepreneur always searches for change, responds to it, and exploits it as an opportunity."

The main point which is focused on all the theories is on the individual and his personality inference by environment factors in general and internal values in particulars.

## **2.6 Questions**

### **Long Answer Questions**

1. Write a short note on theory of innovation
2. Explain Max Weber's Theory of Social Change
3. Write a short note on Hagen's Sociological theory of entrepreneurship
4. Write down the assumptions and criticisms of Kunkel's theory
5. Explain Kunkel's Psychological Theory of entrepreneurship

### **Short Answer Questions**

1. Write down the criticisms of theory of innovation
2. What are the five points of innovation given by theory of innovation?
3. Explain the concept of sociological theory of entrepreneurship

4. Write a short note on Hagen's Theory
5. According to Kunkel, the supply of entrepreneurship depends on which of the following factors

**B. Multiple Choice Questions**

1. \_\_\_\_\_ innovated theory of innovation
  - a. Joseph Schumpeter
  - b. Henry fail
  - c. Adam Smith
  - d. Johnson
2. The \_\_\_\_\_ is the one who invents new materials and new methods
  - a. Inventor
  - b. entrepreneurs
  - c. Managers
  - d. Leaders
3. According to \_\_\_\_\_ the entrepreneur is defined as someone who specializes in taking judgmental decisions about the coordination of scarce resources.
  - a. RR Carlson
  - b. John Schumpeter
  - c. Mark Caisson
  - d. Emerald
4. According to Max Weber, \_\_\_\_\_ had a profound influence on the growth of entrepreneurship.
  - a. understanding
  - b. Education
  - c. Experience
  - d. Religion
5. An individual working in the society but indifferent to the work and position.
  - a. The ritualist
  - b. The retreats
  - c. The reformist
  - d. The innovator

**Answers:**

1-a, 2-a, 3-c, 4-d, 5-b.

## **2.7 Suggested Readings**

Kotter, J. (1996). *Leading Change: An Action Plan from The World's Foremost Expert on Business Leadership*.

Mariota, S., & Towel, T. (2010). *Entrepreneurship: Owning your future*. Prentice Hall.

Hirsch, R. D., Peters, M. P., & Shepherd, D. A. (2012). *Entrepreneurship*. McGraw-Hill Education.

Ashton, K. (2016). *How to Fly a Horse: The Secret History of Creation, Invention, and Discovery*. Anchor.

Klein, A. (2020). *Steal Like an Artist: 10 Things Nobody Told You About Being Creative*. Adams Media.

**M.A (ECONOMICS)**  
**SEMESTER II**  
**MAEC24203T- ENTREPRENEURSHIP DEVELOPMENT**

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**UNIT 3- INNOVATION AND MANAGEMENT SKILLS**

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**STRUCTURE**

**3.0 Learning objectives**

**3.1 Introduction**

**3.2 Concept of innovation**

**3.2.1 Meaning and Definitions**

**3.2.2 Types of Innovation**

**3.3 Features, Need and Importance of Innovation**

**3.3.1 Features of Innovation**

**3.3.2 Need and Importance of Innovation**

**3.4 Latest Innovations in Manufacturing and Service Sectors**

**3.5 Management Skills**

**3.6 Questions**

**3.7 Suggested Readings**

**3.0 OBJECTIVES**

After studying the Unit, you would be able to:-

- Understand the detailed concept of Innovation in Entrepreneurship along with characteristics
- Explore the concept of social entrepreneurship

- Find out about the latest innovations in the manufacturing and service sector.

### **3.1 INTRODUCTION**

Innovation is the development and implementation of new tools and techniques to create major and minor changes to goods, processes, and services, resulting in the introduction of something new for the company, which provides value to consumers and contributes to the organization's knowledge store. In the era of extreme competition, global business presence, and arising issues and awareness about environmental and governance aspects of business, new innovations in manufacturing and trading of goods and services have been frequent and prominent.

Natural sciences, social sciences, health sciences, and other fields contribute to the outcomes of innovation. Basic scientific knowledge aids understanding in such disciplines and to completely comprehend technology or technological potential for advancement in procedures and hence the betterment of final product. The evolution of today's electric bulbs is an outstanding example of innovation right from the history of invention, creation and mass production of electric bulbs.



As the diagram depicts, the history of electric light, which improves our daily lives is the contribution of numerous scientists. James Lindsay, Frederick Moleyns, Heinrich Göbel, Humphrey Davy, and Thomas Edison were among those who made significant contributions to the development and advancement of electric light. From simple light bulbs to CFL and LEDs, bulbs have to go through a long path.

### **3.2 CONCEPT OF INNOVATION**

Innovation is a phenomenon through which a product, or a service is refreshed and kept updated by the application of new procedures, latest techniques, or the establishment of innovative concepts to generate new value to increase customer satisfaction and demand.

Innovation thus modifies the features and performance of the products, processes, or other activities of a business that leads to higher value addition for the business organization, consumers and the industry as a whole. A product is considered innovative when it has:

1. Unique Function or feature,

2. Unique design,
3. or both,
4. And is superior to what was previously offered in the market.

Innovations mostly lead to ease of doing business operations, efficient consumption and effectiveness of the products, solves a previously faced issue by the consumers of the products and related stakeholders etc. For example: online interaction with customers to sell and orient them with basic features as well as take feedback from them has proved beneficial. Similarly, advanced laser machine models are constant examples of frequent and significant innovations in the business of medical industry. The Sunscreens these days not only protect consumers from UV rays of the sun as they traditionally did but also from other light rays coming from electronic devices that we are exposed to these days as a result of increased screen time.

An innovation increases the wealth of the business by making it gain a competitive edge in the marketplace. It has become a major aspect in marketing a product. Customers tend to switch between brands being attracted by the innovative practices opted by a business. Especially a new enterprise can create a quick and big market share in comparatively less time if they have a USP (unique selling point) of some innovative feature in their product or service. While innovation frequently results in a victory for someone, it may also result in a loss for someone else. It's a fight out there.

### **3.2.1 Meaning and Definitions**

The term "innovation" comes from the Latin word "innovare," which means "to refresh " or "to renew ". To enhance or replace anything, such as a method, a product, or a service, is to innovate.

“Innovation is the creation of something that improves the way we live our lives”  
-Barack Obama.

“Innovation is change that creates a new dimension of performance.”  
-Peter Drucker.

Turning an idea into a solution that adds value from a customer's perspective

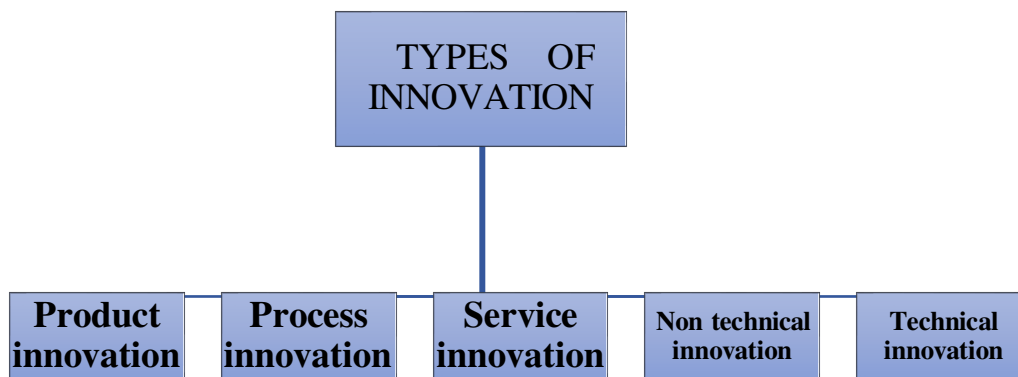
Nick Skillicorn Innovation is something fresh (new, original, or improved) that creates value.

-Jeff Dance.

“Innovation is significant positive change”.

-Scott Berkun

### 3.2.2 Types of Innovation:



The concept of innovation has various dimensions or types as follows:-

- **Product innovation:** A new kind of product invented which tackles an existing problem posed to customers or serves an additional feature that may increase the utility of the product.
- **Process innovation:** The process of production or sale and after sale services is creatively modified to either reduce the cost of production or improve business-customer relationship.
- **Service innovation:** An innovative method to provide the same service in a creative and more beneficial way that may help increase customer base, reduce problems of the business, the customers and the society. For example applications like OYO ,MakeMyTripetc have eased out the selection and booking of hotels and planning trips . they provide same services as a travel agent but in a more convenient and trustworthy way. They ensure better services, prices, security and safety to both the customers and business.
- **Technical innovation:** Technological innovation is concerned with changes in the physical characteristics and features of a product or modification of methods of manufacturing the products. For example; Introduction of smart phones, smart watches were a technical innovation in the market.
- **Non-technical innovation:** Non-technical innovation is generally related to organization structure changes and marketing channels. Any innovative supply chain management or customer relationship management are good examples of this.

### **3.3FEATURES, NEED AND IMPORTANCE OF INNOVATION**

**3.3.1 Features of innovation:** The concept of innovation has the following characteristics:-

1. **Relevance** – A process or product is termed innovative when it brings freshness to the market and is relevant to the basic objective of providing utility to the customers or the business houses selling and manufacturing the product. The stakeholders of the innovation



need to see the benefits of the particular innovation as compared to the traditional product or service. Innovative changes can be done in any of the following aspects:

- Better user interface and ease of using the product or doing the process.
- Improve the quality and effectiveness of product or service or the process innovated for example new age sunscreens that not sticky and also provide protection from blue light of devices.
- Combining several functionalities into a single tool, for example, a mobile phone these days works as a watch, a computer, a camera and a phone, all in one device.
- Increase the durability of product or process.
- Reduce the requirement of other equipment and supplies.
- Increase the efficiency and productivity.
- Increased usefulness.
- Reduce pollution.

The innovation of computer word processing programs as a substitute to typewriters is a simple yet brilliant example. The innovation reduced the burden of extra physical accessories other than a personal computer, constant demand for ink, the documents easily editable and files could be saved for a lifetime and transferred to other computers very conveniently with the use of small devices like pen drives, CDs etc.

2. **Solution to problems:** An innovation is the result of time and efforts spent on creating a new concept of production and customer satisfaction to address a currently faced problem. The most common issues addressed by innovations in business processes and products are concerned with:

- Low waste generating manufacturing system
- Reduced Pollution
- Healthy after effects on consumer
- Ease of doing business
- Ease of procuring and utilizing materials

3. **Results in change:** Innovation is a process that leads to change: change in the utility of product or service; change in the design; change in consumer experience; change in the production process; change in selling arrangements. The basic purpose of innovation is always betterment of experience and functioning on part of both seller and buyer.

4. **Adds value:** The advancement made through innovation is always to add value to a product. Innovation reflects advancement in technology which adds value to the product and service with additional benefits, elongated use, environment friendly and positive health effects. An innovative product is always deemed superior to other peers in the market so is always sold on premium. Hence innovation adds value to the price due to added benefits.

5. **Entrepreneurial opportunity:** Innovation in any aspect and field is an entrepreneurial opportunity created in itself which can be sold at higher profit as well as it

will have the potential to serve as a competitive edge for the enterprise. Any enterprise that comes to the market with innovative base always grows higher and faster.

**6. Inevitable in enterprise:** An ordinary business becomes an enterprise only when the product or service offered is innovative and is different from the kind of products present in the market already. Innovation and entrepreneurship go hand in hand with USP (unique selling point) being freshness in the idea, better performance and solution to existing problems, continuous updating etc.

**7. Systematic process:** Innovation is a systematic process to be applied through all the levels of management. Every business organization is managed through an interdependent set of management functions and departments. Introduction of an innovative product or process, is going to affect all the functional departments of the organization directly and indirectly so it is inevitable to observe effects of innovation on every aspect of business.

### **3.3.2 Need and importance of Innovation**

**1. Survival in competition:** Innovation is an unavoidable characteristic in a business model and product these days due to immense global competition and frequent advancements in technology and science. Technologies are getting obsolete frequently. No business can stay constant in techniques and product features provided by them else they may end up in heavy losses. Best example of this is Nokia phones which was considered to have largest market share in the market but they went to a significantly low position however their competitor Samsung and Xiomi managed to acquire more market shares in spite of having competition from brands like Apple.

**2. Competitive edge:** Innovation has become a pioneer in providing a competitive edge to business over their rivals. Apple I-phone and other products of the company is the best example of this as the company is not just able to sell the products at high demand but also due to their innovative products and services, they charge way too high prices and have created a superior image in the global market.

**3. Socially aware customer:** Spread of social media has further accelerated the awareness among the society about the pros and cons of various products on them individually as well as socially. Consumers are much more actively participating in giving their opinion about the products they consume and demand for better technology in every aspect at lowest price possible. There is not much scope of salesmanship marketing in the present era because the society itself is evolving day by day as intelligent and completely aware of the products they consume and the technologies that are involved. Word of mouth marketing spreads more effectively where in people actually inform each other about the various positives and negatives about businesses online very conveniently.

**4. Creating brand value:** Businesses may promote the impression that they create revolutionary items by showing innovation to consumers. The customers like to be associated with brands that have the leading edge of innovation, using the most advanced unique products.

**5. USP (unique selling point):** Innovation have proved to be the reason and the only factor for establishment and success of certain brands in the market. for example Apple I-phones ,Macbook, Apple smart watch revolutionized the market.

**6. Marketing hype:** Innovation leads to self-publicity and promotion of the enterprise and creates a trend in the society. For example; Facebook, Snapchat etc. initially managed to establish themselves as a recreational activity and excited people about using these applications.

### **3.4 LATEST INNOVATIONS IN MANUFACTURING AND SERVICE SECTORS**

Innovations in the business world are becoming more and more frequent due to the spread of internet and access to the global markets. New age entrepreneurs are competitive enough to revolutionize the market with brilliant unique ideas faster than even before a technology becomes common. Newer versions are launched even before the previous ones have even penetrated the market completely.

**1. Digital Transformation:** The biggest transformation in the business world these days is digitalization. There is a parallel market operating in today's era which is the virtual online market. It has increased its share in the business to a very significant size that it has become impossible for businesses to succeed and grow without having presence on the internet.

**2. Customization:** From computers to cars, Jordan shoes to Bare Anatomy shampoos-customers have access to the privilege of customizing their own products as per their choices and requirements these days. Many brands have gained customers on the ground of providing ample liberty to customers to decide and design their own products to consume for example Dell computers, Jordan shoes, Bare Anatomy shampoos etc.

**3. Artificial Intelligence:** The technology these days have advanced to unimaginable scenario. Artificial intelligence is being used these days by Human resource management teams of businesses to recruit and select candidates. It has proved to be a boon in marketing and advertising industry as the artificial intelligence is even used to analyze the potential future buys of people which they are either planning to or are having some interest in any product or service. Whatever we search or talk about or surf on the internet is used to send us the relevant advertisements, and offers of brands.

**4. Faster frequent global transactions:** Businesses these days have global reach thanks to technological advancement, electronic devices, internet and social media. Many business have flourished due to their innovative customer relationship management and social media fame. For example: 1) Many designers these days take measurements and sell their designs to customers abroad online and courier the designer dresses. 2) Many dieticians provide online diet plans to customers etc.

**5. Online economy:** Financial transactions these days have increased through online modes more like online money transfer applications, Whatsapp, bank accounts etc. Bitcoins and cryptocurrency is another pioneer of emergence of a virtual financial market presence. This innovation although has increased the scope for small businesses as they can now just operate financially with the help of their personal phones conveniently. Payment have become easy, quick and safe through these applications.

**6. Marketing strategies:** The marketing techniques have evolved a lot different from what traditionally these were practiced as. Traditional advertising is becoming irrelevant day by day. Advertising is more through content creators on social media and through online modes or innovative customer building chain organizations like one followed by Amway - Nutrilite, Avon etc.

**7. Cross industry innovations:** Technological innovations lead to rise in cross industry competition. Innovation of smart phones posed competition to watches, offline service providers and computer industry which further resulted in inevitable changes in the traditional services and products to survive. For example, watches had to be evolved into smart watches, offline education institutes had to start doing operations online etc.

**8. Minimum or no side effects:** Innovations in the manufacturing and service sector are more concerned about reducing the bad effects if any on the life of a customer. For example; Invention of laser technology leads to medical procedures go pain-free, scar free and gives instant results. Service entrepreneurs' these days have to put efforts to convince consumers about the elimination of side effects from their procedures.

### **3.5 MANAGEMENT SKILLS**

Management skills can be defined as certain attributes or abilities that an executive should possess in order to fulfill specific tasks in an organization. They include the capacity to perform executive duties in an organization while avoiding crisis situations and promptly solving problems when they occur. Management skills can be developed through learning and practical experience as a manager. The skills help the manager to relate with their fellow co-workers and know how to deal well with their subordinates, which allows for the easy flow of activities in the organization.

Good management skills are vital for any organization to succeed and achieve its goals and objectives. A manager who fosters good management skills is able to propel the company's mission and vision or business goals forward with fewer hurdles and objections from internal and external sources.

#### **Hard Skills**

Hard skills, also called technical skills, are job-specific, relevant to each position and seniority level. In other words, each position in every company will require a unique hard skills list. For example, an accountant needs to know how to reconcile bank statements, while that knowledge is unnecessary for a developer. At the same time, reconciliation is important for accountants no matter their level of experience, but preparing business budgets is a skill that's not usually required of a junior accountant.

#### **Soft Skills**

Soft skills are general characteristics, relevant to personality traits. Some soft skills you'd like to see in all employees regardless of their position or expertise, while other soft skills make sense in certain jobs and are less important in others. For example, if you value collaboration in your company, you want to hire employees who are great team players and can communicate well with others. On the other hand, networking and relationship-building skills might be essential for sales and marketing roles, but irrelevant for engineering roles. Likewise, leadership abilities make sense for people who'll manage a team no matter their department.

Developing hard skills vs. soft skills

Employees develop hard skills through education and on-the-job practice, while they develop soft skills through various, life-long professional and personal experiences. For example, marketers can learn marketing techniques and tools by attending a marketing course, whereas they could grow their collaboration skills by participating in a sports team.

#### Measuring hard skills vs. soft skills

Hard skills are measurable and can be described using numerical or yes/no criteria. On the other hand, soft skills are often intangible or hard to quantify and are usually described with qualitative scales. For example, one salesperson might be:

an excellent user of X CRM software having used its features on a daily basis for the past 5 years and;  
a good communicator being able to explain ‘fairly well’ the benefits of a product to a potential customer.

Management and leadership skills are often used interchangeably as they both involve planning, decision-making, problem-solving, communication, delegation, and time management. Good managers are almost always good leaders as well.

In addition to leading, a critical role of a manager is to also ensure that all parts of the organization are functioning cohesively. Without such integration, several issues can arise and failure is bound to happen. Management skills are crucial for various positions and at different levels of a company, from top leadership to intermediate supervisors to first-level managers.

### **Types of Management Skills**

According to American social and organizational psychologist Robert Katz, the three basic types of management skills include:

#### **1. Technical Skills**

Technical skills involve skills that give the managers the ability and the knowledge to use a variety of techniques to achieve their objectives. These skills not only involve operating machines and software, production tools, and pieces of equipment but also the skills needed to boost sales, design different types of products and services, and market the services and the products.

#### **2. Conceptual Skills**

These involve the skills managers present in terms of the knowledge and ability for abstract thinking and formulating ideas. The manager is able to see an entire concept, analyze and diagnose a problem, and find creative solutions. This helps the manager to effectively predict hurdles their department or the business as a whole may face.

#### **3. Human or Interpersonal Skills**

The human or the interpersonal skills are the skills that present the managers’ ability to interact, work or relate effectively with people. These skills enable the managers to make use of human potential in the company and motivate the employees for better results.

### **Examples of Management Skills**

There is a wide range of skills that management should possess to run an organization effectively and efficiently. The following are six essential management skills that any manager ought to possess for them to perform their duties:

### **1. Planning**

Planning is a vital aspect within an organization. It refers to one's ability to organize activities in line with set guidelines while still remaining within the limits of the available resources such as time, money, and labor. It is also the process of formulating a set of actions or one or more strategies to pursue and achieve certain goals or objectives with the available resources.

The planning process includes identifying and setting achievable goals, developing necessary strategies, and outlining the tasks and schedules on how to achieve the set goals. Without a good plan, little can be achieved.

### **2. Communication**

Possessing great communication skills is crucial for a manager. It can determine how well information is shared throughout a team, ensuring that the group acts as a unified workforce. How well a manager communicates with the rest of his/her team also determines how well outlined procedures can be followed, how well the tasks and activities can be completed, and thus, how successful an organization will be.

Communication involves the flow of information within the organization, whether formal or informal, verbal or written, vertical or horizontal, and it facilitates smooth functioning of the organization. Clearly established communication channels in an organization allow the manager to collaborate with the team, prevent conflicts, and resolve issues as they arise. A manager with good communication skills can relate well with the employees and thus, be able to achieve the company's set goals and objectives easily.

### **3. Decision-making**

Another vital management skill is decision-making. Managers make numerous decisions, whether knowingly or not, and making decisions is a key component in a manager's success. Making proper and right decisions results in the success of the organization, while poor or bad decisions may lead to failure or poor performance.

For the organization to run effectively and smoothly, clear and right decisions should be made. A manager must be accountable for every decision that they make and also be willing to take responsibility for the results of their decisions. A good manager needs to possess great decision-making skills, as it often dictates his/her success in achieving organizational objectives.

### **4. Delegation**

Delegation is another key management skill. Delegation is the act of passing on work-related tasks and/or authorities to other employees or subordinates. It involves the process of allowing your tasks or those of your employees to be reassigned or reallocated to other employees depending on current workloads. A manager with good delegation skills is able to effectively and efficiently reassign tasks

and give authority to the right employees. When delegation is carried out effectively, it helps facilitate efficient task completion.

Delegation helps the manager to avoid wastage of time, optimizes productivity, and ensures responsibility and accountability on the part of employees. Every manager must have good delegation abilities to achieve optimal results and accomplish the required productivity results.

### **5. Problem-solving**

Problem-solving is another essential skill. A good manager must have the ability to tackle and solve the frequent problems that can arise in a typical workday. Problem-solving in management involves identifying a certain problem or situation and then finding the best way to handle the problem and get the best solution. It is the ability to sort things out even when the prevailing conditions are not right. When it is clear that a manager has great problem-solving skills, it differentiates him/her from the rest of the team and gives subordinates confidence in his/her managerial skills.

### **6. Empowering**

The ability to motivate is another important skill in an organization. Motivation helps bring forth a desired behavior or response from the employees or certain stakeholders. There are numerous motivation tactics that managers can use, and choosing the right ones can depend on characteristics such as company and team culture, team personalities, and more. There are two primary types of motivation that a manager can use. These are intrinsic and extrinsic motivation.

### **7. Building good working relationships with people at all levels.**

Recommended by 79.9% of managers surveyed.

The most important management skill, the survey found, is the ability to build good relationships with people at all levels. For example, an approach to relationship building described in the book focuses on creating "high-quality connections" through respectful engagement.

Bottom Line

Management skills are a collection of abilities that include things such as business planning, decision-making, problem-solving, communication, delegation, and time management. While different roles and organizations require the use of various skill sets, management skills help a professional stand out and excel no matter what their level. In top management, these skills are essential to run an organization well and achieve desired business objectives.

## **3.6 QUESTIONS**

### **Long Answer Questions**

1. Explain the concept of innovation. What is role of innovation in the success of an enterprise? Why is it considered inevitable for the survival and success of an enterprise?
2. Describe the features of innovation in context of entrepreneurship. Give examples.
3. What are the benefits of innovation to an entrepreneur?
4. What are the latest innovations in the manufacturing and service sector? Explain.

## 5 Define Hard skills and Soft skills of Managers

### Short Answer Questions

1. Define innovation.
2. What are the different types of innovation?
3. Distinguish between leadership and management
4. What are the qualities of good and successful leader?
5. Explain the concept of Leadership and subordinate development

### 3.7 Suggested Readings

Kotter, J. (1996). *Leading Change: An Action Plan from The World's Foremost Expert on Business Leadership*.

Mariota, S., & Towel, T. (2010). *Entrepreneurship: Owning your future*. Prentice Hall.

Hirsch, R. D., Peters, M. P., & Shepherd, D. A. (2012). *Entrepreneurship*. McGraw-Hill Education.

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## **M.A (ECONOMICS)**

### **SEMESTER II**

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#### **UNIT 4: ENTREPRENEURSHIP: SOCIAL, COMMERCIAL, WOMEN ENTREPRENEURSHIP**

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##### **STRUCTURE**

##### **4.0 Objectives**

##### **4.1 Introduction**

##### **4.2 Types of Entrepreneurship**

##### **4.3 Social Entrepreneurship**

##### **4.4 Commercial Entrepreneurship**

##### **4.5 Women Entrepreneurs**

##### **4.5.1 Successful Women Entrepreneurs**

##### **4.6 Successful women entrepreneurs**

##### **4.7 Concept of women entrepreneur**

##### **4.7.1 Definitions of women entrepreneurs**

##### **4.7.2 Characteristics of women entrepreneurs**

##### **4.7.3 Functions of women entrepreneur**

##### **4.7.4 Others functions of women entrepreneur**

##### **4.8 Problems faced by women entrepreneurs**

##### **4.9 Remedial steps to support women entrepreneurs**

##### **4.10 Selection of industry by women entrepreneur**

##### **4.10.1 Schemes of government for women Other government initiatives**

##### **4.11 Questions**

##### **4.12 Suggested readings**

#### **4.0 LEARNING OBJECTIVES**

After studying the Unit, you would be able to:-

- Understand the concept of Women Entrepreneurship.
- Identify the problems and challenges faced by Women Entrepreneurs.
- Find out the role of government to promote Women Entrepreneurship.

Outline the suggestions to overcome the challenges faced by Women Entrepreneurship

#### **4.1 INTRODUCTION**

Entrepreneurship is the act of creating a business or businesses while building and scaling it to generate a profit. Entrepreneurship is the art of starting a business, or as a venture offering creative

product, process or service. Entrepreneurship is used with different meanings such as innovation, risk bearing, adventurism, wealth creation etc.

Entrepreneurship is an evolving phenomenon. With the advancement of science and technology it has undergone metamorphosis change and emerged as a critical input for socioeconomic development. Entrepreneurship is the process of being an entrepreneur, of gathering and allocating the resources, financial, creative, managerial or technological, necessary for the success of new ventures. Entrepreneurship is characterized by creative solutions to problems and ingenuity and innovation are the forte of an entrepreneur. Economies have been characterized by innovations and new products that entrepreneurs have brought to the market. Further, entrepreneurship has acted as the catalyst to transfer a segment of new generation of people into self-employed business owners to provide jobs and motivation for the rest. Entrepreneurship is a phenomenon associated with entrepreneurial activity and entrepreneurs who seek to generate value by identifying and exploiting new products, processes, markets and creating or expanding economic activities

## **4.2 TYPES OF ENTREPRENEURSHIP**

As there are different types of entrepreneurs, there are also different types of businesses they create. Different types of entrepreneurship have been mentioned as follows:-

### **Small Business Entrepreneurship**

Small business entrepreneurship is concerned with opening a business without turning it into a large conglomerate or opening many chains. Examples of small business entrepreneurship include; A single-location restaurant, grocery shop, a retail shop to sell your handmade goods etc.

The individuals involved in small business entrepreneurship usually invest their own money and succeed if their business gains profit. They take a loan only if it is in case of need or it helps continue the business.

### **Scalable Startup**

These are companies that start with a unique idea. Such startups enter in market with a unique product or service and continue growing the company and continuously scaling up with the passage of time. To grow their idea and reach multiple markets, such companies require investors and large amounts of initial capital mostly.

### **Large Company**

Large company entrepreneurship is a new form of business created within an existing company. The existing company plans to shift into other sectors or to get involved in new technology.

Leaders of such companies either foresee a new market for the company or the manpower within the company put forward the ideas that help to start the process.

## **Social Entrepreneurship**

The social entrepreneurship is aimed at providing benefit to society and humankind. Through their products and services, they facilitate communities or the environment. Earning profits is not the sole aim rather they help the world around them.

### **4.3 SOCIAL ENTREPRENEURSHIP**

An enterprise is said to be a social enterprise when the business is established in an arrangement to provide benefits to the society in some form. Social entrepreneurship is that form of entrepreneurship which creates value for the society as a whole rather than focusing on just earning money. The enterprise aims at solving current issues in the society, benefiting some weaker or underprivileged section of the society through its operations, address existing cultural, communal and environmental issues. The main purpose of a social enterprise is to benefit the society. The social enterprises work for greater good rather than just generating profits. Examples of social enterprises include; Microfinance institutions, self-help groups, waste management organizations etc.

#### **Meaning**

A social enterprise is an innovative business model with a social mission that functions on a sustainable entrepreneurial strategy. The objective of the enterprise is to bring about a positive change in the society using constructive opportunities in innovative ways to facilitate transformations and sustainability.

Amul – the social enterprise of India

A very famous example of social entrepreneurship in India is of a well-known brand Amul. Amul was set up with a social motive and provides access to thousands of farmers who cannot establish their own platforms to sell in the national market. Amul provided a systematic supply chain management system to thousands of poor farmers in the country. Amul was a part of a cooperative movement in Anand, Gujarat, against Polson Dairy, which bought milk from local farmers in Kaira District at very low prices and sold it to the Bombay government.

#### **Characteristics of a Social Enterprise**

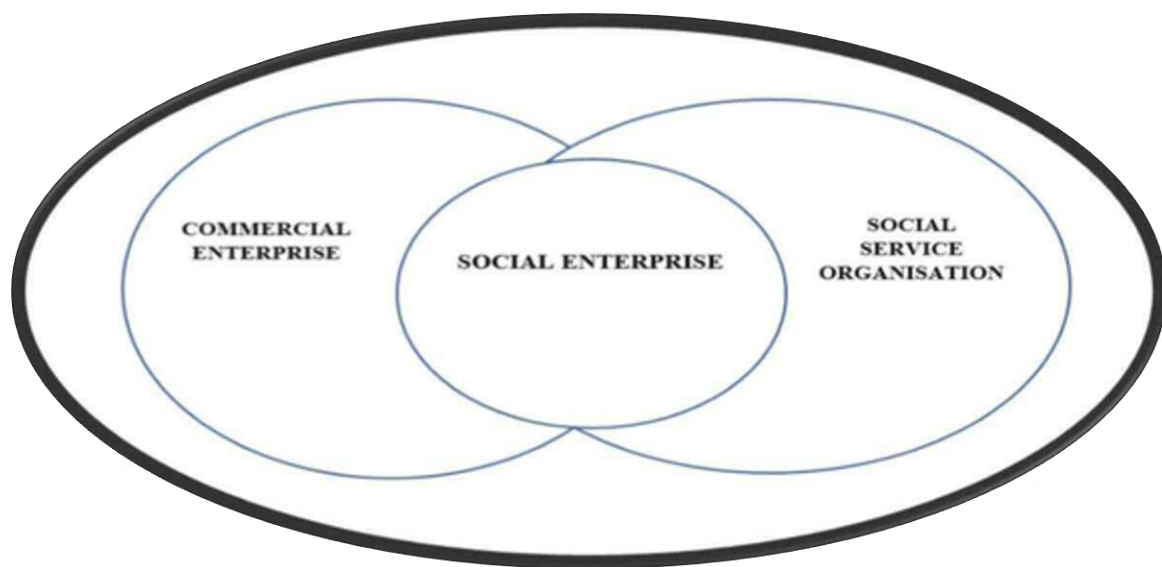
1. **Social motive:** The fundamental concept of a social enterprise is that this business is established with the basic motive of benefiting the society. The entire establishment is focused on generating solutions to the existing problems in the society.
2. **Sustainability:** A social enterprise model is mostly created with an idea of sustainable business activities with special focus on having the least possible side-effects on the environment, and society. It helps in making it function in a sustainable and eco-friendly

manner.

3. **Underprivileged sections:** The social entrepreneurs try and help the underprivileged sections of the society by either providing them with employment opportunities, education, better living conditions and equip them enough to be self-dependent.

4. **Transformation:** The entrepreneur aims at bringing about a positive change in the world through his business idea by transforming the society in an innovative manner.

5. **Profit Earning Social Work Entity:** Social enterprise is a blend of a pure commercial enterprise whose basic motive is to earn profit and wealth maximization and a social work organization that works as a non-profit entity functioning to serve the society and aim at social welfare.



6. **Social value:** The enterprise idea creates a social value through its activities. The process starts when a socially active person gets an idea to solve an issues of the society. He recognizes an opportunity to serve the people in an innovative business venture. So he takes up accountability as a good citizen to learn and adapt to the new idea and execute it to make the world a better place.

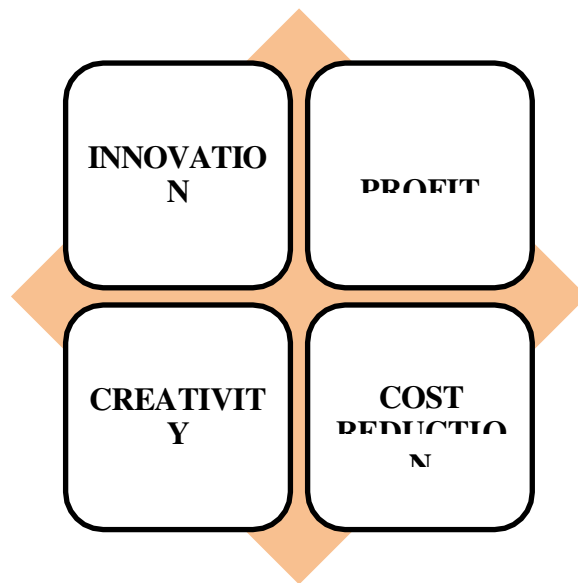
#### **4.4COMMERCIAL ENTREPRENEURSHIP**

It refers to a unique innovative idea of business which is new in the market and has profit generating potential. It is like an ordinary business only just the basic idea of such business needs to be new creative and unique in itself.

- Commercial entrepreneur uses innovation to explore new opportunities and unsatisfied needs of the consumers in market.
- Innovation is focused on reducing the cost and generating high income generating

products and services that can be sold at higher profits.

- The main motive is financial growth of the organization.
- Innovative efforts are made to maximize wealth and minimize the cost
- The product is more into satisfying the consumers as much as possible so they enjoy it relish it and buy more of it or even at premium prices.



### **DIFFERENCE BETWEEN COMMERCIAL AND SOCIAL ENTERPRISE**

An enterprise is a business entity that aims to earn profit by indulging in an innovative and unique business idea. A social enterprise however tries to benefit the society as well through its business idea and operations, be it through employing weaker sections of the society, opting for a sustainable eco-friendly production method or solving any other issues in the society.

<b>BASIS OF DIFFERENCE</b>	<b>SOCIAL ENTERPRISE</b>	<b>COMMERCIAL ENTERPRISE</b>
Purpose	Bring about as positive change in the world.	Earn profit through acquiring the maximum share in the market .
Risk	Risk involves business financial risk and social aspect is also under concern.	Risk involves majorly on financial front.
Strategy	Strategy involves addressing some societal issues in addition to earning profit.	Strategy is to earn compete in the market and generate maximum profit possible.
Objective	Social welfare	Wealth maximisation
Value creation	Social value creation	Financial value addition
Priority	Social welfare is always given preference over any other objective of the business	Financial earning is always the priority.

Focus	Social enterprise focuses on the needs of the society. what is needed for the weaker sections or the society as a whole or for the betterment of the environment.	Focus is on needs of the customers who can pay for products. Pure business motive. Needs that may generate money if served are of interest.
Uniqueness	The uniqueness of this enterprise lies in its innovative management of a social issue.	The uniqueness of this enterprise lies in the innovative product or service that serves the unsatisfied needs of the customers.
Examples	Self-help groups, Amul, the better India etc.	Apple, Facebook, BMW etc.
Importance	Social enterprises provide social welfare, sustainability and prosperity in the society. They hold social importance in the country.	Commercial entrepreneurs accelerate economic growth, generate employment opportunities and is crucial for the economic growth and financial wellbeing of the country.
Financial performance	Mostly it is observed that the financial growth and results of social enterprise are lower than commercial enterprises.	Commercial enterprise's operations at all levels are focused on reducing cost, maximising profits and sales so they are generally observed to perform better financially.
Government Aids	Social enterprises since are benefitting the weaker sections of the society so the government also tends to value them more and is lenient to them in terms of taxes to facilitate growth and maintain survival.	Commercial enterprises donot get such privileges or support from government to this extent.

### **SIMILARITIES BETWEEN SOCIAL ENTERPRISE AND COMMERCIAL ENTERPRISE**

1. **Process of establishment:** The social and commercial enterprises both emerge from an idea or vision of an innovative mind. Identifying entrepreneurial opportunities and transforming visions into attainable operations.
2. **Common goals:** Both are business entities hence aspire to expand their sales and earn profits although the objectives and goals may differ due to prioritization of financial and social benefits.

3. **Innovative:** Both type of enterprises are businesses that sell innovative goods and services that were never experienced before in the market and are result of unique fresh ideas.

#### **4.5 WOMEN ENTREPRENEURSHIP**

Woman is a person who accepts challenging role to meet her personal needs and become economically independent. Women have played a small role in the field of business. In a patriarchy society, women face number of problems in businesses. She considered as weak and dependent on their father, husband and son. traditionally, outside the domain of economic activities. Women must be part of economic growth, because it will ensure the social development and economic growth of women along with providing more human resources to strengthen the economy of the country. In traditional Indian society, parents prefer male child to female. After pregnancy tests reveals that a female child, then parents destroyed female child. They have many excuses regarding that why they don't want female child. In several developed countries like India, parents assumed that only marriage is the career for most of women. They don't want our female child do anything as an entrepreneur. They have number of logics regarding, not to do any business. Parents already decided about to choose profession teaching, medicine and office work etc. for a woman.

Feminism isn't about making women stronger. Women are already stronger; it's about changing way the world perceives that strength.

Women empowerment is empowering the women to take their own decisions for their personal development as well as social development. When a woman stands for herself than she also stands for the society to adapt the changes being by the women. The best way to empowering women is to develop women entrepreneurship. The role of women has changed drastically in the past few years for the better. A lot of women are entering in the business to earn bigger and better. India needs more women entrepreneurs to grow economically, socially and culturally. To facilitate this growth, better access to finance has been offered especially for women in India. The government of India has formulated various training and development cum employment generation programmes for the women to start various types of business. Government and non- government, promotional and regulatory agencies have come forward and play supportive role in promoting the women entrepreneur in India. A congenial environment is created to enable women to participate actively in the entrepreneurial activities.

##### **4.5.1 Successful Women Entrepreneurs**

The increasing presence of women as entrepreneurs has led to the change in the developing phase of business and economic growth of country. Women owners are playing a prominent role in society inspiring others and generating more employment opportunities in the country. With the increasing number of competitors, women faced list of problems while during their business. There are lots of women entrepreneurs who overcome this difficulty and also encourage others to do the same. Some of the successful women entrepreneurs are as follows:

1) **Kalpana Siraj:** She is known as the first women entrepreneur of India. She was born in Maharashtra village and belongs to Dalit family. At that time, it was very difficult to enjoy freedom and child marriage was very common. That time girls are considered as burden and this was reason they were married off at early age. She got married at the age of 12 but her in laws treated as slave and due to this reason, her took her back. Due to the society pressure she tried to end her life but her family saved her. She then decides to do some big things in life. She heard about government provide loan to Dalit on radio which help to use that money to become a women entrepreneur.



2) **Kripa Dharmaraj:** From being an IT professional to homemaker to CEO, Kripa Dharmaraj has made many hats. For seven years, Kripa had served more than 1000 million lunchboxes everyday as a part of her business -MCs lunchbox. Kripa and her husband brought together the team of 50 plus members to start up this business. Over the years, she explained her business and setup “green canteen” for several schools in Chennai to served balanced diets meals to kids.

3) **Falguni Nayer:** She is the founder and CEO in Nykaa. She built a beauty and style retail empire with a portfolio of 1500 plus brands, including its own private label, available online and across 68 stores in India.

There are women who choose their career as women entrepreneur and become successful but all of them face many problems in life.

#### **4.7 CONCEPT OF WOMEN ENTREPRENEUR**

A woman entrepreneur means who adopts, taking initiatives, discover new concepts and ideas in business is called woman entrepreneur. A woman entrepreneur is who has performed all the activities in establishing an enterprise. The role of women has changed drastically in the past few years for the better. A lot of women are entering in the business to earn bigger and better. India needs more women entrepreneurs to grow economically, socially and culturally. To facilitate this growth, better access to finance has been offered especially for women in India. The government of India has formulated various training and development cum employment generation programmes for the women to start various types of business. Government and non-government, promotional and regulatory agencies have come forward and play supportive role in promoting the women entrepreneur in India. A congenial environment is created to enable women to participate actively in the entrepreneurial activities.

##### **4.7.1 Definitions of women entrepreneurs**

Women entrepreneurship has been defined by various authors in different perspective and here we discuss some of these:

**According to Government of India,** “A woman entrepreneur is defined as an enterprise owned and controlled by a woman and having a minimum financial interest of 51% of the employment generated in the enterprise to woman”.

**According to J. Schumpeter,** “Woman who innovates, imitates or adopts a business activity is called woman entrepreneur.”

**According to Frederick Harbison,** “Any woman or group of women which innovates, imitates, or adapts an economic activity may be called woman entrepreneurship.”

The term woman entrepreneur signifies that section of female population who started out into industrial activities that is manufacturing, assembling, job works, repairs or servicing and other enterprises.

##### **4.6.2 Characteristics of women entrepreneurs**

On the basis of definitions given by different scholars, the following characteristics have been identified:

- A woman who controls and manages the whole business of enterprise under her own supervision and guidance is the main feature of woman entrepreneur.

- A woman entrepreneur must have good leadership quality.
- A woman entrepreneur faces any problem and uncertainty with confidently.
- A woman entrepreneur is considered as good organizer, coordinator, and manager in all factors as land, labor and capital. She can manage all factors of production from the society and distributes a product with finishing product.
- A woman entrepreneur has self-confidence. She should have a trust in herself and her abilities too. She has a confidence to implement to change and how to overcome any resistance to change.
- A woman is a good decision maker. So, as an entrepreneur, it assumed that she takes good decision for her business. She must be clear with her decision-making process.
- A woman entrepreneur is one who can invent new ideas and she can start her business with these new ideas and can provide new added value to the society through her enterprise.
- A woman entrepreneur is willingness to do hard work. She believes on the principle, "hard work is the key to success".
- A woman entrepreneur has an achievement orientation derive. She can face challenges and can get success.
- A woman entrepreneur must be optimistic. Her positive or optimistic attitude can give a positive environment to her business.
- A woman entrepreneur must have the technical know-how.
- A woman entrepreneur has trust on herself so that she can get success with boldly and bravely facing problems.
- A woman entrepreneur must have sound mind person. She has to clear her mission and vision.

#### 4.7.3 Functions of women entrepreneur

Like a male entrepreneur, a woman entrepreneur has to perform the following function:

##### (A) Entrepreneurial functions

**1) Innovation:** The main function of woman entrepreneurship is innovation. She has to generate new ideas, creation of new markets and productions, discover new ideas and better sources of finance and make better form of industrial organization.

**2) Risk taking:** A woman entrepreneur should be risk taker. This is another function of entrepreneurial function of innovation. Whenever an innovation is done then there is some risk associated. So, a woman entrepreneur should be visualized opportunities for introducing new ideas and handle uncertainty.

**3) Organization building:** A woman entrepreneur alone decides the line of business to growth and expansion and how to utilize capital and build healthy organization.

##### (B) Promotional functions

**1) Discover new idea:** A woman entrepreneur visualizes new idea for her business so that she can raise new funds and ventures in new business.

**2) Detailed investigation:** After getting detailed investigation from all areas that she will think of arranging of finances for the new enterprises.

**3) Assembling the requirements:** A woman entrepreneur canvass to select new location for factory, decides the plant and machinery and contact with suppliers of raw materials.

**4) Financing the proposition:** The woman entrepreneur will estimate requirements of finances for her enterprise. The financial requirements for short term and long term are estimated.

(a) Managerial Functions

**1) Planning:** Planning means thinking before doing or thinking in advance. It is a decision in advance, what to do, when to do, how to do and who will do a particular task. Planning is process which involves thinking or mental state of woman entrepreneur. She will think before undertaking a work.

**2) Organizing:** A woman entrepreneur has another function of organizing is to arrange, guide, coordinate, direct and control the activities of other factors of production that is men, material, money and machines so accomplish the goals of the enterprise.

**3) Staffing:** a woman entrepreneur has to perform the function of staffing which includes manpower planning, recruitment, selection, and training, placement of manpower, development, promotion, transfer and determination of employee remuneration.

**4) Directing:** directing is concerned with managerial functions. Group activities should be accomplished by employees under the direction of planned actions.

**5) Leadership:** A woman entrepreneur should have the quality of leadership. A woman should lead by example, so that every employee working in her firm should have faith in women owner to achieve organization goals. To be successful leader, she must possess the qualities to create motivation.

**6) Motivation:** A women entrepreneurs motivate their employees by providing incentives and canvass their employees for achievement of objectives of their enterprise.

**7) Supervision:** Women entrepreneur should have aim of supervision. Supervision means to oversee their employees and give direction to employee how to achieve their goals. If any employee does work then the women entrepreneur should correct them.

**8) Controlling:** Controlling is another function of managerial. With control process a woman entrepreneur to implement her rules and regulations and can take corrective actions if performance is not up to mark.

**9) Coordination:** Coordination is also very much important function of managerial. Coordination creates spirit to work and helps in achieving goals through collective efforts.

(D) Commercial Functions

**1) Production:** A woman entrepreneur has a key function is production function. This function contains manufacturing and advisory activities.

**2) Personnel:** With the help of people and workers a woman entrepreneur can achieve their goals. Workers can develop their organization with coordination.

**3) Finance:** With the help of finance functions of woman entrepreneur can achieve goals. The need of money is continuous. It deals with estimating financial requirements, deciding capital structure, selecting a source of finance, proper cash management etc.

#### 4.7.4 Others functions of women entrepreneur

There are some other functions as following.

- Exploration of the prospects of starting a new business
- Handling of economic uncertainties involved in business.
- Introduction of innovations in business.

- Disciplinarian as business woman
- Manage risk and taking good decision to expand her business.
- Develop confidence amongst in workers
- Awareness regarding new technology
- Conducting proper and routine supervision
- Arranging proper source of finance.
- Managing good factors of production in timely.

#### **4.8 PROBLEMS FACED BY WOMEN ENTREPRENEURS**

Women entrepreneurs face many problems in their efforts to develop their enterprises. The main problems faced by the women entrepreneurs are discussed as follows:

- 1) **Family restrictions:** This is the most common problem faced by women. They are expected to spend more time with their family, friends. They do not encourage women to travel around the world to grasp the opportunity for developments.
- 2) **Lack of education:** Women are generally denied of higher education, especially in rural areas and undeveloped countries. Women are not allowed to enrich their knowledge in technical and research areas to introduce new products.
- 3) **Role conflict:** Marriage and family are given more importance than career in Indian society. It is expected from women to be a good house wife and take care of family rather than go outside for work.
- 4) **Lack of finance:** Family members do not encourage women entrepreneurs. They hesitate to invest money in the business initiated by women. Banks and financial institutes also hesitated to provide financial support to women.
- 5) **Lack of information:** Women entrepreneurs are not generally aware of the subsidies and incentives available for them. Lack of knowledge may prevent them from availing the special schemes.
- 6) **Stiff competition:** Women face competition with men due to limited mobility they find it difficult to compete with men.
- 7) **Lack of raw material:** The lack of material required is one of the big problems which is faced by a woman entrepreneur. Women entrepreneurs face a number of problems to procure the required raw materials for production in sufficient quantity and quality.
- 8) **Limited managerial ability:** As a woman, she may not be expert in all managerial activities. She could not be able to give her time in various types of activities.
- 9) **Lack of risk taking ability:** As a woman, she has not much ability to face uncertainties and not ever bear uncertain risks. This problem is due to lack of infrastructure and hesitation in quick decisions.
- 10) **High cost of production:** Another problem faced by women entrepreneurs is high cost of production. To reduce high cost of production, have to increase efficiency. So, it creates high cost of production.

#### **4.9 REMEDIAL STEPS TO SUPPORT WOMEN ENTREPRENEURS**

The following measures may be adopted to solve the problems faced by women entrepreneurs in India:

1. **Promotional help:** Government and NGO'S must provide assistance to entrepreneur, both in financial and non-financial areas so that it can help them to improve more in this field.
2. **Training:** They must be given training to operate and run a business successfully. Training has to be given women who are still reluctant to take up the entrepreneurial task.
3. **Finance:** Finance is one of the major problems faced by women entrepreneur. Both family and government organizations should be liberal in providing financial assistance to them.
4. **Family support:** Family should support women entrepreneurs and encourage them to establish and run business successfully. Family support helps the women to encourage more and take the risk to compete in the men dominated business world.
5. **Concessional rates of interest:** Finance should be provided at concessional rates to women entrepreneur.
6. **Proper supply of raw materials:** To make products cost competitive and at reasonable price to women entrepreneur at right time.
7. **Changing the social attitudes:** A society should have to change their attitudes regarding women entrepreneurs. Parents should have to support female child so that they could become a good entrepreneur.
8. **Setting up marketing cooperatives:** To set up and manage business enterprises of their own successful business, women should have potential. So that they could achieve their goals. If women will join that stream, it will enhance the national economy and may generate employment too.

#### **4.10 SELECTION OF INDUSTRY BY WOMEN ENTREPRENEUR**

The type of industry a woman entrepreneur can establish depends on her family background, education, interest, attitude, training, and local market conditions. Other factors to be considered as availability of funds, raw materials, labour, local people demand, power etc. Small industry service institute SISI has been recommended the number of industries for women entrepreneurs: -

- 1) Production and manufacturing of pickle, papad, handcrafts, packaging, stationery, bedsheets, boutique etc.
- 2) Operating Centre's for repairs of television, electric repairs, radio and watches repair, office maintenance on contract basis, catering, batik painting, embroidery, tutorial classes, stenography etc.
- 3) Retail shops for readymade garments, grocery shops, drug stores, snack bars, soft drinks, florist shops etc.
- 4) Operating of crèches, photographic studios, dry cleaning, travel agencies, working women hostels etc.

For running small industries, government providing various types of assistance to women entrepreneurs, such as,

- 1) Providing financial assistance to women entrepreneur as credit for fixed and working capital.

- 2) Providing training in which they want to establish their small industries.
- 3) Providing help in promotional activities as in preparation of project report, registration, and licensing etc.
- 4) Providing proper training, so that women entrepreneurs can achieve their goals.
- 5) Providing marketing assistance.

#### **4.10.1 SCHEMES OF GOVERNMENT FOR WOMEN OTHER GOVERNMENT INITIATIVES**

The role of women has changed drastically in the past few years for the better. A lot of women are entering in the business to earn bigger and better. India needs more women entrepreneurs to grow economically, socially and culturally. To facilitate this growth, better access to finance has been offered especially for women in India. The government of India has formulated various training and development cum employment generation programmes for the women to start various types of business. Government and non- government, promotional and regulatory agencies have come forward and play supportive role in promoting the women entrepreneur in India. A congenial environment is created to enable women to participate actively in the entrepreneurial activities. There are number of schemes have been launched by government for women entrepreneurs as follows:

##### **1) Mudra yojna scheme**

Government has launched Mudra yojna scheme for women who want to commence new business or want to grow their business. This scheme can be helpful for new business entrepreneurs. Under this scheme government provide loans to Rs. 50k to Rs. 100k. This scheme is perfect for small businesses like salons, or home-based businesses. This scheme is divided into three categories:

- A) Kishore Loans up to 50k/-
- B) Shishu Loans above 50k/- and up to 500k/-
- C) Tarun Loans above 500k/- and up to 10 lacs.

One of important point here is that there is no need of any collateral security or any guarantor for this loan.

##### **2) Dena Shakti Scheme**

Under this scheme government provide loans for women entrepreneurs in certain sectors are as:

- . Agricultural businesses
- . education
- . retail stores
- . housing
- . micro organisations

If any women are planning to commence any of above business then under this scheme maximum loan limit is Rs. 20 lacs and rate of interest is 0.25% below that of base rate. For applying this loan, entrepreneur has to fill application form and submit required documents to avail of the loan. It is very easy to get loan under this scheme.

##### **3) Udyogini scheme**

A woman can commence a business under this scheme, which comes from small income family. Under this scheme, there are no restrictions to get loan. Amount of loan, a woman can avail is Rs. 3 lacs at low rate of interest. This scheme can help a woman to start business or enterprise or to make self-reliant. This scheme was started firstly by the Karnataka state women development. Many financial institutions have adopted this scheme with number of variations. Through online mode anybody can apply for this scheme and get easy loans.

**4) Cent Kalyani scheme**

This scheme is for who want to commence small scale business. This scheme is launched by Central Bank of India for women entrepreneurs. Under this scheme any women can avail loan up to Rs. 100 lacs. In this scheme, there is no collateral or processing fees.

**5) Mahila Udyam Nidhi Scheme**

This scheme is launched by Punjab National Bank and to assist small scale industries. The main objective of this scheme is to promote small scale business by providing modern technologies and advancement. These loans are hassle free loans.

**6) Women entrepreneurship platform**

NITI Aayog has started an initiative called Women entrepreneurship platform that support women to commence business. This scheme is for budding women entrepreneur. Under this scheme, to train the women who want to start business according to their choicest business, give them knowledge about laws, how to get financial assistance and raising of funds, and providing community and network of same consensus women etc.

**7) Stree Shakti Package**

This scheme is offered by the state bank of India branches in India and main aim to provide loan to women business. The biggest benefits to women are that there is no security for loans up to Rs. 5 lacs. Bank is providing various concessions to women, and loan amount could exceed up to Rs. 2 lacs or more.

**8) Annapurna scheme**

Under this scheme Government provides loans to women entrepreneur up to Rs. 50k. This scheme is for women who want to commence agricultural business. This scheme is firstly launched by the state bank of Mysore and Bhartiya mahaila bank. Loan amount has repaid through EMI's for 36 months with the interest rate prevailing in the market. Here, women entrepreneur needs a guarantor along with assets of the business being pledged as collateral security.

**9) Orient Mahila Vikas Yojna Scheme**

This scheme is launched by oriental bank of commerce for women entrepreneurs who hold 51% share capital individually or jointly in a business. This scheme provides loan amount up to Rs. 10 lacs to Rs. 25 lacs for women entrepreneurs in the small-scale enterprises. There is no need of collateral security. The repayment of loan is of 7 years and interest rate is 2% only.

**10) Pradhan Mantri Mudra Yojna**

This scheme is launched in 2015 by the government of India for women entrepreneurs. This scheme provides financial support to women entrepreneurs for starting their own

business. It helps to promote women in the country. Various financial institutions have extended Mudra loans under this scheme.

### **Other Government Initiatives for growth of women entrepreneurship**

There are number of programmes followed by government for promotion of women entrepreneurs such as:

#### **1) Steps taken in seventh five year plan:**

A special chapter on the integration of women in development was introduced by the government of India with following number of suggestions:

- a) Efforts should be made to increase their efficiency and productivity through appropriate technologies, equipment's and practices.
- b) In this plan, it was suggested to provide required assistance for marketing the products produced by women entrepreneurs.
- c) It was suggested that to arrange new vocational training facilities for women to suit their changing needs and skills.
- d) It was suggested that to treat a women as specific target groups in all major development programmes of the country.
- e) It was suggested that to involve the women in decision making process.

#### **2) Steps taken by government during eighth five year plan:**

The government of India revised special programmes to increase employment and income generated activities for women in rural areas. The various plans were launched during eighth five-year plan like:

- a) Prime Minister Rojgar Yojna and EDP's were introduced to develop entrepreneurial qualities among rural women.
- b) To generate employment opportunities for women KVIC took special measures in remote areas.
- c) Women cooperatives schemes were formed to help women in agro- based industries like dairy farming, poultry, animal husbandry, horticulture, etc.
- d) Training of rural youth for self-employment and several others schemes were started by the government to eliminate poverty and provided reservation to women under these schemes.

#### **3) Steps taken by the government during ninth five year plan:**

- a) Swarn Jayanti Gram Swarozgar Yojna and Swarn Jayanti Sehkari Rozgar Yojna were introduced by government to encourage women entrepreneurs.
- b) State industrial and development bank of India has been introduced to assist the women entrepreneurs.
- c) Trade related entrepreneurship assistance and development scheme was launched by Ministry of small industries to develop women entrepreneurs in rural, semi-urban and urban areas by developing entrepreneurial qualities.
- d) Government has provided special strategy to assist women entrepreneurs.
- e) Government introduced new scheme named women development corporations who will help in arranging credit facilities.

Chamber of women entrepreneurs of India provides various platforms to help women entrepreneurs to develop new and innovative techniques of production, finance and marketing. There are number of bodies or boards or organisations that help rural and urban areas women entrepreneurs.



- 4) Training programmes or schemes were arranged for women entrepreneurs to generate self-employment.
- 5) Rashtriya Mahila Kosh was set up in 1963 to provide grant to women entrepreneurs at lowest rate of interest under less cost and with simple procedure.
- 6) SIDBI has developed this fund for the entrepreneurial development of women especially in rural areas. Under Mahila Vikas Nidhi grants loan to women are given to start their venture in the fields like spinning, weaving, knitting, embroidery products, block printing, handlooms, handicrafts, bamboo products etc.

Women entrepreneurship played an important role in economic growth and stability for any country. Women entrepreneurs inspire other women to start businesses. This will lead to further job creation for women which ultimately helps in reducing the gender gap available in workforce of any country. A successful woman is confidently feminine and eager to learn and grow. She has maintained balance in all aspects of her life.

#### **4.11 Questions**

##### **Long Answer Questions**

1. Explain various types of entrepreneurship
2. Define a woman entrepreneur. What are the functions of a woman entrepreneur?
3. Explain women entrepreneurs. Discuss the important characteristics of woman entrepreneur.
4. Discuss the problems faced by women entrepreneurs. What are the steps taken by government to solve these problems?

##### **Short Answer Questions and Answers**

1. Define entrepreneur.
  2. What are the main features of woman entrepreneur?
  3. Explain promotional functions.
  4. Explain managerial functions?
  5. Explain entrepreneurial functions?
  6. Discuss problems faced by women entrepreneurs.
  7. Motivational factors behind women entrepreneurs.
  8. What are the various steps taken by government of India to promote women entrepreneurs?
  9. Highlight the examples of some successful women entrepreneurs.
  10. Which of the following areas are preferred by women entrepreneurs?
    - A. Administration
    - B. Organization
    - C. Utilities
    - D. Manufacturing
- Answer (A)
11. A typical Inventor is usually.....
    - A. Highly creative & in love with the invention
    - B. Does not encourage change

- C. Willing to modify the invention
- D. Not enthusiastic

Answer (A)

12. An individual who initiates, creates and manages a new business can be called

- A. A leader
- B. A manager
- C. A professional
- D. An entrepreneur

Answer (D)

13. implies the availability or otherwise of plant and machinery and technical know-how to produce the product,

- A. Economic viability.
- B. Financial feasibility.
- C. Technical feasibility.
- D. Managerial competence

Answer (C)

#### **4.11SUGGESTED READINGS**

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Klein, A. (2020). Steal Like an Artist: 10 Things Nobody Told You About Being Creative. Adams Media.

**M.A (ECONOMICS)**  
**SEMESTER II**  
**MAEC24203T- ENTREPRENEURSHIP DEVELOPMENT**

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**UNIT T- 5 DESIGN THINKING AND INNOVATION**

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**STRUCTURE**

- 5.0 Learning Objectives**
- 5.1 Introduction**
- 5.2 What is Design Thinking?**
- 5.3 Origin of design thinking**
- 5.4 Features of Design thinking**
- 5.5 Use of Design Thinking**
- 5.6 Applications of Design thinking**
- 5.7 Design thinking Vs Scientific Method**
- 5.8 Problem focus Vs Solution Focused**
- 5.9 Questions**
- 5.10 Suggested Readings**

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**5.0 LEARNING OBJECTIVES**

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**After completing this unit, students will be able to**

Define: –The applications of design thinking.

Understand: Examine the use of design thinking.

Define: the design thinking vs. scientific method.

Explain: Team Work and Collaboration

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**5.1 INTRODUCTION**

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Design thinking is a problem-solving framework that is ideal for tackling ill-defined or unknown problems. This makes it very effective for addressing the multifaceted problems faced by today's increasingly complex organisation. In the words of IDEO Founder, Tim Brown, for businesses, "design thinking is all about upgrading within constraints" – meaning companies must innovate without disruption to drive growth and stay relevant.

The successful ones are those which are always seeking new ways to compete in their sector – and design thinking is one framework that can help them achieve this.

**What Is Design Thinking?**

Design thinking was developed by Stanford Professor David Kelley who is also the founder of the design agency IDEO. His work was also influenced by Professors Terry Winograd and Larry Lifer at the school at

Stanford University. Unfortunately there is no single, agreed upon definition of design thinking. However, in a study conducted by the Nielsen Norman Group, the majority of the UX and design professionals define it roughly the same, regardless of industry and experience. Still, there is no agreement on the specifics.

A concise sentence that defines design thinking would be the following:

Design Thinking is a human-centric, iterative, solution-based, problem-solving framework

Whoa! Let us break this down.

Design thinking is:

**A problem-solving approach:** It is a methodology that is ideal for tackling complex problems that are ill-defined or unknown. This is because design thinking helps us define a problem, challenge any assumptions and thus reframe it in a way that will help us come up with solutions that may potentially solve it.

**Human-centric:** In design thinking, we seek to understand the user. This is why the user – the person for whom we are designing our products or services for, is considered at each stage of the design thinking process.

**Iterative:** This means that in the different stages of the design thinking process, you will use the results to review, question and improve any initial assumptions, understandings and outcomes. This makes the design thinking approach a non-linear one.

**Solution-based:** The design thinking process provides a very hands-on approach to problem-solving. You will formulate several potential problem-solving approaches, prototype them and test them in the context of the problem being solved. Due to the iterative nature of design thinking, you will be able to re-shape and optimise these approaches until an optimal solution is chosen.

#### Characteristics Of The Design Thinking Process

Design thinking can be seen as ‘out-of-the-box’ thinking since it encourages you to explore alternatives by creating different, and often innovative solutions that you might not have thought about. At the same time, it focuses on the users’ needs, and thus, it will help you address the problem as experienced by the user, and that includes contextual and cultural factors.

Another critical aspect of design thinking is that it encourages collaborative, multidisciplinary teamwork to leverage skills, personalities and thinking styles of different persons. This will come in handy in all the stages of the design thinking process.



### **Fig :5.1 Design Thinking**

Configuration believing is a critical thinking system that is great for handling not well characterized or obscure issues. This makes it exceptionally successful for resolving the diverse issues looked by the present progressively complex associations. In the expressions of IDEO Founder, Tim Brown, for organizations, "plan believing is tied in with updating inside imperatives" - significance organizations should enhance without interruption to drive development and remain applicable. The fruitful ones are those which are continuously looking for better approaches to contend in their area - and configuration believing is one system that can assist them with accomplishing this.

In this article, we will initially talk about inside and out what configuration believing is. Then, at that point, we will cover the plan thinking process, by which we will likewise go through the five phases of the plan thinking process: Empathize, Define, Ideate, Prototype and Test.

Configuration believing is a term used to address a bunch of mental, vital and functional cycles by which plan ideas (recommendations for items, structures, machines, interchanges, and so on) are created. A considerable lot of the vital ideas and parts of configuration thinking have been recognized through investigations, across various plan areas, of plan insight and plan action in both research facility and normal contexts. An iterative, non-direct course of getting clients, testing suppositions, reclassifying issues, and making creative answers for model and test is called plan thinking.

Configuration believing is likewise connected with remedies for the advancement of items and administrations inside business and social contexts. Some of these solutions have been condemned for misrepresenting the plan interaction and minimizing the job of specialized information and abilities.

By and large, fashioners would in general be involved uniquely in the later pieces of the course of new item improvement, concentrating on the style and usefulness of items. Numerous organizations and different associations currently understand the utility of inserting plan as a useful resource all through hierarchical strategies and practices, and configuration thinking has been utilized to help a wide range of sorts of business and social associations to be more useful and innovative. In the 2000s there was a huge development of interest in plan thinking as an impetus for acquiring upper hand inside business, yet questions around configuration thinking as a panacea for progress have likewise been expressed. Designers bring their techniques into business either by participating themselves from the earliest phases of item and administration advancement processes or via preparing others to utilize plan techniques and to assemble creative thinking abilities inside associations. All types of expert plan training can be thought to be creating configuration thinking in understudies, regardless of whether just certainly, yet configuration believing is presently unequivocally instructed overall as well as expert schooling, across all areas of training. Plan as a subject was brought into optional schools' instructive educational programs in the UK during the 1970s, bit by bit supplanting or potentially creating from a portion of the conventional craftsmanship and specialty subjects, and progressively connected with innovation review. This improvement ignited related examination studies in both schooling and design.

New courses in plan thinking have additionally been presented at the college level, particularly when connected with business and advancement studies. An eminent early course of this kind was presented at Stanford University in 2003, the Hasso Plattner Institute of Design, known as the d.school.

In the K-12 schooling area, plan believing is utilized to improve learning and advance inventive reasoning, cooperation, and understudy liability regarding learning. A plan based way to deal with instructing and learning has likewise grown all the more broadly all through training.

Drawing on mental investigations of innovativeness from the 1940s, like Max Wertheimer's "Useful Thinking" new imagination procedures during the 1950s and plan techniques during the 1960s prompted plan thinking as a specific way to deal with imaginatively tackling issues. Among the principal writers to expound on plan believing were John E. Arnold in "Innovative Engineering" (1959) and L. Bruce Archer in "Methodical Method for Designers".

In his book "Innovative Engineering" (1959) Arnold recognizes four areas of plan thinking:

- i. Novel usefulness, for example arrangements that fulfil an original need or arrangements that fulfil an old need in a completely new manner.
- ii. Better execution levels of an answer.
- iii. Lower creation expenses or
- iv. Expanded saleability.

Arnold suggested a fair methodology - item engineers should look for open doors in every one of the four areas of configuration thinking: "It is somewhat fascinating to investigate the formative history of any item or group of items and attempt to order the progressions into one of the four regions ... Your gathering, as well, could have gotten into a trench and is coincidentally doing all of your plan thinking in one region and is missing great wagers in different regions.

Albeit L. Bruce Archer's "Methodical Method for Designers" "was concerned essentially with a precise course of planning, it likewise communicated a need to widen the extent of traditional plan: "Ways have must be found to fuse information on ergonomics, artificial intelligence, promoting and the executives science into configuration thinking". Bowman was additionally fostering the relationship of configuration thinking with the board: "The time is quickly moving toward when plan navigation and the executives dynamic procedures will share such a great amount for all intents and purpose that the one will turn out to be something like the augmentation of the other".

Arnold started a long history of configuration thinking at Stanford University, stretching out through numerous others, for example, Robert McKim and Rolfe Faste who educated "plan thinking as a technique for inventive action", and going on with the shift from imaginative designing to advancement the executives in the 2000s. Design believing was adjusted for business purposes by Faste's Stanford partner David M. Kelley, who established the plan consultancy IDEO in 1991.

Bryan Lawson's 1980 book *How Designers Think*, basically tending to plan in engineering, started a course of summing up the idea of plan thinking. A 1982 article by Nigel Cross, "Designerly Ways of Knowing", laid out a portion of the characteristic characteristics and capacities of configuration imagining that likewise

made it applicable in everyday training and in this way for more extensive audiences. Peter Rowe's 1987 book *Design Thinking*, which depicted techniques and approaches utilized by modelers and metropolitan organizers, was a huge early use of the term in the plan research literature. A global series of examination symposia in plan thinking started at Delft University of Technology in 1991. Richard Buchanan's 1992 article "Underhanded Problems in Design Thinking" communicated a more extensive perspective on plan thinking as tending to unmanageable human worries through plan.

Configuration believing is an idea utilized in numerous unique situations and it is fairly not well characterized. Most frequently it is utilized to portray a sort of plan strategy. Dorst recognizes two standards of current plan technique: plan considered to be a sane critical thinking cycle and configuration considered as an intelligent practice.

As per Callahan "Specialists have directed examinations inside and outside the plan fields to work on comprehension and control of the plan cycle. Inside the plan fields, these analyst try to comprehend the nonverbal cycles of planners and how these cycles are connected to plan hypothesis and practice. Outside the fields, the longing to comprehend the plan cycle is driven by a need to bridle its imaginative power. The expression "plan thinking" connects these two ways to deal with the examination of plan."

Configuration thinking ordinarily infers a client focused methodology that incorporates prototyping. There are likenesses between configuration thinking drives in bigger associations and the "creator" development. "The most common way of making, ideating, and pondering the interaction in advanced manufacture conditions has a nearby likeness to configuration thinking (for example Nelson and Stolterman, Cross. Cross). In cycles of computerized manufacture and plan thinking, the understudy professional draws in with not well characterized or "underhanded" issues, and investigations of experimentation, to settle on their own decisions in light of bits of knowledge or previous experience."

Configuration believing isn't equivalent to plan science. Inside plan science one can observe different sorts of configuration thinking, however configuration thinking likewise exists in different regions, for example the executives and, all the more as of late, instruction.

Here and there, plan believing is introduced as a solution to current muddled issues. Brown closes: "Regardless of where we look, we see issues that can be tackled distinctly through advancement These issues all have individuals at their heart. They require a human-focused, inventive, iterative, and functional way to deal with tracking down the smartest thoughts and extreme arrangements. Configuration believing is simply such a way to deal with development."

Configuration thinking presumably started in item configuration, however at that point spread to different regions, for example business: "Plan thinking, first used to make actual items, is progressively being applied to perplexing, in-substantial issues, for example, how a client encounters a help. No matter what the specific situation, plan scholars will generally utilize actual models, otherwise called plan relics, to investigate, characterize, and convey. Those models-essentially outlines and portrays supplement and sometimes supplant the spread-sheets, details, and different records that have come to characterize the conventional hierarchical climate. They add a liquid aspect to the investigation of intricacy, taking into consideration

nonlinear idea while handling nonlinear issues." (Harvard Business Review). One more illustration of more interest to instructive innovation is additionally portrayed by Kolko: "The MIT Media Lab formalizes this in its adage, "Demo or pass on," which perceives that main the demonstration of prototyping can change a thought into something genuinely important all alone, thoughts are very common."

Prototyping is just a single part of configuration thinking in business associations, the other, related, alludes to more adaptable perspectives.

Configuration thinking can be connected to advancement. As per the executives researchers Carlgren, Rauth, and Elmquist, M. "The advancement potential in plan has been featured by a few researchers". The creators likewise bring up that "In the administrative talk, DT commonly doesn't allude to exemplary plan trains, for example, designing plan, modern plan or correspondence plan; rather it is introduced as a general human-centred way to deal with critical thinking, imagination and advancement Roger Martin contends that organizations should turn out to be more similar to configuration shops, with the principle accentuation on the mental cycles of planners, which in his view could likewise help supervisors. Martin depicts these cycles as 'integrative reasoning', which is a perspective that 'joins the age of novel thoughts' (abductive rationale) 'with their investigation and assessment of how they apply.

As per Carlgren et al. "Despite the uncertainty in these fundamental works (e.g., discipline versus approach versus perspective), a few famous colleges, for example, Rotman School of Management and Stanford University have presented DT programs The d.school at Stanford University (2010), which has been incompletely credited for the spread of DT, has proposed a stepwise, iterative cycle system which is frequently portrayed as a grouping of exercises that can be deciphered as straight: relate (assortment in light of, for instance, ethnographic examinations), characterize (information union to acquire a refined issue understanding), ideate (recommend thoughts for tackling the issue), model (foster unmistakable and experienceable portrayals of the thoughts) and test (with likely clients)."

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## 5.2 WHAT IS DESIGN THINKING

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Design thinking is a collaborative approach to problem-solving that can also be used to develop organizational strategy.

According to Tim Brown, CEO of IDEO, design thinking is "a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success."

### **Here are the basic steps:**

Empathize: Set aside your own assumptions and understand the problem.

Define: Use different activities and exercises to clearly define the problem.

Ideate: Choose from a wide variety of techniques to generate ideas.

Prototype: Create a model or simple version of the final product (or process).

Test: Does the prototype solve the problem? What are the issues?



Deliver: After multiple iterations, tests, and rounds of problem-solving, deliver the solution.

Design thinking not only works for designing tangible products, but also as a leadership approach. Design thinking helps the Florida Institute of Technology test and improve their spacesuit design. Similarly, it can help an HR team develop a new approach to managing the employee life cycle.

### **Design Thinking Can Be Your Superpower, Even If You Don't Develop A Product**

Many organizations that we work with already use design thinking in their product development process. However, the real magic happens when they implement design thinking, also known as human-centered design, into their leadership approach.

Design thinking applies tools from the field of design for use in any industry. Above all, it puts the customer at the center of the innovation process. Anna Bracco, our in-house expert on design thinking and leadership, highlights the simplicity of design thinking and its ability to adapt to your organization's needs. "It's not rocket science. It's just a different way of thinking about leadership."

Think about a process that you would like to test or improve. Consider the problems you're trying to solve based on the goals for your organization.

### **What Does A Design Thinking Organization Look Like?**

Applying aspects of design thinking to your company can be incredibly valuable in promoting organizational adaptability.

First off, let's look at a well-known example of two companies on opposite ends of the organizational adaptability spectrum. Netflix and Blockbuster were two video industry heavyweights with drastically different outcomes based on their ability to be flexible and empathize with their customers.

In 2004, Blockbuster was doing what worked: renting physical videos. Netflix, on the other hand, was "constantly re-evaluating what their customers want and need," says Bracco. "Netflix was doing mail-order DVDs and then they launched online. This ended up disrupting their whole business. If Blockbuster had done something like that, maybe they'd still be around."

Above all, organizations with a more agile approach are more apt to react to what's happening in the environment. However, others are slow to move and slow to make changes. Therefore, by constantly ideating, evaluating, and testing their own processes, agile organizations are able to stay one step ahead.

Bracco underlines that you can react more quickly to changes in the industry and the landscape if you "have a constant understanding of what your customer wants and needs. Therefore, you can react to that versus being surprised like some of these large companies that have failed."

You don't have to disrupt an entire industry. Are you doing enough to disrupt and push the limits on your current processes? Do you have a culture of innovation?

### **Define Your Customer (Hint: They Might Not Be The End Customer)**

Design Thinking's first two steps, Empathize and Define, require you to determine who your customer actually is and then look at the problem from their point of view.

Your customer isn't always the end customer. If you work for Netflix, your end customer might be the binge-watching Grey's Anatomy fan. If you're the head of Human Resources at Netflix, your customer may be the employee or the team that reports to you, instead of the end customer.

Let's look at another example. The financial and international accounting department of a large company needed to define their real customer. This team had no contact with the end customer. Therefore, to determine their actual customer, the team asked themselves questions such as:

Who receives our numbers?

Who interacts with those numbers?

Do they need those numbers presented in a different way?

How would it help them if we delivered the numbers in a different way?

After you define your customer, it's easier to highlight what is important to them. As a result, you can ensure that the process or product you are designing fits their needs.

In your role, what are the questions you need to ask yourself and your team in order to discover your actual customer?

### **Innovate And Reduce Risk With Design Thinking**

Bracco also works closely with space flight organizations in her work as a facilitator for our Launch Point Leadership Experience.

Understandably, risk is a main concern for these organizations. Risk is inherent in space flight. However, design thinking's focus on identifying problems and testing solutions allows for problem-solving in the middle of production. As a result, this saves time and reduces risk at the end of production.

Consider the Human Spaceflight Laboratory at the Florida Institute of Technology. The Lab is helping develop Federal Aviation Administration guidelines for safer commercial spaceflight. By using human-centered design – and rigorous testing with a 500-pound simulator for human subjects – they anticipate various risks.

“There's not a lot of incentive for commercial companies to spend money and time thinking about human factors,” says Ondrej Doule, Founder and Director of the Human Spaceflight Laboratory. Doule is also our Subject Matter Expert at our Launch Point Leadership Experience.

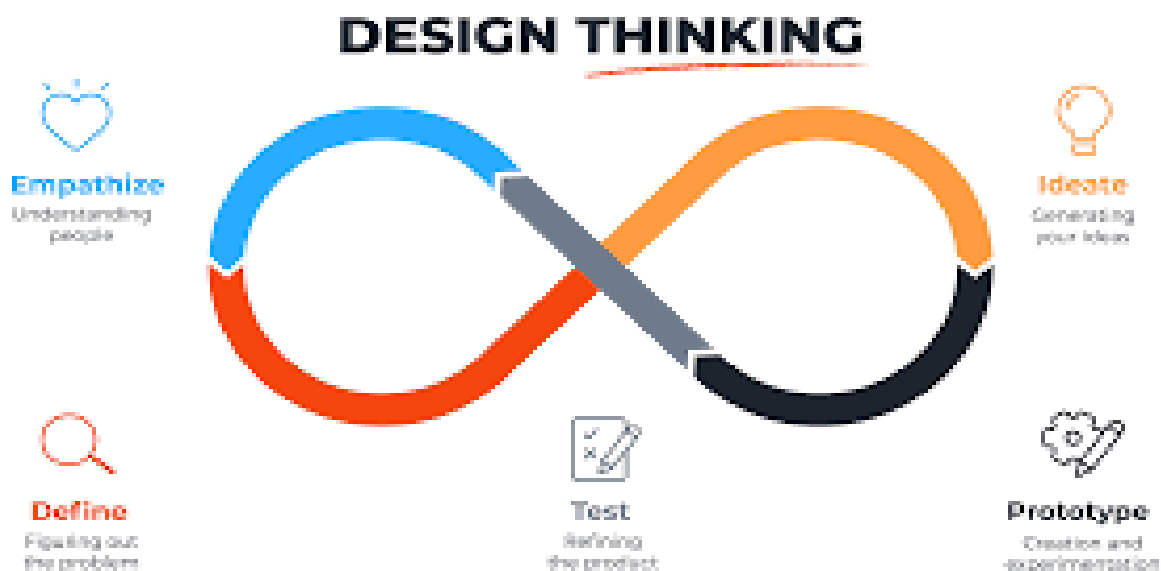
“They're really focused on getting their vehicles to work. That usually means making a rocket work and putting a person in it. As a result of implementing design thinking, they collaborate with end-users such as astronauts and potential commercial flight customers. Therefore, they are able to make beneficial changes to spacesuit requirements.”

Your end product might not be as high-risk as spaceflight. But you can certainly minimize risk for leadership processes by following the design thinking methodology. Therefore, when you get to the high-stakes environment, you've already identified and addressed the potentially high-risk problems.

Configuration Thinking is an iterative cycle wherein we look to comprehend the client, challenge suppositions, and reclassify issues trying to recognize elective systems and arrangements that probably won't

be right away evident with our underlying degree of comprehension. Simultaneously, Design Thinking gives an answer based way to deal with tackling issues. It is a perspective and filling in as well as an assortment of involved techniques.

Configuration Thinking rotates around a profound interest in fostering a comprehension of individuals for whom we're planning the items or administrations. It helps us notice and foster sympathy with the objective client. Configuration Thinking helps us during the time spent addressing: scrutinizing the issue, scrutinizing the suppositions, and scrutinizing the ramifications. Configuration Thinking is incredibly helpful in handling issues that are not well characterized or obscure, by re-outlining the issue in human-driven ways, making numerous thoughts in meetings to generate new ideas, and embracing an active methodology in prototyping and testing. Configuration Thinking additionally includes continuous trial and error: outlining, prototyping, testing, and evaluating ideas and thoughts.



**Fig :5.2 Design Thinking**

Configuration thinking is certifiably not an elite property of creators generally incredible pioneers in writing, craftsmanship, music, science, designing, and business have polished it. Things being what they are, the reason call it Design Thinking? Exceptional with regards to Design Thinking that architects' work cycles can assist us with deliberately removing, instruct, learn and apply these human-focused strategies to take care of issues in an inventive and imaginative manner - in our plans, in our organizations, in our nations, in our lives.

A portion of the world's driving brands, like Apple, Google, Samsung and GE, have quickly taken on the Design Thinking approach, and Design Thinking is being instructed at driving colleges all over the planet, including d.school, Stanford, Harvard and MIT. Be that as it may, do you have at least some idea what Design Thinking is? What's more why it's so well known? Here, we'll get to the point and stop for a minute it is and why it's so sought after.

People normally foster thought processes displayed on monotonous exercises and usually got to information. These help us in rapidly applying similar activities and information in comparative or recognizable

circumstances, however they additionally can possibly keep us from rapidly and effectively getting to or growing better approaches for seeing, comprehension and tackling issues. These thought processes are regularly alluded to as blueprints, which are coordinated arrangements of data and connections between things, activities and contemplations that are animated and started in the human brain when we experience a few natural boosts. A solitary blueprint can contain a tremendous measure of data. For instance, we have an outline for canines which includes the presence of four legs, fur, sharp teeth, a tail, paws, and various other discernible attributes. Whenever the ecological improvements match this outline - in any event, when there is a dubious connection or a couple of the attributes are available - a similar example of believed is brought into the brain. As these blueprints are stimulated naturally, this can block a seriously fitting impression of the circumstance or keep us from seeing an issue such that will empower another critical thinking system. Inventive critical thinking is otherwise called "thinking outside about the container".

Thinking outside about the crate can give a creative answer for a persistent issue. Nonetheless, thinking outside about the case can be a genuine test as we normally foster thought processes that are displayed on the dull exercises and ordinarily got to information we encircle ourselves with.

A few years prior, an episode happened where a transporter attempted to pass under a low extension. Be that as it may, he fizzled, and the truck was stopped solidly under the extension. The driver couldn't keep passing through or invert out.

The story goes that as the truck became stuck, it caused enormous traffic issues, which brought about crisis faculty, specialists, firemen and transporters social affair to devise and arrange different answers for dislodging the caught vehicle.

Crisis laborers were discussing whether to destroy portions of the truck or work on pieces of the extension. Each discussed an answer which fitted inside their separate degree of aptitude.

A kid strolling by and seeing the serious discussion took a gander at the truck, at the extension, then, at that point, checked out the street and said casually, "Why not simply let the air out of the tires?" to the outright shock of the multitude of trained professionals and specialists attempting to unpick the issue.

At the point when the arrangement was tried, the truck had the option to drive free easily, having experienced just the harm brought about by its underlying endeavour to pass under the extension. The story represents the battles we face where as a rule the clearest arrangements are the ones hardest to drop by as a result of the purposeful limitations we work inside.

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### **5.3 ORIGIN OF DESIGN THINKING**

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As a mindset and methodology, design thinking is relatively young. In comparison, the scientific method has stood centuries of rigorous investigation; and modern management practices such as Six Sigma and lean manufacturing have benefited from decades of practice and examination. Design thinking has seen just 15 or so years of widespread adoption. For the most part, it's still largely a set of heuristics for guiding team-based collaboration.

The essence of the practice was a response to the question of what design had to contribute to the modern world. Designer and scholar Richard Buchanan framed this ongoing challenge for design thinking in 1992 through the notion of “wicked problems,” though scholars trace the term farther back, to 1935, with John Dewey and the melding of aesthetics and engineering principles for a new age. Buchanan built on theorist Horst Rittel’s challenge to designers in the early 1970s to move from solving simple problems to “wicked problems”—problems that are complex, open-ended, and ambiguous. These are problems that do not lend themselves to easy judgments of “right” or “wrong.”

Today, design thinking has become common parlance in many industries and disciplines. The approach is fresh and effective, and newcomers can easily learn and engage productively with it. But it's also easy to get stuck in the basic motions of design thinking, while missing opportunities for fuller integration. As the concept has spread, it hasn't always retained a consistent meaning, nor a uniform depth. The term "design thinking" can be used as currency without a true commitment to understanding and applying the practice. At IDEO, we believe that applying design thinking with integrity means continuing to deepen and refine—to be lifelong learners and practitioners at the same time.

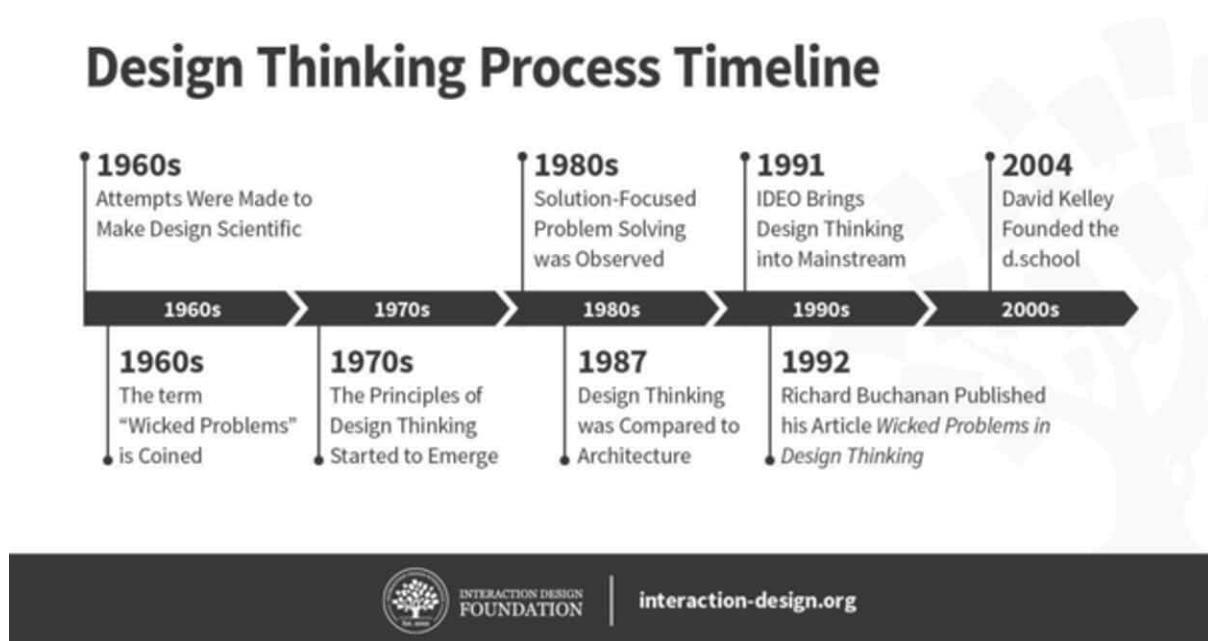
### **Fig :5.3 Origin of Design Thinking**

We need to appreciate the roots and origins of a concept to truly understand it—we need to know how it came to be. Let’s take a look at how design thinking emerged from an exploration of theory and practice to become one of the most effective ways to address the human, technological and strategic innovation needs of our time.

It’s virtually impossible to list all of the influential factors that led to the contemporary understanding of design theory, process and practice. Business analysts, engineers, scientists and creative individuals have studied the methods and processes behind innovation for decades. Early glimpses of design thinking date back to the 1950s and 1960s, although these references were more within the context of architecture and engineering — fields which struggled to grapple with the rapidly changing environment of that era.

World War II did have a profound effect on strategic thinking, however, and we have looked for new ways to solve complex problems ever since. In fact, we can say this huge world event fundamentally changed the way we apply ourselves to management, production and industrial design in the modern world. Let’s

take a look at the history of design thinking, decade by decade, and see how the story unfolds from this point onwards.



**Fig :5.4 Desing Thinking process Timeline**

The 1960s: Attempts Were Made to Make Design Scientific

In the '60s, people applied scientific methodology and processes in an attempt to understand every aspect of design—how it functions and what it's influenced by, for example.

Nigel Cross—Emeritus Professor of Design Studies at The Open University, UK—unpicks the struggle that began to unfold in the early 1960s in the paper “Designerly ways of knowing: design discipline versus design science” (2001). Cross highlights statements made by radical technologist Buckminster Fuller, in which he refers to the “design science decade”:

"[Fuller] called for a 'design science revolution', based on science, technology and rationalism, to overcome the human and environmental problems that he believed could not be solved by politics and economics."

– Nigel Cross

The struggle continued throughout the decade as further attempts were made to bring the field within the objective of rational sciences and, ultimately, make design scientific.

The term “Wicked Problems” is Coined

In the mid-1960s, Horst Rittel wrote and spoke extensively on the subject of problem-solving in design... so much so that he's known as the design theorist who coined the term “wicked problem” to describe problems which are multidimensional and extremely complex. Rittel specifically focused on how design methodologies could be used to tackle wicked problems and how these methodologies were influential to the work of many design practitioners and academics of the time.



**Fig :5.5 Wicked problem**

Wicked problems are at the very heart of design thinking because it is precisely these complex and multidimensional problems that require a collaborative methodology to gain a deep understanding of humans' needs, motivations and behavior.

The 1970s: The Principles of Design Thinking Started to Emerge

Cognitive scientist and Nobel Prize laureate Herbert A. Simon was the first to mention design as a way of thinking in his 1969 book, *The Sciences of the Artificial*. He then went on to contribute many ideas throughout the 1970s which are now regarded as principles of design thinking.

Simon is noted to have spoken about rapid prototyping and testing through observation, for example—concepts which form the core of many design and entrepreneurial processes today, including two of the major phases in the typical design thinking process. Simon touched on the subject of prototyping as early as 1969 when he stated the following in *The Sciences of the Artificial*:

"To understand them, the systems had to be constructed, and their behaviour observed."

Early research in the field of artificial intelligence, such as the work by Herbert Simon, Allen Newell and Cliff Shaw involving chess software, also resulted in a better understanding of design as a way of thinking.

Image courtesy of Carnegie Mellon University.

What's more, a large proportion of his work was focused on the development of artificial intelligence and whether human forms of thinking could be synthesized—a topic which is very prevalent in the design world today.

Robert H. McKim, Emeritus Professor of Mechanical Engineering, also referred to the notion of design thinking in his 1973 book, *Experiences in Visual Thinking*. McKim differed from Simon in that he is best described as an artist and engineer—he focused his energies more on the impact visual thinking had on our ability to understand things and solve problems. McKim's book unpicks various aspects of the visual thinking and design methods used to solve problems. He places an emphasis on the combination of left and right brain modes of thinking, to bring about a more holistic form of problem-solving. The ideas discussed in his book ultimately underpin the design thinking methodology we use today.

The 1980s: Solution-Focused Problem-Solving was Observed

In 1982, Nigel Cross continued to make history in the design thinking world when he discussed the nature of how designers solve problems in his seminal paper “Designerly Ways of Knowing”. (Please note, this is not to be confused with his series of articles and papers similarly titled “Designerly Ways of Knowing”, published much later in the 2000s). In his 1982 paper, Cross compared designers’ problem-solving processes to the non-design-related solutions we develop to problems in our everyday lives.

Bryan Lawson, Emeritus Professor at the School of Architecture, University of Sheffield, UK, also discussed the insights he’d gathered from a series of interesting tests. The main goal of the tests was to compare the methods used by scientists and architects when they attempted to solve the same ambiguous problem.

Lawson conducted the tests on postgraduate architectural students (i.e., the “designers”) and postgraduate science students (the “scientists”). The problem he set for each group required the students to arrange colored blocks according to a set of rules—some of which were unknown to the students.

The results were as follows:

Scientists	Designers
Systematically explored every possible combination of blocks.	Quickly created multiple arrangements of colored blocks.
Formulated a hypothesis about the fundamental rule they should follow to produce the optimal arrangement of blocks.	Tested their arrangement of blocks to see if it fit the rules.

#### 1987: Design Thinking was Compared to Architecture Once Again

Peter Rowe, then Director of Urban Design Programs at Harvard, published his book *Design Thinking* in 1987. It focuses on the way architectural designers approach their tasks through an inquisitive lens.

"This book is an attempt to fashion a generalized portrait of design thinking. A principal aim will be to account for the underlying structure and focus of inquiry directly associated with those rather private moments of “seeking out,” on the part of designers, for the purpose of inventing or creating buildings and urban artifacts."

– Peter Rowe (1987)

As you can see, the progression of design thinking as a subject made its journey through various fields of specialization over the decades. Thinkers within those various fields explored the cognitive processes within the scope of their own knowledge until design thinking finally became a separate concept and moved into a space of its own.

The 1990s to the Present

1991



It is widely accepted that IDEO is one of the companies that brought design thinking into the mainstream. They developed their own customer-friendly terminology, steps and toolkits over the years, and made the process more accessible to those not schooled in design methodology.

1992

Richard Buchanan, then Head of Design at Carnegie Mellon University, published his article “Wicked Problems in Design Thinking”, which discussed the origins of design thinking. In the article, he discusses how the sciences developed over time to become more and more cut off from each other until they finally became specializations in their own right. He clarifies that design thinking is a means to integrate these highly specialized fields of knowledge so they can be jointly applied to the new problems we face in the world today—and from a holistic perspective.

2004

David Kelley founded the Hasso Plattner Institute of Design at Stanford—commonly known as the d.school. The d.school has made the development, teaching and implementation of design thinking one of its central goals since inception, and it serves as a source of huge inspiration to design thinkers across the world, including us here at the Interaction Design Foundation.

Present Day

At present, the design thinking movement is rapidly gaining ground—with pioneers like IDEO and the d.school paving out a path for others to follow. Other prestigious universities, business schools and forward-thinking companies have adopted the design thinking methodology to varying degrees, and have sometimes even re-interpreted it to suit their specific context or brand values.

The understanding and use of the term 'wicked problems' has matured too, and Human-Centered Design pioneers and leaders like Don Norman now prefer the term 'complex socio-technical systems'.

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## 5.4 FEATURES OF DESIGN THINKING

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Design thinking is a non-linear, iterative process that teams use to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test. Involving five phases—Empathize, Define, Ideate, Prototype and Test—it is most useful to tackle problems that are ill-defined or unknown.

“Design thinking is a human-centred approach to innovation that draws from the designer’s toolkit to integrate the needs of the people, the possibilities of technology, and the requirements for business success.” — Tim Brown, chair of IDEO.

Design thinking refers to the cognitive, strategic and practical processes by which design concepts (proposals for products, buildings, machines, communications, etc.) are developed.-

As an organization, if you are looking to adopt the design thinking methodology it is important to understand the key elements that are core to this method.

### Features of Design Thinking

## 1 – Process

IDEO, the creator of the design thinking approach, has developed a well-structured process of design thinking. This process is based on years of experience of IDEO, which has been strengthened with time. They have validated the process through many innovations and organizations.

When you have a process in place, it saves a lot of time for you to understand the concept. And also gives direction to the team.

The design thinking process has 3 phases i.e. Inspiration, Ideation, and Implementation.

Inspiration includes research and understanding of the problem. Ideation involves coming up with ideas and solutions based on the research in the inspiration stage. And implementation is launching the idea out in the market.

These phases are further expanded into multiple steps

### Design Thinking Phase 1 – Inspiration

Framing the problem statement or design challenge.

Observing and meeting people – It includes tasks like user interviews, group interviews, and user behaviour analysis.

### Design Thinking Phase 2 – Ideation

Generate Ideas – Brainstorming on all ideas.

Make Ideas Tangible – Build prototypes of the shortlisted ideas using minimum viable tools. It could be as basic as a paper cutout.

Test Prototypes – Test prototypes with actual users. Gather feedback and gain insights.

### Design Thinking Phase 3 – Implementation

Share the story – Once you have the ultimate solution, share it with the relevant people.

Launch – Launch the ultimate solution in the market.

The process looks linear, but it works in iteration, especially the ideation phase where you keep testing prototypes till you have the ultimate solution. An ultimate solution is that which solves the user problem and is validated by actual users.

This process is the key element of the design thinking approach as it gets the team aligned on where to start and what to do next. This process will lead to a successful solution.

## 2 – Empathy

The users for whom we are solving a problem have unique characteristics, personality, and needs. Most of the time, we assume user characteristics and cannot relate ourselves to the user. Thus, creating a solution that is not well accepted in the market.

To build a successful product or solution, the design thinking team needs to get into the user's psyche. They need to build a complete understanding of user behaviour and thought process.

It's like being an actor in a movie, play the role of the user while you are working on their problem.

“Design thinking is a human-centred process and knowing the humans you are designing for is the core. Remove your self-reference idea and focus on the user.”

One of the greatest examples of building a solution by creating a strong empathy towards the user is the scanning machine GE Healthcare designed for paediatric patients.

Doug Dietz, an industrial designer at GE Healthcare, one day observed a little girl who was crying on her way to a scanner that was designed by him. It clicked to him that the machine he has designed scares users and is a very uncomfortable experience for patients, especially kids.

That's where he got back to the drawing board to solve a problem, to build a scanner that children will love. He started by observing and gaining empathy for young children and by talking to child specialists. Finally, he came up with a design that was like an adventure ride for the kids.

Many of the world's most successful brands created breakthrough ideas that are inspired by a deep understanding of consumers' lives. Some brilliant advertising campaigns have come from a specific deep consumer insight.

A successful product is not the one that is first in the market but the one that builds a stronger connection with the user. iPod was not the first MP3 player. Building empathy is one of the key element of Design Thinking.

### 3 – Team Work and Collaboration

The design thinking approach is not a single man act. It requires an excellent team to collaborate and coordinate with each other. It works best with the synergy of unique minds aligned to a single goal and objective.

The team members need to have a mindset where they are not biased towards their own ideas and should be open to other's ideas as well.

To have more creative juices flowing, it is essential to have different perspectives and viewpoints. With more variations in ideas, there is more scope to innovate. It's like jamming and toasting of ideas.

Consider it as a music band where you have unique members like guitarist, vocalist and drummer to create a brilliant piece of music.

The team needs to be multidisciplinary. Have a few professionals who have expertise in the industry for which you are trying to solve the problem. Have a few generalist design thinking professionals. It's also good to have a marketing or sales professional to understand the market potential of the solution.

Also, include unique personality characteristics. The team should include thinkers (people with high imaginative skills), makers (who can design a prototype using minimum resources in a short time), and doers (who will test the prototype among themselves and in the market)

One of the key element in getting the team to work together is holding effective brainstorming meetings. These brainstorming sessions are where idea jamming and toasting will happen. It's important to follow the key principles of brainstorming meeting.

Get your team to toast on many ideas and perspectives to form a single ultimate solution.

### 4 – Un-Learn and Relearn

“You must unlearn what you have learned” – Master Yoda

Before you apply the design thinking process in your organization, you and your team should go through a shift in mindset. Design thinking is a process that works best when you start by accepting that you know nothing. That's when you will respect and accept many data points.

Unlearn what you know about the problem, and be ready to relearn. Unlearning is a process that means forgetting what we know so that we can learn from a fresh perspective. We have so much information and data that sometimes there is no space for new information, thus limiting your understanding of the problem.

If you start with a certain belief or perspective of the problem, then you will only try to find points that validate those beliefs. You may ignore the points that will conflict with your belief. This could cause not reaching the most ideal solution and missing certain points of the problem.

When you and your team start the process, make sure you are open to all kinds of information and learn from the start the problem you are trying to solve.

Example of applying un-learn and learn in design thinking process

By analysing things from a fresh perspective, Mobisol was able to reinvent the solar panel in rural Tanzania. Mobisol provides clean, reliable energy to rural off-grid households in the Sub-Saharan African region.

While starting the project, the common belief among top advisers was to make an affordable system, as people will only pay €5/month. But Mobisol realized: if people really want something, they find ways to pay for it — also in small Tanzanian villages.

People did not want just light. Their needs were more advanced, like radio (information), TV (status) and cell phone charging (communication). They were ready to pay more to meet those needs. With this insight, Mobisol built a product with a higher monthly cost and power output. They also had an option to own the panel with 36 monthly instalments. As another insight was rent will win games but ownership wins championships. Mobisol has over 35,000 customers and has helped 100K+ students to study at night.

Make sure you are not analysing the problem from your own perspective and biases. Throw out what you know. Relearn the problem you are trying to solve from the scratch.

## 5 – Creative Confidence

Creativity does not come naturally to many people. It is a trait that is present among all humans. Each one of us is creative. Some steps and processes can tap into our creative side. It is something that can be learned.

Creative Confidence is the belief in us that we can be creative and that we will find the ultimate solution. Creative Confidence is the concept coined by David Kelly and Tim Kelly, founders of IDEO. Based on several success stories of IDEO, they identified the principles that allow us to tap into our creative potential. There is a lot of creativity and innovation required while working on a design thinking project. And most of us feel we won't be able to find the best solution as we are not creative. But the process is designed in a way that naturally taps into each one of our creative potentials.

While working on the project, trust the process and have a belief that you will reach the solution. It may take time, there will be times when you will feel stuck but keep following the process and you will find the solution. Be okay with not knowing the answer for a prolonged time. Building that creative confidence is a very important element of design thinking.

Another important aspect of creative confidence is being open to failure. To find the right solution, you will go through many rejected solutions. You will fail many times to succeed in the end. As Albert Einstein famously says

## **5.5 USE OF DESIGN THINKING**

1. Assists in enhancing team collaborations: Creating a successful design is a team effort that requires input from the entire team as well as inspiration from other sources. You can suggest the same type of notion in an approach to any business difficulties by using a design thinking technique.

If a company is having trouble keeping customers, the design strategy may inspire employees to find fresh, creative approaches to sales instead of only using tried-and-true methods.

2. Aids in Brainstorming: Design thinking is the process of creating new goods and services while reevaluating elements that can be enhanced in the present. Continuous idea and concept testing can assist organisations in making significant advancements and implementing improved methods of operation.

3. Assists in Overcoming Creative Obstacles: Design thinking enables you to examine creative obstacles from a unique angle. Your designers can develop original concepts that can broaden the knowledge of the learners by using brainstorming.

Additionally, it enables your designers to interact, work on consumer input, and provide them with better experiences.

4. User-Focused: One of design thinking's main advantages is that it is user-focused. Understanding your target user is essential for each new technology or project management solution that you design.

5. Effectively Supports Client Requirements: Design thinking encompasses MVP-stage product prototype and experimentation. You may provide your customers with unique items by conducting numerous rounds of testing and incorporating user input. This will enable you to directly involve them in the design process and meet their expectations.

6. Aids in Knowledge Enhancement: The design thinking method calls for numerous evaluations and analyses. Additionally, the process is ongoing and doesn't end even when the product is finished.

Businesses measure the outcomes based on customer feedback to guarantee that the final customer has the best possible experience with the product.

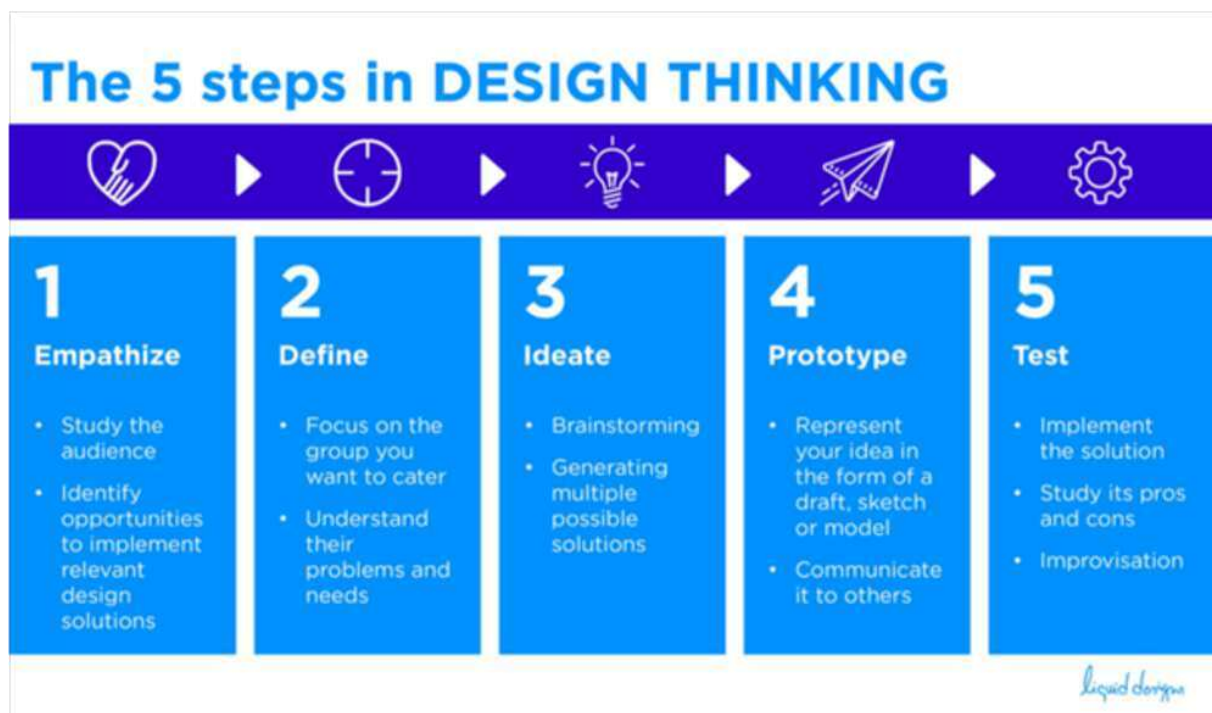
This aids design thinkers in bridging gaps in their knowledge of clients and increasing their productivity.

## **5.6 APPLICATIONS OF DESIGN THINKING**

In 2009, a hospitality company from San Francisco, California, was on the verge of bankruptcy. Desperate for solutions, one of the founders remembered a simple, human-centered design process from design school which could be used to discover innovative solutions to problems. By using the design thinking process, the founder discovered a creative solution to help customers publish appealing advertisements so they could rent their private homes and apartments in New York City. Without employing design thinking to solve customers' issues, this company may not have revolutionized the tourism industry, by producing more than 1,500,000 ads in 192 countries and 34,000 cities [1]. This company is known as Airbnb.

Many believe the design thinking process can be applied only for design-related industries; however, research shows that design thinking is a relevant and helpful strategy for innovation across all types of industries, benefiting organizations, employees, and customers alike. Numerous companies have experienced great success as a result of employing the design thinking process. Design thinking can be applied to all industries because of its potential for innovation, focus on serving customers, and added value to products and services.

The design thinking process entails a structured set of phases. According to the Journal of Strategic Innovation and Sustainability, the most central aspect of design thinking methodology is its focus on deep user understanding. This aspect enables companies to acquire rich user insights and discover their implicit needs, which eventually leads to creativity and innovation. Design thinking integrates what is desirable from the human point of view with what is technologically feasible and economically viable [2]. Figure 1 shows the steps included in the design thinking process.



**Fig :5.6 The 5 Steps in Design Thinking**

Design thinking enables individuals who have no prior experience as designers to use creative tools to address a vast range of challenges. IDEO U, an online school that champions design thinking, suggests to start practicing this process by identifying your end-user, their needs, and what problem needs to be fixed in the empathy stage. Next, you gather inspiration in the define stage by looking for solutions that could possibly help you to rethink the way you're working. Use that to push past obvious solutions and arrive at breakthrough ideas in the ideation stage. Then, the prototyping stage involves building rough prototypes to make those ideas come to life and find what's working and what's not. Gather feedback, go back to the drawing board, and keep going. Finally, once you have arrived at the right solution, introduce your ideas to your colleagues, clients, and users in the testing stage. Some of these steps may happen several times, and

you may even jump back and forth between them. However, design thinking can take you from a blank slate to a new, innovative idea [4].

#### Potential for Innovation

The design thinking process can be applied to any industry due to its potential for innovative thinking. The more a company knows about its customers, the more potential for better ideas and innovations. For example, a health company start-up, MeYouHealth, partnered with an established industry incumbent, Healthways, to figure out how to use social networking to increase well-being by helping individuals take healthier practices one step at a time. MeYouHealth could more easily find solutions to improve its customer's health as a result of capitalizing on Healthways's depth of knowledge about its customers and experience in the industry

Another example of the influence that design thinking has on innovation can be observed in business operations. Toyota employed design thinking to analyze one of its West Coast customer-contact centers from the ground up, engaging a cross-functional team of frontline call reps, software engineers, business leaders, and change agents in a redesign process that transformed the service center experience for both customers and associates [6]. Across all industries, the design thinking process enables individuals to work in cross-functional teams, which increases a company's ability to innovate according to customer needs.

#### Focus on Serving Customers

Next, customers are more effectively served through companies that employ design thinking. Companies should seek customer feedback throughout each of the design stages, especially during the empathy and define phases. The insights companies gain from customers counteract previous human biases and misconceptions. Through the design thinking process, innovators are encouraged to step into their customers' shoes in order to live the customer experience. By involving the customers, companies achieve broad customer commitment to change.

Furthermore, by interacting with customers, companies gain valuable insights to design criteria that fit the customers' needs. Consequently, a company's enhanced innovative offering can lead to better financial performance and more satisfied customers.

#### Added Value to Offerings

Not only can design thinking lead companies to create new products, services, or processes, but design thinking can add value to these aspects. Applying the design thinking methodology to existing products and services leads to creating unique customer value, differentiating a company's offerings from its competitors. Creating this competitive advantage over competitors builds a premium brand image by more closely aligning with customers' needs. The design thinking process encourages customers to be involved in every step of product and service development.

Consider what happened at the Kingwood Trust, a UK charity helping adults with autism and Asperger's syndrome. One design team member, Katie Gaudion, got to know Pete, a nonverbal adult with autism. The first time she observed him at his home, she saw him engaged in seemingly damaging acts—like picking at a leather sofa and rubbing indents in a wall. She started by documenting Pete's behavior and defined the

problem as to how to prevent such destructiveness. But on her second visit to Pete's home, she asked herself: What if Pete's actions were motivated by something other than a destructive impulse? Putting her personal perspective aside, she mirrored his behavior and discovered how satisfying his activities actually felt. Katie's immersion in Pete's world not only produced a deeper understanding of his challenges but called into question an unexamined bias about the residents, who had been perceived as disability sufferers that needed to be kept safe. Her experience caused her to ask herself another new question: Instead of designing just for residents' disabilities and safety, how could the innovation team add value by designing for their strengths and pleasures?

Design thinking finds its application across a variety of professions. From sports, education and research to business, management and design, design thinking is widely used by professionals around the globe.

Design thinking is halfway between analytical thinking and intuitive thinking. Analytical thinking involves purely deductive reasoning and inductive logical reasoning that utilize quantitative methodologies to come to conclusions. However, intuitive thinking refers to knowing something without any kind of reasoning.

These are two extreme kinds of thinking. Design thinking makes use of both the extremes in an optimum manner. The intuitive thinking helps in invention for the future, whereas analytical thinking to create something creative in the present, which is replicable. The willingness to use these futuristic solutions is what is called abductive logic.

#### Business

Design thinking helps in businesses by optimizing the process of product creation, marketing, and renewal of contracts. All these processes require a companywide focus on the customer and hence, design thinking helps in these processes immensely. Design thinking helps the design thinkers to develop deep empathy for their customers and to create solutions that match their needs exactly. The solutions are not delivered just for the sake of technology.

#### Information Technology

The IT industry makes a lot of products that require trials and proof of concepts. The industry needs to empathize with its users and not simply deploy technologies. IT is not only about technology or products, but also its processes. The developers, analysts, consultants, and managers have to brainstorm on possible ideas for solving the problems of the clients. This is where design thinking helps a lot.

#### Education

The education sector can make the best use of design thinking by taking feedback from students on their requirements, goals and challenges they are facing in the classroom. By working on their feedback, the instructors can come up with solutions to address their challenges.

For example, Michael Schurr, a 2nd grade instructor from New York, realized that his students would be more comfortable with bulletin boards lowered. He also found the idea of creating comfortable semi-private space for working students as it provided them space to study. As a result, his students became more engaged and felt free to move.

#### Healthcare



Design thinking helps in healthcare as well. The expenditure on healthcare by the government and the cost of healthcare facilities is growing by the day. Experts worldwide are concerned about how to bring quality healthcare to people at low cost.

Venice Family Clinic in Venice, California has come up with innovative solutions to the challenge of opening a low-cost children's clinic to serve the low-income families. Problems of finance, transportation, and language barriers had to be solved. And all this had to be done at low cost for the poor kids. Fostering good health along with profits was a challenge, as it does not sound sustainable. Using design thinking, the inefficiencies in the system and the perennial crises were addressed.

This was followed by mind-blowing innovations to serve the children. How they solved the various issues will be seen in the later sections of the tutorial.

Whether in the healthcare, manufacturing, digital technology, engineering, or education industries, the design thinking process can serve as a valuable approach to create or improve any type of business offering. Much like Airbnb, organizations, and employees across all industries can empathize, define, ideate, prototype, and test to empower innovation, focus on serving customers, and add value to products and services.

## **5.7 DESIGN THINKING VS SCIENTIFIC METHOD**

Design thinking is a human-centred approach in which intangible things such as emotion and visual design play a key role. This is less important in the scientific process which focuses on tangible, objective and measurable results.

Design thinking starts with a problem, it tests assumptions about the solution to the problem and creates innovative solutions to things that do not exist yet.

Scientific education starts with a question, it tests hypotheses and looks at what is already exists in the world. You could say that design thinking images the future and the scientific process examines the past (or observable).

Looking at the steps of design thinking and the scientific process there are a few similarities and differences

### **Empathy vs Question**

Researchers start by asking questions and following their curiosity. Designers start by empathising with the people they are designing for. They use their curiosity to step into the shoes of others so they can identify with what it is to experience this problem.

### **Define vs Research**

When scientists have formulated a question, they start to research how others have answered this question and how they can add to gaps in the knowledge around the topic.

After designers have empathised with their users, they will start to define the problem more clearly, so they are solving the right problem. This problem might be quite different to what you started with. In this phase, designers also record what requirements are needed in the solution.

### **Ideate vs Hypothesis**

Designers brainstorm different solutions to the problem and choose the solution they think is best to start building in as a prototype.

Scientists in this phase will formulate hypothesis around their research question. These hypotheses will be tested during the experiment.

#### Prototype vs Experiment

The goal of the prototype is to gather data on whether the solution is really solving the problem.

The difference in this phase is that there is usually one experiment in a research project, in the design process there will almost always be multiple prototypes.

#### Test vs Analyse

During the test phase in design thinking the data is gathered and interpreted. This is like the analysis phase in research where you interpret the results of your experiment.

As mentioned before, design thinking is an iterative process. Within one design project designers go back and forth between the phases. Even though the scientific process is mostly displayed as a linear process, scientists will tell you that it is an iterative process.

Analysts in administration science and other sociologies progressively search for the results of their exploration to offer some incentive straightforwardly to specialists of the field, as well as fulfilling the afflictions of value scholastic grant. Such examination looks to recommend general arrangement ideas for pragmatic settings. By and large, these settings have been perceived and examined through conventional examination with a more logical direction. The writing talking about this point depicts the overall arrangements as curios or innovative guidelines. As indicated by Tranfield, cited in Huff mechanical principles are results of examination that "give model answers for original issues". Such innovative principles or relics are ipso facto the results of a plan interaction, and numerous scientists have embraced plan science as the worldview to impact the point of specialist pertinence. Plan science has gathered a significant writing and there is a creating understanding among its specialists regarding what it is, the thing it isn't, and what it involves. This paper adds to this agreement. Herbert Simon addressed the all-inclusive nature of plan as a study of the fake. His was essentially a positivist, rationalistic worldview that focussed on plan as a science. We comprehend 'science' here to mean an unbiased, lucid assemblage of information got and approved by thorough pragmatist techniques. Similarly, the more extensive plan local area has a voluminous writing on the idea of configuration, portraying the way that its concentration and hypotheses have created in the course of the last century. Bousbaci portrays this improvement as far as the 'models of man', closely resembling the 'homo-economicus' or 'sane' man that was implied in the conventional investigation of financial aspects before Simon's presentation of the idea of limited levelheadedness. As per Bousbaci, the model of man verifiable in plan talk preceding 1950s was of a natural and creative architect. This gave way in the last part of the 1950s to a legitimate and pragmatist model, which is the predecessor of present day plan science. Through the 1980s, the plan model took its lead from Simon and took a limited reasonableness viewpoint. This changed again during the 1990s to the model of creator as an intelligent professional who takes part in a 'discussion' with materials and clients, after Schön.

It isn't in the extent of this paper to survey in full the writing on the ways of thinking and models of plan. In any case, obviously the entirety of commitments regarding this matter grasp configuration as being in excess of a pragmatist or positivist science. This is in accordance with well-known view of plan, we accept, where inventiveness, instinct and human-intelligence would be high on the rundown of characterizing plan qualities. An extensively perceived model of configuration frets about human practices, mentalities, values and sensibilities notwithstanding item attributes, implications and styles. This isn't simply in the public insight. Researchers, for example, Cross, Bousbaci, Findeli and others concur. Cross suggests the conversation starter about "... the turn of events, explanation and correspondence of plan information. Where do we search for this information?" accordingly, he says that plan information has three sources: "individuals, cycles and items. Plan information dwells right off the bat in individuals: in fashioners particularly, yet additionally in everybody somewhat."

Conversely, cycle, content and objectivity are the main issues of science. The cycles should show thorough check or falsifiability of new information (Popper). Other than the age and confirmation of information, great science should be worried about the order, attachment and intelligibility of the information base. Also, positivist science assumes a free, objective truth that has presence outside of the individual or ancient rarity. Configuration doesn't assume this; it worries about the evil definition and vulnerability of comprehensive critical thinking or complex circumstance improvement. To do this, important information is perceived to be fused in the specialist of plan as well as in the actual antique.

From the above brief history and outline of plan, the clear division in the characterisation of plan between natural, relativist creativity on the one limit and sane, positivist science on the other limit recommends that there might be beyond what one way that plan can go about as mechanism for the executives studies to carry advantageous importance to the board specialists. This is without a doubt the case. The last option (pragmatist) sort of configuration is intervened as plan science; the previous (instinctive) kind of configuration is interceded as configuration suspecting. Configuration Thinking frets about the "investigation of the mental cycles that are appeared in plan activity". Then again, plan science adjusts the course of plan to the logical strategy necessities of the board science research. As opposed to plan science for research, plan thinking accentuates plan's capacity to manage human awareness's, socio-social agreement, vulnerability and integrative treatment of not well characterized issues, which are more attribute of the 'chaotic' field of the board practice and most particularly for development the executives. In this paper, we embody the vital qualification between configuration thinking and plan science in the circle of the board concentrates as follows. Plan science adjusts and supplements the purposeful, positivist and realist strategies, which are utilized in ordinary planning, as a strategy for remedy situated sociology research, the result of which is brought to settings of sociology practice through a developing bank of completely commented on true information. Configuration thinking outfits and fosters the natural, inventive, integrative, visual thinking, constructivist aspects of master configuration practice and brings these to intricate and 'mischievous' settings of training, thanks to the human professionals.

Like Star Trek, 'the mission of configuration believing is to strikingly go where no science has gone previously - or is probably going to go sooner rather than later'. Both plan thinking and plan science are gotten from plan and expect to help the executives studies' importance. However, shockingly, there is little intercourse between the two fields. It is hard to track down a distribution that alludes to both plan science and configuration thinking. Cross depicts the 'designedly' perspective as various and corresponding to a science perspective, with regards to the recorded advancement of plan theory as portrayed previously. Anderson et al give a portrayal of a use of plan science to Chevron's advancement cycle that verges on connecting the two yet neglects to do as such expressly. Different models are intriguing. We could guess that the shortfall of intercourse and cross referring to between the types of configuration thinking and plan science should be because of an absence of common commonality, comprehension or regard. If valid, this is unfortunately unexpected. Both draw from the rich well of plan's heritage with a similar extreme reason. Both are moving toward similar objective according to alternate points of view. The positivist viewpoint of plan science sees its centre functional commitments as curios that aggregate the information base. There is an implied supposition that the information is level headed and somewhat generalisable. In its centre working (for example doing it as unmistakable from learning about it), plan believing is exemplified in the plan mastermind, as far as practices, values, perspectives, instinct, imagination. This is a relativist and constructivist point of view where information is fundamentally occupant in the scholar or setting. Obviously, the last option is more fit to circumstances which are exclusively novel or 'messy' as are numerous pragmatic settings and every mischievous issue. By the way, it is in some cases failed to remember that a college's job is to educate, for example to frame understudies' psyches, in equivalent or much higher measure as to investigate. Newman in his original work *The Idea of a University*, said: "A university is a position of showing general information. This suggests that its article is ... the dissemination and augmentation of information rather than the progression of knowledge. In the event that its item were logical and philosophical disclosure, I'm not sure why a university ought to have understudies obviously, research is these days perceived to be a fundamental and significant job. On a basic level, obviously the act of plan science and configuration thinking individually focus on the two jobs of exploration and instructing, and that they complete one another in this manner. Obviously, to help a plan thinking mastery for educating, it is thusly important to investigate the actual point and this is a developing examination region. Hevner depict the attributes of good plan science research and give seven rules to directing and assessing great plan science research.

These are issue significance, plan assessment, research commitments, research meticulousness, plan as a pursuit interaction, correspondence of exploration. All the more concisely, Hevner portrays a three-cycle perspective on plan science research. This is repeated with some variation of format. He depicts it subsequently: "The pertinence cycle spans the relevant climate of the examination project with the plan science exercises. The meticulousness cycle interfaces the plan science exercises with the information base of logical establishments, experience, and skill that illuminates the examination project. The focal plan cycle repeats between the centre exercises of building and assessing the plan antiques and cycles of the

examination." Hevner places that "these three cycles should be available and obviously recognizable in a plan science research project".

## **5.8 PROBLEM FOCUS VS SOLUTION FOCUSED**

Every person approaches a problem in a different way. Some focus on the problem or the reason why a problem emerged (problem focused thinking). Others prefer to think about possible solutions that help them to solve a problem (solution focused thinking). Problem Oriented Thinking: Approaching a difficult situation problem-oriented might be helpful if we attempt to avoid similar problems or mistakes in the future, but when it comes to solving the problem we simply waste large amounts of our precious time! Problem-focused thinking does not help us at all to solve difficult situations, which is especially necessary in times where one must find quick solutions to an upcoming problem. Furthermore, the problem focused approach can have negative effects on one's motivation, but more on this later.

The whole "problem vs. solution oriented thinking" – approach does not only apply when a person faces a problem or a difficult situation (as previously mentioned), but is also being applied in one's everyday life, when we have to face a challenging task or when having to perform several duties. In fact: if we really focus our attention on this topic we can discover that the majority of our decisions and our attitudes towards tasks, problems and upcoming situations will either be problem or solution oriented. In order to demonstrate you the problem and solution focused approach I have chosen to give you the example of a college student:

Let's say there is a college student that really does not like math at all (it doesn't matter what subject he does not like, but I do not like math as well). Just like every other college student, he will have to do some homework for math and if he wants to pass the exams he will have to study a lot, whether he likes math or not. The student would be approaching the subject math problem-oriented if he would continuously imagine all the negative aspects of math that he does not like and might ask himself the question, "Why do I have to study for math? For what kind of reason?". The college student would be talking with his fellow students about the pointlessness of math, which will only strengthen his negative opinion about math. Rather than focusing his energy on studying for math he will get uptight and spends large amounts of his time in an ineffective way, that won't help him to pass the exams.

When I was in school I heard similar questions whole the time, especially when it came to subjects that the majority of my classmates did not like. To be honest, when I was younger I was asking myself these questions as well, especially in subjects that I knew were pointless for the profession I wanted to become. When I grew older I started to scrutinize this behavior and noticed how senseless it was to focus all my attention on problem focused thinking, especially as this only decreased my motivation and strengthened my resentment towards these subjects.

Discovering that one is majorly approaching tasks and challenges problem focused can be really difficult, but once we are aware of this we can start to change our focus from the problem towards the solution and make use of the solution-focused thinking.

Let us come back to the example of the college student that was thinking problem oriented. In order to think solution oriented, he would need to completely accept the fact that math is a part of his schedule and will, therefore, be tested in his exams, whether he likes math or not. By accepting this fact he will easily destroy the root cause for questions that focus on the reason for something (“Why?”) and that only waste his time.

We start to think solution oriented once we are aware that we cannot change certain facts/problems and will only spend our time in an inefficient way when we seek for the possible reasons for these situations. By clarifying the reasons why the task we have to face (e.g. math) might be important, for example, to get accepted to a good university or to increase our GPA, we can bring the solution focused thinking to a further level.

It is really astounding to see how many people are thinking problem oriented, especially as this behavior starts in school and can be found in the professional world as well, for example when an employee has to face a new task that he is not familiar with, or has little to no knowledge about. Those that think problem-oriented would be imagining all the negative consequences they might have to face or all the mistakes they might commit when trying to solve the task. The employee will talk about his difficult situation with different colleagues, his partner or friends, which will only increase his fear of the upcoming task.

The employee that quite in the contrary knows of the benefits of solution focused thinking does not struggle with the new task for a second, as he is too busy to take necessary preparations to solve it. He will completely accept the new task as a challenge, or even consider the task as a chance to prove his boss that he is capable of solving even the more advanced tasks.

How to avoid problem focused thinking?

#1 Self-knowledge:

In order to avoid problem focused thinking and to replace it with solution-oriented thinking we firstly need to discover that we approach different tasks, problems, challenges, etc. in a problem-oriented way. This is the utmost important step to do. You can identify whether you approach tasks problem-oriented by paying attention towards the questions that arise when you have to face a task that you do not like, which might be indicators for problem focused thinking:

Why do I have to perform this task?

What is the reason that I have to study this subject?

Why do I even spend time with this?

#2 Fight problem-oriented questions:

The very first step to approach problems with solution focused thinking is to avoid questions that mainly focus on the reason or the problem in general. You need to clarify yourself that the question for the “WHY” will only waste important time that you could have invested to solve a given problem.

#3 Clarity:

When you come to the conclusion that a task needs to be done you will see the pointlessness of further evaluating the usefulness or non-usefulness of a task. So when you have to face a task that you dislike you

could ask yourself the question, “Has this task to be fulfilled?” and when you conclude that the answer is “Yes”, then you know that every further attempt to evaluate the reasons and the “Why’s” is a waste of time.

#4 Why is it important to solve this task?

Questioning and clarifying the importance of a task will finally erase the root cause of every problem-oriented question. By clarifying the reasons why a task needs to be performed we can effectively change our focus from the problem to possible solutions.

#5 Think about the solution:

The final step to profit from solution focused thinking the most is to ask yourself different questions on how you can solve a given task or problem:

How can I solve this task?

How can I address this problem?

What would be the first step to solving this problem?

What kind of preparations will be necessary for this task?

Why does problem focused thinking decrease motivation?

Just imagine yourself having to study for an upcoming test (whether it is for school or a professional development is unimportant). While you are sitting in front of your table you start thinking about the exam and how much you dislike the whole subject. Questions that address the reason why you have to study for this subject start to arise and will ensure that you lose even the slightest interest in your task. Without being interested and a dozen of different questions that start to arise we finally lack the motivation to study for the exam!

Problem vs. Solution oriented thinking was presented by our Personality Growth Website. What is your preferred way of thinking? We’re excited to hear about your experiences in the comments section below.

## **5.9 QUESTIONS**

### **Long Answer Questions**

1. Explain the design-thinking process for innovation.
2. Illustrate the concept of design thinking in leadership.
3. Explain the Features of design thinking.
4. Examine the applications of design thinking.

### **Short Answer Questions**

1. How design thinking helps to have a growth mindset
2. Illustrate the difference with problem focused vs. solution focused.
3. Explain the Origin of design thinking
4. How design thinking can make you better leader
5. How Design thinking adds value to the innovation

## **B. Multiple Choice Question**

1. What is design thinking?
  - a. Thinking after design
  - b. Think only about the existing solution
  - c. Plan different types of thinking
  - d. Workout the optimal solution based on users' perspectives
2. Design thinking starts with
  - a. Empathize
  - b. Prototype
  - c. Test
  - d. Ideate
3. A good approach to empathy should not have the following attribute
  - a. Judgment of other's opinion
  - b. Curiosity
  - c. Optimism
  - d. Respect for other's opinion
4. Which of the following design principles provides limitations to the user?
  - a. Constraint
  - b. Discoverability
  - c. Feedback
  - d. Visibility
5. Making of interaction models takes place in which step of the interaction design process?
  - a. Identifying needs
  - b. Developing alternative designs
  - c. Building prototypes
  - d. Evaluating

**Answers:**

1-d, 2-a, 3-a, 4-b, 5-c

## **5.10 SUGGESTED READINGS**

Kotter, J. (1996). *Leading Change: An Action Plan from The World's Foremost Expert on Business Leadership*.

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Hirsch, R. D., Peters, M. P., & Shepherd, D. A. (2012). *Entrepreneurship*. McGraw-Hill Education.



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**M.A (ECONOMICS)**

**SEMESTER II**

**MAEC24203T- ENTREPRENEURSHIP DEVELOPMENT**

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**UNIT 6 ROLE OF STIMULATING CREATIVITY, GOVERNMENT SCHEMES IN  
ENTREPRENEURSHIP DEVELOPMENT**

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**STRUCTURES**

**6.1 Introduction**

## **6.2 Creativity and problem solving**

## **6.3 Role of Creativity in Entrepreneurship**

## **6.4 Creativity Process**

## **6.5 Role of Government to support Entrepreneurs**

## **6.6 Summary**

## **6.7 Questions**

## **6.8 Suggested Reading**

## **6.1 INTRODUCTION**

Entrepreneur is one of the most important segments of economic growth. Basically, he is a person responsible for setting up a business or an enterprise. An entrepreneur is a person who perceives a need and then brings together manpower, material and capital required to meet the need. The concept of entrepreneurship is an age-old phenomenon that relates to the vision of an entrepreneur as well as its implementation by him. Entrepreneurship is a creative and innovative response to the environment. It is also the process of setting up a new venture by entrepreneur. Entrepreneurship is a composite skill that is a mixture of many qualities and traits such as imagination, risk taking ability to harness factors of production i.e. land, labour, technology, and various intangible factors. Entrepreneurship culture implies a set of values, norms and treats that are conducive to the growth of entrepreneurship.

The entrepreneur is a visionary and an integrated man with outstanding leadership qualities. With a desire to excel, he gives up priority to Research and Development. He always works for the well-being of society. It is the ability and quality of an entrepreneur to identify an investment opportunity and to organize an enterprise in order to contribute for the real economic growth.

Entrepreneurship plays a dominant role in the growth and development of an economy. Entrepreneurship can solve problems like unemployment, concentration of economic power in the hands of very imbalanced regional development. Entrepreneurial competence makes all the difference in the rate of economic growth. In India, state and private entrepreneurship co-exist. The small scale industrial sector and business are left completely to private entrepreneurs. It is in this context that an increasingly important role has been assigned to the identification and promotion of entrepreneurs for this sector.

## **6.2 CREATIVITY AND PROBLEM SOLVING**

### **Creativity:**

Creativity is the ability of a person to conceive something unpredictable, original, and unique. Creativity is to generate new ideas, alternatives, solutions, and possibilities in a unique and different way. It is the mirror of how beautifully a person can think in any given circumstances. Creativity is a brainstorming and mind blogging activity in which a person has to think beyond his

imagination for bringing something worthwhile. It is an activity unveiling something which was previously hidden or never creating something new that existed before.

### **Definition of creativity:**

According to Oxford dictionary creativity means.” the use of imagination or original ideas to create something.”

### **Characteristics of a Creative Entrepreneur**

A creative entrepreneur should possess following features:

1. An entrepreneur experiments with his ideas as the first step, later converting ideas into implementation.
2. An entrepreneur adheres to rules and principles only when they add value to the organization and have a potential to attract more customers.
3. An entrepreneur is less afraid to lose and is always keen to experiment in new ventures.
4. A creative thinker is interested in bringing totally opposite things together to create new products or services.
5. A creative thinker will take inspiration from new ideas in every area directly or indirectly related to enterprise.
6. An entrepreneur shares an idea and is open to feedback that improves and refines the idea.
7. An entrepreneur is not afraid to appreciate new ideas irrespective of who comes up with them.
8. A creative entrepreneur learns different things whether they are related to the industry or not.

### **6.3 ROLE OF CREATIVITY IN ENTREPRENEURSHIP:**

Creative thinking is the must have ‘skill’ of an entrepreneur for the creation of new ideas. Creativity allows a person to devise interesting processes which gives numerous benefits to entrepreneurs. Creativity leads to success by:

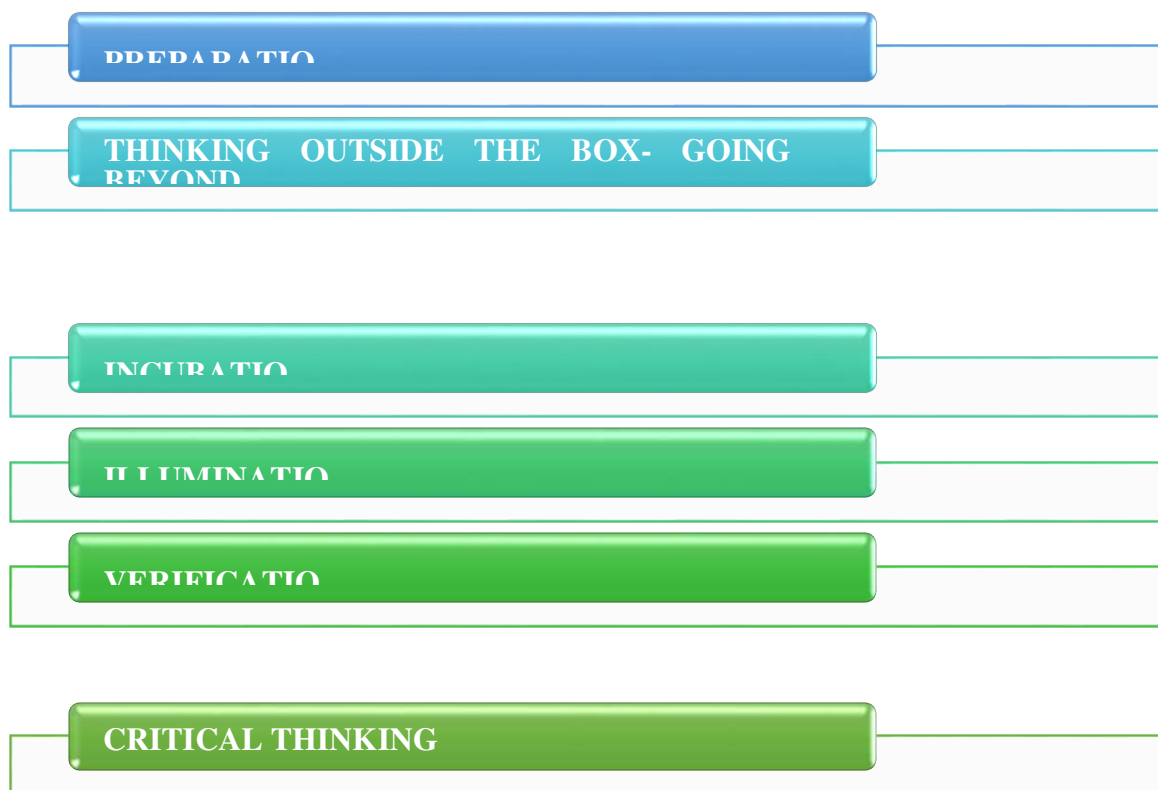
- i. Creative new ideas for competitive advantage: the whole process of entrepreneurship is rooted in creation and exploration of new ideas. When an entrepreneur can generate new idea that is feasible as well as efficient, it gives him a competitive edge over competitors.
- ii. Developing new products and improving the business: Creativity helps develop new ways of improving an existing product or service and optimizing a business.
- iii. Thinking and unthinkable: Creativity requires imagination to produce the most obscure ideas. Imagination is needed to cross the boundary of usual and normal or to have out of box thinking. It enables the entrepreneur to think beyond the traditional solutions, come up with something new, interesting versatile and yet have success potential.
- iv. Finding similar patterns in different areas: Sometimes due to following a routine or a habit the thinking process also goes along the line of those established processes. Creativity enables people

to connect dissimilar and unrelated subjects and make successful entrepreneurial ideas. Merging different fields creates interesting intersections that develop new niches.

- v. Developing new niches through creativity and entrepreneurship: In entrepreneurship, it is important that new aspects of traditional business are explored. This can be in the form of changing the method of manufacturing the product or delivering the service or mechanism through which they are supplied to the users. All these areas can create a niche that has great potential in business.

#### **6.4 PROCESS OF CREATIVITY**

A Typical process of creativity goes through the following steps



**Step 1. Preparation:** The first stage is the preparation of some basic ideas to hold onto. There must be some inspiration that forces or prepares the entrepreneur to move forward. The creative process starts with identifying a problem and then researching for related information. This is an effort to start looking for a feasible solution. An entrepreneur explores every direction to solve the problem, be inside the industry or outside the business domain.

**Step 2. Thinking outside the box - going beyond the comfort zone:** One has to leave the comfort arena, go beyond and take a risk. Rewards come with effort. “Thinking outside the box” is an expression that has been used in the area of marketing, business and psychology since 1970. It owes its origin to a “nine dot” game that was once used as a test of creativity. The puzzle was designed such that a person had to go beyond the dots to find the solution. However, psychologists say that this external factor is not

external. It is simply the existing solution to the problem. External is only how our brain tends to perceive it as a problem and its solution.

**Step 3: Incubation:** During the incubation stage, ideas that have the potential to solve a problem tend to flourish. This stage is characterized by the unconscious thought process of refining an idea. Apparently, there are many activities at work during this stage but overall goal is find a solution. Evaluating existing projects can help to generate viable ideas.

**Step 4. Illumination:** incubation leads to clarity of ideas. This is the solution finding stage. Now the creativity process leads to the knowledge of some practical ideas that can be put to work. It is like a “light bulb moment”, hence it is called illumination. During this stage innovators pick up one possible solution capable of solving the problem.

**Step 5. Verification:** This stage determines whether the “found” solution even has the potential to work or not. This idea can either be accepted as such, modified with minor or major changes or rejected altogether requiring that the whole process to be done again.

**Step 6. Critical thinking:** Generating innovative ideas is a comprehensive task. The maker success of an entrepreneurial endeavor lies in critically examining the viability of an idea. Critical thinking enables an entrepreneur to self-judge in order to evaluate the idea. It is defined as a self-directed, self-disciplined, self-monitored and self-corrective process of evaluating an idea. The process of creative thinking starts with brainstorming “ends at the critical analysis of idea’s viability. The resulting potentially viable ideas can lead to the creation of entrepreneurial enterprises of improvement of the existing ones.

### **ENTREPRENEURSHIP AND CREATIVITY:**

In today’s world, due to globalization and excessive industrialization products are manufactured and exported to international market. As a result, there is easier access to every product, everywhere. The consumer has access to various kinds of products differing in terms of type and quality. So, what does a businessperson do in a market flooded with products? How can someone think of manufacturing and supplying a product in markets where consumers already have their trusted preferences and so many choices to choose from? How can we make a product stand out from the rest?

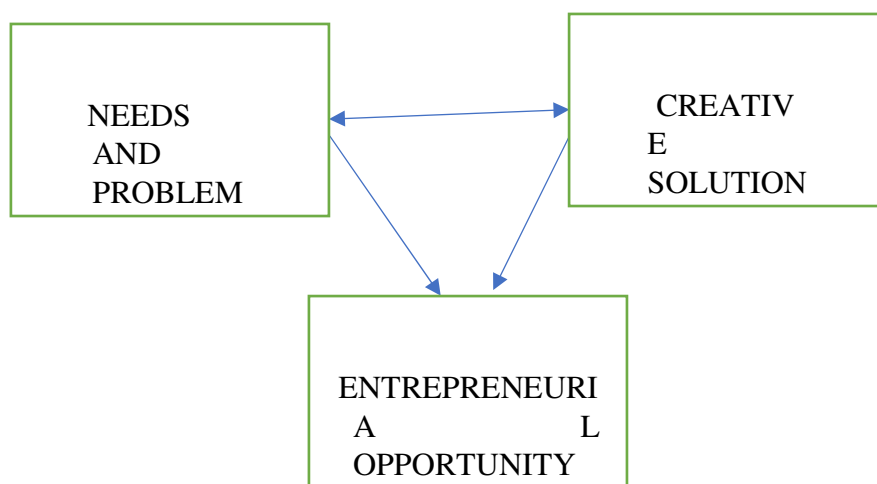
A creative mind answers all these questions. Creativity helps us think of how to improve existing business practices. A creative mind is like an artist who creates new and exciting patterns on canvas; Creativity can come up with the most unthinkable ideas and bring innovation into existing practices. Creativity is simply the ability of imagination. Imagination leads someone to reach never explored areas. In business terms imagination alone what is known as “thinking outside the box”. However, a creative mind has entrepreneurial skills to bring those creative ideas to life in a business setting, An entrepreneur assesses the requirements of how to execute an idea by analyzing available required resources and think how to establish a new enterprise and how to manage it. An entrepreneur designs business models that can support and execute innovation ideas in the first place. An entrepreneur provides

the science aspect about how to bring artistic creativity to life. Therefore, entrepreneur bridge the gap between the creative genius and a traditional business approach.

### **ENTREPRENEURS AS PROBLEM SOLVERS:**

Entrepreneurs are gifted with the ability to identify problems and provide their solutions in an innovative way, leading to creation of utility and wealth. The word 'entrepreneur' is taken from French word 'entreprendre' which means 'to undertake'. So, an entrepreneur is a person, who undertakes risk and tries to resolve the problems faced by the society and earn profit in this process.

Entrepreneurial actions are efforts to solve the problems of others. When one solves a problem, a new value is created which leads to the creation of new profitable enterprise.



Urban Company, Paytm, Delhivery, Cred, Ola etc. they all are Indian startups. Their success stories inspire entrepreneurs to hold on to their vision. The main reason these ventures succeeded considering many challenges faced by startups in India is that they attacked a real need.

Creativity is the ability of a person to conceive something unpredictable, original and unique. Creativity is to generate new ideas, alternatives, solutions and possibilities in a unique and different way. It is the mirror of how beautifully a person can think in any given circumstances. Creativity is a brainstorming and mind-boggling activity in which a person has to think beyond his imagination for bringing something worthwhile. It is an activity unveiling something which was previously hidden or never creating something new that existed before.

Entrepreneurial actions are efforts to solve problems of others. When one solves a problem, a new value is created which leads to the creation of new profitable enterprise.

## **6.5 GOVERNMENT ROLE TO SUPPORT ENTREPRENEURS**

### **CHALLENGES FACED BY NEW ENTREPRENEURS**

Entrepreneurs often encounter various challenges when it comes to marketing their products or services. Some of these challenges include:

1. **Limited Resources:** Entrepreneurs often have limited budgets and resources for marketing efforts. This can make it challenging to compete with larger companies that have more extensive marketing budgets.
2. **Lack of Brand Awareness:** Building brand recognition from scratch can be difficult. Consumers may be hesitant to try products or services from an unfamiliar brand.
3. **Target Audience Identification:** Identifying and understanding the specific needs and preferences of the target audience can be challenging. Without a clear understanding of the audience, marketing efforts may not effectively resonate with potential customers.
4. **Competition:** Competing against established players in the market can be tough. These competitors may have greater resources, brand recognition, and customer loyalty.
5. **Changing Market Dynamics:** Markets are constantly evolving due to technological advancements, changing consumer behaviors, and emerging trends. Entrepreneurs must stay agile to adapt to these changes.
6. **Marketing Expertise:** Entrepreneurs often need to wear many hats, and they might not have a strong background in marketing. This can lead to less effective strategies or missed opportunities.
7. **Measuring ROI:** Determining the return on investment (ROI) of marketing efforts can be challenging, especially for strategies that don't provide immediate results.
8. **Choosing the Right Channels:** Selecting the most effective marketing channels to reach the target audience can be tricky. Different channels work better for different types of products and services.
9. **Creating Compelling Content:** Developing high-quality, engaging content that resonates with the target audience can be time-consuming and require creative skills.
10. **Consistency:** Consistently maintaining marketing efforts over time is crucial for building brand awareness and customer loyalty. However, maintaining consistency can be challenging amid other business responsibilities.
11. **Negative Feedback and Criticism:** Entrepreneurs may face negative feedback or criticism, which can be disheartening. Learning how to handle negative feedback constructively is important.
12. **Time Constraints:** Juggling marketing efforts with other business responsibilities can be overwhelming. Entrepreneurs must manage their time effectively to ensure a balanced approach.
13. **Technological Challenges:** Keeping up with technological advancements in the digital marketing space can be challenging for entrepreneurs who are not tech-savvy.
14. **Regulatory and Legal Considerations:** Ensuring that marketing efforts comply with relevant laws and regulations, such as data privacy laws, can be complex.

Overcoming these challenges requires a combination of strategic planning, continuous learning, adaptability, creativity, and a willingness to seek help or collaborate with experts when needed. Entrepreneurs who address these challenges effectively can create effective marketing strategies that contribute to their business's success.

## MARKETING SUPPORT TO NEW ENTREPRENEURS

New entrepreneurs can benefit from various marketing support strategies to help them establish and grow their businesses successfully. Here are some ways to receive marketing support:

1. **Business Incubators and Accelerators:** These programs offer mentorship, resources, and networking opportunities to startups, including guidance on marketing strategies.
2. **Small Business Development Centers (SBDCs):** Government-funded centers provide free or low-cost business consulting and training, including marketing advice.
3. **Online Courses and Webinars:** Numerous online platforms offer courses and webinars on marketing topics, from basic concepts to advanced strategies.
4. **Networking Events:** Attending local business networking events can help entrepreneurs connect with mentors, peers, and marketing professionals who can offer advice.
5. **Mentorship Programs:** Joining mentorship programs allows new entrepreneurs to learn from experienced business leaders, including marketing experts.
6. **Business Competitions:** Participating in startup competitions can provide exposure, feedback, and potential funding, all of which can contribute to marketing efforts.
7. **Online Communities:** Participate in online forums, social media groups, and communities where entrepreneurs discuss marketing strategies and share insights.
8. **Consultants and Freelancers:** Hiring marketing consultants or freelancers can provide specialized expertise for developing effective marketing strategies.
9. **Local Chambers of Commerce:** Chambers often offer workshops, seminars, and networking opportunities that can help entrepreneurs learn about marketing strategies.
10. **Free Marketing Tools:** Utilize free or low-cost marketing tools such as social media platforms, email marketing services, and content management systems.
11. **Government Resources:** Some governments provide resources and grants for startups, including marketing-related initiatives.
12. **Trade Associations:** Industry-specific associations can provide resources, events, and networking opportunities for entrepreneurs looking to market their products or services.
13. **Pitching Events and Demo Days:** Participating in these events can help entrepreneurs refine their product pitch and gain exposure to potential investors and customers.
14. **Startup Incubation Programs:** These programs offer physical spaces, mentorship, and resources that can aid in marketing efforts.



**15. Collaboration with Universities:** Partnering with universities can provide access to student talent, research, and marketing insights.

**16. Online Resources:** Blogs, podcasts, and YouTube channels focused on entrepreneurship and marketing can offer valuable insights and tips.

**17. Crowdsourcing and Crowdfunding Platforms:** Platforms like Kickstarter and Indiegogo can help entrepreneurs validate their ideas and raise funds for marketing initiatives.

Remember that the availability of these resources may vary depending on your location and industry. New entrepreneurs should seek out the support options that best align with their business goals and needs.

## **ROLE OF GOVERNMENT TO SUPPORT ENTREPRENEURS**

India has implemented several government initiatives to support new entrepreneurs and startups. These initiatives aim to foster innovation, encourage entrepreneurship, and provide various forms of assistance to help startups grow and succeed. Here are some notable government initiatives in India:

1. **Startup India:** Launched by the Government of India, this initiative aims to promote a culture of entrepreneurship and innovation. It offers benefits such as tax exemptions, funding support, and easier compliance for startups.

2. **Atal Innovation Mission (AIM):** This mission aims to promote innovation and entrepreneurship among students. It includes the establishment of Atal Tinkering Labs (ATLs) in schools and Atal Incubation Centers (AICs) to support startups.

3. **Mudra Yojana:** The Pradhan Mantri Mudra Yojana provides financial support to micro and small enterprises, including startups, through loans from various financial institutions.

4. **Stand-Up India:** This initiative aims to promote entrepreneurship among women and marginalized communities by offering financial support for setting up new businesses.

5. **National Small Industries Corporation (NSIC):** NSIC provides support to startups and small enterprises through various services, including training, advisory services, and marketing assistance.

6. **Make in India:** The Make in India initiative encourages investment in manufacturing and promotes entrepreneurship by creating a conducive environment for startups to establish and expand their operations.

7. **Biotechnology Industry Research Assistance Council (BIRAC):** BIRAC provides funding and support for biotechnology startups, helping them bring innovative products and services to the market.

8. **Invest India:** Invest India is the national investment promotion and facilitation agency. It provides information, guidance, and support to startups looking to establish and grow their businesses in India.

9. **NIDHI-EIR:** The National Initiative for Developing and Harnessing Innovations - Entrepreneur in Residence (NIDHI-EIR) program supports innovators and startups by providing financial assistance, mentoring, and incubation support.

10. **NITI Aayog's Women Entrepreneurship Platform (WEP):** WEP supports and empowers women

entrepreneurs by providing access to resources, networking opportunities, and business development support.

11. SIDBI Startup Mitra: Small Industries Development Bank of India (SIDBI) offers financial support and assistance to startups through its Startup Mitra platform.

12. Aadhaar for Business Registration: Aadhaar, the unique identification number, is used for simplified and faster business registration processes, making it easier for entrepreneurs to start their businesses.

These initiatives demonstrate the Indian government's commitment to nurturing entrepreneurship and innovation across various sectors. Entrepreneurs interested in leveraging these initiatives should thoroughly research each program's eligibility criteria, benefits, and application procedures to take full advantage of the support available.

**Marketing plays a crucial role in promoting entrepreneurship by facilitating the growth and success of new ventures. Here are several ways in which marketing supports and promotes**

#### **Entrepreneurship:**

1. Creating Awareness: Marketing helps entrepreneurs create awareness about their products or services in the market. Effective marketing campaigns increase visibility, allowing potential customers to learn about the new venture.

2. Market Validation: Through market research and analysis, entrepreneurs can identify gaps and opportunities in the market. Marketing helps entrepreneurs test their ideas, products, or services to see if there is demand or interest.

3. Building a Brand Identity: Developing a strong brand identity is essential for startups. Marketing helps entrepreneurs define their brand's values, messaging, and image, which contributes to building credibility and trust.

4. Customer Acquisition: Marketing strategies attract and engage potential customers. Entrepreneurs can use marketing channels to reach their target audience, generate leads, and convert them into paying customers.

5. Product Development and Improvement: Customer feedback gained through marketing efforts can provide valuable insights for improving products or services. Marketing helps entrepreneurs understand customer needs and preferences.

6. Value Proposition: Entrepreneurs need to communicate the unique value their products or services offer. Marketing helps articulate this value proposition effectively to potential customers.

7. Market Expansion: As startups grow, marketing strategies can help them expand into new markets or reach new customer segments. This contributes to the scalability of the business.

8. Access to Funding: Effective marketing strategies can attract investors and funding. Demonstrating

a strong marketing plan can make a startup more appealing to investors, accelerating its growth.

9. **Loyalty and Retention:** Marketing efforts help entrepreneurs engage and retain existing customers. Building customer loyalty is crucial for long-term success and sustainability.

10. **Networking and Partnerships:** Marketing events, conferences, and platforms provide opportunities for entrepreneurs to connect with potential partners, collaborators, and mentors.

11. **Innovation:** Entrepreneurial marketing often involves creative and innovative strategies to stand out in competitive markets. This mindset of innovation can extend beyond marketing to other aspects of the business.

12. **Job Creation:** As startups grow and succeed, they often create job opportunities. Effective marketing can contribute to the company's growth, leading to more employment opportunities.

13. **Economic Growth:** Successful entrepreneurs and their ventures contribute to economic growth by generating revenue, creating jobs, and fostering innovation. Effective marketing accelerates this process.

14. **Learning and Adaptation:** Marketing requires continuous learning and adaptation to changing market trends and customer preferences. This mindset of adaptability extends to the entrepreneurial journey as well.

In essence, marketing acts as a bridge between a startup and its target audience, helping entrepreneurs navigate the challenges of reaching customers, building a brand, and achieving business goals. By effectively using marketing strategies, entrepreneurs can accelerate their business's growth and maximize its potential for success.

## **6.6 SUMMARY**

The entrepreneur is a visionary and an integrated man with outstanding leadership qualities. With a desire to excel, he gives up priority to Research and Development. He always works for the well-being of society. It is the ability and quality of an entrepreneur to identify an investment opportunity and to organize an enterprise in order to contribute for the real economic growth.

Entrepreneurship plays a dominant role in the growth and development of an economy. Entrepreneurship can solve problems like unemployment, concentration of economic power in the hands of very imbalanced regional development. Entrepreneurial competence makes all the difference in the rate of economic growth. In India, state and private entrepreneurship co-exist. The

small scale industrial sector and business are left completely to private entrepreneurs. It is in this context that an increasingly important role has been assigned to the identification and promotion of entrepreneurs for this sector.

## **6.7 QUESTIONS**

### **Long Answer Questions**

- 1 Explain the steps involved in creative process
- 2 What do you mean by creativity? How entrepreneurs and creativity are linked with each other
- 3 Discuss the significance of government initiatives in India to support marketing knowledge and skills for entrepreneurs

### **Short Answer Questions**

- 1) Explain any three features of creative entrepreneurs.
- 2) Write down two basic skills in entrepreneurs.
- 3) Explain the role of creativity in entrepreneurship
- 4) Explain the purpose of the "Make in India" campaign.
- 5) How does the "Stand-Up India" initiative promote entrepreneurship?
- 6) What is the focus of the "NITI Aayog's Women Entrepreneurship Platform"?
- 7) Define the "Aadhaar for Business Registration" initiative

## **6.8 Suggested Readings**

- Paul Burns and Jim Dew Hunt, Small Business Entrepreneurship, Palgrave Macmillan publishers, 2010. Suman Kalyan Chaudhury, Micro Small and Medium Enterprises in India Hardcover,
- Raj Publications, 2013. Aneet Monika Agarwal, Small and medium enterprises in transitional economies, challenges and opportunities, DEEP and DEEP Publications. S.S. Khanka, Entrepreneurial Development, S. Chand, 2017

**M.A (ECONOMICS)**  
**SEMESTER II**  
**MAEC24203T- ENTREPRENEURSHIP DEVELOPMENT**

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**UNIT 7 START UPS: MEANING, TYPES OF START-UPS**

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**7.0 Learning objectives**

**7.1 Introduction**

**7.2 Startups: definition, characteristics and their types**

**7.2.1 Definition of startup**

**7.2.2 Characteristics and features**

**7.2.3 Types of startups**

**7.2.4 Steps for starting a startup**

**7.3 Registration process**

**7.4 Tax benefits for startups**

**7.5 The legal difference between MSME and startup**

**7.6 Summary**

**7.7 Questions**

**7.7 Suggested readings**

**7.0 LEARNING OBJECTIVES**

After studying the Unit, you would be able to:

- Introduction and definition of Start up
- Registration process of a startup
- Types of Financial support to start ups by Government of India
- Tax Benefits for Startups
- Types of Startups

**7.1 INTRODUCTION**

India's startup community is thriving and expanding quickly. India is well recognized for its thriving startup scene, which is influenced by several factors, including Startup Ecosystem Diversity, wherein, India has a wide spectrum of startups in a variety of industries, including technology, e-commerce, healthcare, Fintech, Edtech, agricultural technology, and more. The Startup India programme is only one of the many initiatives the Indian government has started to help companies. These programmes sought to give entrepreneurs access to capital, tax advantages, and simplified company procedures. Venture capitalists, private equity firms, and angel investors from both domestic and foreign sources are making large investments in India. The number of investment rounds and unicorn startups (startups valued at over \$1 billion) are rising across the nation. Another reason for

thriving startup scene is pool of talented and knowledgeable businesspeople who are creating new businesses and going global.

Technology and Innovation is also an important factor for conducive environment for Startups. Indian companies are renowned for their inventiveness, particularly in industries like AI, block chain, and IoT. These firms are tackling a range of issues that the nation and the world are facing. Another factor is E-commerce Boom: Companies like Flipkart, Amazon India, and others are leading the way in India's quickly expanding e-commerce industry. Moreover, as the importance of online education and healthcare services has grown, the creation of Edtech and Healthtech firms has also fueled up. Despite government backing, businesses continued to face regulatory obstacles, notably in fields like fintech and e-commerce. It was nevertheless important to deal with these regulatory restrictions. Growing number of unicorn businesses are created in India, including companies like Flipkart, Ola, Paytm, Zomato, and Byju's. Furthermore, the nation has a robust ecosystem of incubators and accelerators that offered resources, cash, and guidance to companies.

### **7.2.1 DEFINITION OF A STARTUP**

An entity shall be considered as a Startup:

- i. Up to a period of ten years from the date of incorporation/ registration, if it is incorporated as a private limited company (as defined in the Companies Act, 2013) or registered as a partnership firm (registered under section 59 of the Partnership Act, 1932) or a limited liability partnership (under the Limited Liability Partnership Act, 2008) in India.
- ii. Turnover of the entity for any of the financial years since incorporation/ registration has not exceeded one hundred crore rupees.
- iii. Entity is working towards innovation, development or improvement of products or processes or services, or if it is a scalable business model with a high potential of employment generation or wealth creation. Provided that an entity formed by splitting up or reconstruction of an existing business shall not be considered a 'Startup'.

An entity shall cease to be a Startup on completion of ten years from the date of its incorporation/ registration or if its turnover for any previous year exceeds one hundred crore rupees.

General Definition: The concept of a startup is quite comprehensive as it works on a fresh idea and tries to fulfill the basic needs and it demands lot of hard work on research, developing business idea, and coping with the challenges and fear of failure as Niel Blumenthal, co- founder of Warby Parker states that a startup is a company working to solve a problem where the solution is not obvious and success is not guaranteed. It shows that a startup requires an expertise, patience, innovative and managerial skills altogether.

Among the most popular definitions of a startup, the definition given by Eric Ries (the creator of the Lean Startup methodology) is considered the most suitable. He says, "A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty."

Wil Schroter has defined a startup in his own way. He defines, “A startup is the living embodiment of a founder’s dream, and it represents the journey from concept to reality”.

Stephanie Caudle claims, “A startup is a company that solves a problem, if your company isn’t solving a problem, your company is simply an idea”.

**Some prominent examples of startups in India:** Microsoft, Amazon and eBay are good examples of successful startups worldwide. It is, currently, a great time for startups in India. Business seems to be booming and we can observe their way of working and get some inspiring insights. A number of startups in India are rocking and giving motivation to the new aspirants at large. We can take the example of Wow which is food chain based on Kolkata, growing its business day by day in India. It sells burgers, Tibetan food and just about anything a customer demands for. Everyone knows Ola Cabs, which is currently giving tough competition to the Uber in minicab services. A company named by AddressHealth is providing healthcare in schools and clinics and have proven to be very successful recently. Most of the people especially the Youngsters might be familiar with Zomato which is one of the most well-known startups and perhaps one of the most successful food tech startups in India that has turned into an international business. Paytm is a great example of another very successful startup. This startup is a payment service that allows people to pay funds to each other. It is very similar to PayPal. While it’s not at that level yet, it still seems to dominate all over India. FreshToHome, FreshMenu, Myra, Cure.Fit etc. are some of the most leading and successful examples of startups in India.

### **7.2.2 Characteristics and Features**

To understand the concept of a startup, we must pop out with its features. There are various features of startups which are common. Some important features are discussed below as:

**Innovation:** this type of business needs to have a differentiator competition in order to gain competitive advantage in the market. Innovation may be present in their products or in the business model associated with company. An innovation plays a significant role in the success of a startup. So, all entrepreneurs should seriously consider this aspect.

**Age:** A startup is a new company which is still in early stages brand management, sales and hiring employees. Generally, this concept considers a business as a startup that has been on the market for less than 3 years, however, this is always not true.

**Growth:** A startup is a company, whose goal is to grow and expand rapidly, taking up to sometimes drastic proportions. This is one of the points that make a distinction of startups over the small business.

**Risk:** Once a startup comes into existence, there are always several associated uncertainties about ensuring the success of the business. For this reason, these businesses are considered risk investments with a high failure rate.

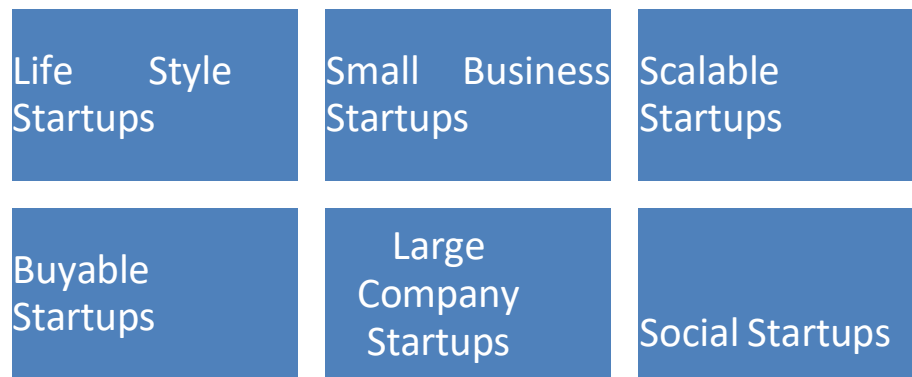
**Scalability:** A startup is a company in constant search of a business model that is scalable and repeatable, that is, it can grow without the need to increase human or financial resources.

**Work team:** startups usually get shaped with limited resources and made up of very few people. Although, this is not the only determining factor for the designation of startup but it is quite common to define it when in working team there are less than 100 people.

In short, we can consider that a startup is a company that is in the early stages of development in order to solve real-life problems through a product or innovative service. In India, the term "startup" has gained a lot of popularity and more and more people are showing their interest in becoming entrepreneurs. The term startup refers to a company in the first stages of operations. Startups are founded by one or more entrepreneurs who want to develop a product or service for which they believe there is demand or demand can be created. These companies generally start with high costs and limited revenue, which is why they look for capital from a variety of sources such as venture capitalists.

### 7.2.3 TYPES OF STARTUPS

After understanding the concept of what is a startup, it is time to identify the various types of businesses that they can present. Due to the increased demand in this market, it is necessary that future entrepreneurs know the types of startups exist in the market in which their idea of business can fit. According to Steve Blank, a reputable entrepreneur of Silicon Valley, there exist 6 different types of startups:



- **Life Style Startups:** These are founded by entrepreneurs who are working for their interests or what else they like. Examples of these are freelancers or web designers who have passion for their work.
- **Small Business Startups:** Small business where the owner follows less ambitious goals, to provide only a comfortable life for his family. Examples of these are hair dressing salons, grocery stores, bakeries, among others.
- **Scalable Startups:** Founded by entrepreneurs who believe from the beginning that can change the world with their business idea and therefore worry about finding a model scalable and repeatable business in order to draw the attention of investors to boost their business. Examples of these are Google, Uber and Facebook.
- **Buyable Startups:** These startups are born with the goal of being sold to large companies after achieving positive results that can catch an attention. These types of startups are very common in web solutions development companies and mobile. Best example of this type of startup is Instagram which is recently purchased by Facebook.
- **Large Company Startups:** They have the main objective of innovation and have a limited duration of life. Changes in customer preferences change in rules and regulations, technologies, increased competition etc. force large companies to create new innovative products and services for new emerged markets. Some good examples of this type of startup are Android and Google.



- **Social Startups:** Finally, business whose entrepreneurs want to make a difference in society and make a better world. Thus, the main objective is not to gain profit, but rather to contribute positively to the community. For example, we can see many charitable institutions in our town or cities working in education and health sector.

## **7.2.4 STEPS FOR STARTING A STARTUP**

A lot of millennials in India these days are eager with the idea of startups. Many of them are carrying the idea of startups in mind already or they are trying to choose something very near to their interests. The reality is there is an intense competition of starting a startup but it needs an exceptionally great skills to sustain in this competition. Before an aspirant work on the idea of startup, he/she needs to ensure what market gap is to be addressed, readiness to take challenges and accept failures and idea must differ to others in its way. Every great startup begins with a great idea but it takes a massive effort to be put into practice and make it successful. Having a great idea is just the beginning and here are few steps you can take that will not only help you in conceptualizing a good business idea but also successfully executing it:

- **Do your market research:** Every entrepreneur has at least one big idea for the next big thing but what matters is not the idea but the willingness to take action on that idea so as to make that idea into a reality. For this, you need to conduct thorough market research so as to know where you stand and if your idea is really worth pursuing further. To know where you stand, begin your research by writing down the problem you think your business idea will solve. For this, you need to either consider writing up a survey for these potential customers to take or talk to them personally to take feedback. It is only after you get your results that you will know where you stand and if it's even worth checking out the competition for your product. After a competition check, aspirant should keep all of results and data with him as it would be really helpful in the coming years to know where the business was and what is needed to take a business on the next level.
- **Find a Co-founder:** During this time businessman also get to decide if he wants co-founders or want to go solo ahead. It is important to know that not having the proper support during this time can make or break your chances of creating a successful venture. Thus, first, look for a founding team or co-founder before making an investment in a startup company. This will not only help build a support system but also having a co-founder will help the business with many other benefits such as decision-making, risk-bearing etc.
- **Get your company incorporated:** Incorporating a company is as big a deal for a startup as it will affect many aspects of its lifecycle. Incorporating means turning your business into a legal entity and deciding how it will be structured for the future. In India after the process of incorporation, a company will typically be incorporated as one of the following:
  - Private Limited Company
  - Public Limited Company
  - Unlimited Company
  - Limited Liability Partnership (LLP)
  - Partnership
  - Sole Proprietorship
  - Joint Venture Company

Also, there are provisions of getting your company incorporated as (a) Liaison Office, (b) Project Office, (c) Branch Office, or (d) Subsidiary Company

- **Secure intellectual property and rights:** To start a startup, one also needs to secure intellectual property rights and research if they are already not patented or trademarked by someone else. Intellectual property or IP refers to the process by which you or your company can own the rights to create your product and then sell them. Examples of IP rights include patents, copyright, and trademarks and they are vital to your success and your company's success in the future. It is important to secure your IP early on as it will protect a business against any copycats. This will also let a businessman to know if he is not one of the "copycats" and product or service is genuine and not violating any existing IP rights.
- **Decide on the branding of product:** Branding is almost as important as IP rights for a company as it builds company's image and reputation. Note that branding is more than just choosing a name for your company as it builds its identity and projects its idea. When one thinks about branding, he needs to see not just the current product, but also its future potential. For example, if you are about to build a platform for selling books on an online platform, you cannot just restrict its name to highlight books as you might expand to selling other products in the future and having a name with the word "books" in it will somehow limit it. It is also important to select a name that you love and want as it would be rather hard to change it once your company had built its brand and reputation. It would also require a lot of hard work and resources to recreate a connection with a new brand or name that people already associate with that name. The biggest example of the above is when Nestle changed the recipe of their noodle Maggie a few years back and lost a huge chunk of their customers due to it.
- **Write a business plan:** Writing a business plan is one of the most important steps in setting up a startup as it covers almost aspects of a company and its future. One can write a good business plan for any company using the market research (that he/she did earlier) and from there on creating that plan for the future and drafting every step for the company. This business plan will also help to determine goals and milestones for a company and help to know when business goes off track and guide management on many aspects.
- **Pick a workplace and find a mentor:** When business plan has been developed, it is important to execute it and execute it well, so during the process one should find a workplace for the business main site and also a place which suits company's needs. Where you work also does have an effect on your startup as the right environment is very important to motivate you and your team. While many founders initially choose to work from home so as to save money, however, after a good start and expansion of business a wider and suitable place is needed. Finding a mentor is also important as the right mentor will guide at a crucial time and make a huge difference in the decision that you take for your business. Right mentor can also provide deep industry insight and wisdom that will help you navigate some of the challenges that might come your way in the future.
- **Raise the capital:** For any company, capital is one of the most crucial parts of their launch and raising it is one of the hardest parts for any company. Founders thus have to look for angel investors or venture capital firms for their company and in return for their money have to show a lot of potentials and at times keep everything as collateral. While capital investment is huge for any company it also does have a dark side as a huge financial risk increases in the business. Thus, it should be decided that how much capital you need to raise for your business and how much of it should come from investors as a loan. Once you have figured this out, you should decide how you will be raising it and how you plan to give it back in the future.

In the beginning, it might take some time to get all these steps completed. So, it demands a patience and thorough knowledge of all these processes as they will help when to move ahead with the operations. Today, there are many large companies in India who were started as startups some years ago. We can look at the examples of Flipkart, Ola, Zomato, Oyo Rooms etc. to find some inspiration.

### 7.3 REGISTRATION PROCESS

The following stages are normally involved in registering a startup in India:

Start by forming your company as a private limited company, partnership, or limited liability partnership (LLP). Pick a legal framework that supports your company's objectives.

**Obtain a Unique Entity Number (UEN):** To receive government benefits, you must obtain a Unique Entity Number (UEN), which is typically available within one working day, via the government's specialized portal.

After receiving your UEN, you must self-certify that your company satisfies the requirements outlined in the startup definition. On the Startup India website, this is possible.

Create a Startup India Portal account: Register for an account on the Startup India website ([www.startupindia.gov.in](http://www.startupindia.gov.in)) and fill out the necessary information about your company.

**Receive Recognition:** The Department for Promotion of Industry and Internal Trade (DPIIT) will formally recognize your startup after reviewing and approving your application.

Benefits are available if your business is recognized as a startup, including tax breaks, access to funding opportunities, and involvement in government procurement initiatives.

### 7.4 FINANCIAL SUPPORT TO STARTUPS IN INDIA

The Indian government offers funding assistance to startups through several programmes and initiatives.

- **Startup India Fund:** The government has established a fund to give companies financial support. This is one of the main financial support vehicles. This fund provides qualifying entrepreneurs with seed money and venture capital.
- **Tax Benefits:** The Startup India initiative offers tax advantages to startups in India. For the first three years in a row, they are eligible for income tax exemptions, and then they pay lower taxes moving forward.
- **Subsidized Patent Filing:** Startups can take advantage of an 80% discount on patent filing costs and accelerated patent review through the Startup Intellectual Property Protection (SIPP) programme, which aims to promote innovation.
- The **Credit Guarantee Fund for companies (CGFS)** assists companies in obtaining loans devoid of collateral. A portion of the default risk faced by banks and other financial

institutions is covered by this fund.

- **Fund of Funds for Startups (FFS):** Venture capital funds receive funding from the FFS, and these funds then invest in new businesses. This makes it easier for businesses to get access to more money. The Indian government has launched several initiatives to support businesses financially. These initiatives are intended to promote entrepreneurship, innovation, and the expansion of startups in a variety of industries.
- **Seed Funding for Startups in India:** As part of the new India initiative, the government established a Fund of Funds with a \$10,000 crore (about \$1.3 billion) corpus to offer new companies with seed money. Through particular venture capital firms, startups can get access to this money.
- **Loans for Women and SC/ST Entrepreneurs** through Stand-Up India Stand-Up India can help startups even though its main audience is SC/ST and female entrepreneurs. The programme offers qualified entrepreneurs bank loans between 10 lakh and 1 crore to help them launch or grow their businesses.
- Startups and small businesses are eligible to apply for **MUDRA loans**, which are offered by the Micro-Units Development and Refinance Agency (MUDRA). MUDRA loans are intended to promote micro and small enterprises by providing financing options at various phases of their growth.
- The **SIDBI Funds of Funds (SFF)** are managed by the Small Industries Development Bank of India (SIDBI), which also invests in several venture capital funds, which in turn invest in start-up businesses. This method of indirect financing enables entrepreneurs to draw from a larger pool of funds.
- **Grants for research and development:** Several government departments and organizations provide grants and other financial assistance to startups working on projects related to research and development, particularly those that are of national relevance.
- **Technology Business Incubators (TBIs):** TBIs are frequently found inside academic institutions and offer funding, networking opportunities, mentorship, and infrastructure to companies, frequently in technology-intensive industries.
- **State-Specific Initiatives:** To encourage local entrepreneurship, several Indian states have also introduced their own startup regulations and incentive schemes. These initiatives come in the form of grants, subsidies, and financial incentives.
- **Export Promotion Capital Goods (EPCG) Scheme:** Under this programme, entrepreneurs can import capital equipment at no additional cost for use in pre-, during-, and after-production.
- **Competitions and challenges:** Both the public and private sectors often hold startup competitions and challenges with cash awards, grants, and other financial incentives for

original concepts and solutions.

## **7.4 TAX BENEFITS FOR STARTUPS**

These are intended to promote innovation, entrepreneurship, and corporate expansion. With the help of these tax benefits, companies' initial operating costs get lessened. The government of India offered a number of tax perks under the Startup India initiative for recognized entrepreneurs. Here are a few typical tax advantages for new businesses in India:

- A tax exemption from income

For the first ten years of their existence, startups who qualify might take advantage of an income tax exemption for three consecutive assessment years.

### **Exemption from Capital Gains Tax**

If startups invest their capital profits into certain funds or assets, they are free from long-term capital gains tax. The purpose of this exception is to promote startup investment.

- Losses are carried forward and offset

For a specific number of years, startups may carry forward and set off their losses. With the help of this clause, they are able to lower their tax obligation by offsetting losses against future profits.

- Compliance Advantages

Startups are given the option to verify their own compliance with specific labour and environmental standards, which reduces their financial and administrative obligations.

- Angel Investment Tax

According to Section 56(2)(vii)(b) of the Income Tax Act, angel investors who made investments in qualified businesses are eligible to get tax benefits. The receipt of compensation for the issuance of shares by qualified startups is free from income tax under this regulation.

- Tax deduction for investments

Under Section 80-IAC of the Income Tax Act, investors in qualifying startups may deduct 50% of their investment from their taxes.

- Lower Tax Rates

A reduced corporate tax rate that is implemented as part of more comprehensive tax reforms is advantageous for startups with a turnover of up to 50 crore rupees. This tax rate cut is intended to help small firms.

- Fast-Track Patent Review

Startups may profit from a quicker patent examination procedure that cuts down on the time and expense needed to secure patents for their inventions.

- GST Advantages

Startups are exempted from GST registration if their yearly revenue is less than 20 lakhs (\$10 lakh for special category states), which lessened their compliance burden.

- Benefits of Public Procurement

Participation in government procurement initiatives is encouraged for startups. To make it possible for startups to compete for government contracts, specific criteria and relaxations are developed. These tax breaks are created with the goal of fostering a supportive environment for new businesses, encouraging innovation, and promoting economic expansion. To ensure compliance with tax regulations and to make the most of the benefits available to them, startups must contact tax or legal specialists since qualifying requirements and specific circumstances may apply.

## 7.5 THE LEGAL DIFFERENCE BETWEEN MSME AND START-UP

The MSMED Act and the most recent DPIIT only permit partnership firms, LLPs, and corporations to have the statuses of "MSME" and "start-up," respectively. If they meet the investment thresholds outlined in the MSMED Act's definitions of MSME, they will be classified as MSMEs. MSME is defined by the MSMED Act. The DPIIT's Start-up Notification No. from 19.02.2019 governs start-up. The following summarizes the differences between start-ups and MSMEs:

Sr. No.	MSME	Start-up
1.	As described by the MSMED Act	The Department for the Promotion of Industry and Internal Trade's definition
2.	To qualify as an MSMEs, an organization must meet both the investment and turnover requirements.	The definition of a start-up only applies to businesses with annual revenues up to Rs. 100 crores.
3.	The threshold for MSME designation is measured in terms of net turnover, or turnover less exports.	Gross turnover without limiting exports is the limit for DPIIT purposes.

4.	If the investment and turnover thresholds are not exceeded, MSME status will be granted.	Start-up status shall remain for ten years from the completion of incorporation or until annual revenue exceeds Rs. 100 crores, whichever comes first.
5.	The net turnover threshold for MSME status is Rs. 250 crores.	The maximum gross turnover for Start-up Status is Rs.100 crores.
6.	The maximum investment for MSME status is 50 crores rupees. If it is, the business is no longer considered an MSME.	No maximum investment amount to qualify as a start-up
7.	As long as an organization's investment in plant, machinery, or equipment does not exceed Rs. 50 crores and its annual revenue does not exceed Rs. 250 crores, it is eligible to receive MSME status for as long as it has been in existence.	Only 10 years after the date of incorporation is the start-up status valid.
8.	The business needs to submit Udyam Registration in order to be recognized as an MSME.	The business must submit a DPIIT Recognition application to be recognized as a start-up.
9.	The business will be an MSME but not a start-up if the investment cap of 50 crores and turnover cap of 100 crores are not surpassed and ten years have passed after incorporation.	The firm will not be classified as an MSME but rather as a start-up if the investment cap of Rs. 50 crores are exceeded but the turnover cap of Rs. 100 crores are not exceeded, and ten years have not passed from the date of incorporation.
10.	MSME businesses may be structured legally in any way.	Only LLPs, private limited corporations, and partnership businesses will be qualified for start-up status.
11.	Any business model that an organization uses can qualify it as an MSME.	The business model must focus on product or service innovation, development, or improvement for it to be considered a start-up. Scalable company models with

		significant employment or wealth creation potential are required.
12.	Even if a company is created by dissolving or reassembling an already existing business, it will still qualify as an MSME.	An organization cannot be a start-up if it was created by dissolving or reorganizing an already existing company.
13.	If the issue price exceeds Fair Market Value, MSME private limited firms that are not considered start-ups are subject to angel tax on the shares they issue at a premium.	If total contributions, including those from family and friends, do not exceed Rs. 25 crores, startup private limited firms are excluded from angel tax.
14.	An MSME will not be eligible for a tax vacation unless it is a start-up, a private business or LLP, and satisfies the requirements of section 80-IAC.	A startup that is an LLP or private limited company is eligible for a tax holiday under section 80-IAC of the Income-tax Act.
15.	If the promoter's residential property is sold and the proceeds are invested in a private limited business that is an MSME but does not meet the criteria for a start-up, there is no tax exemption for the capital gains.	If the promoter's capital gains from the sale of their residential property are invested in a start-up private limited business, they are free from taxation under Section 54GB1.
16.	MSMEs are eligible for benefits under the MSMED Act. Benefits from the Startup India Scheme, however, won't be given out until the company meets the criteria for being a "startup" and receives DPIIT registration.	Start-ups are not eligible for benefits under the MSME Act until they meet the investment requirements for MSMEs and submit Udyam Registration forms.

## 7.5 SUMMARY

we can consider that a startup is a company that is in the early stages of development in order to solve real-life problems through a product or innovative service. In India, the term "startup" has gained a lot of popularity



and more and more people are showing their interest in becoming entrepreneurs. The term startup refers to a company in the first stages of operations. Startups are founded by one or more entrepreneurs who want to develop a product or service for which they believe there is demand or demand can be created. These companies generally start with high costs and limited revenue, which is why they look for capital from a variety of sources such as venture capitalists.

## **7.6 QUESTION**

### Long Answer Questions

- 1 Define the term “Startup”.
- 2 Distinguish between MSME and start up.
- 3 Elaborate the steps for the registration of a Startup.
- 4 Investigate the different financial support mechanisms of Government of India to Startups.
- 5 List the various common tax benefits for startups in India..
- 6 Discuss in detail Start up policy framework in India and underlying reasons for thriving start up milieu.
- 7 Discuss the Legal Difference Between MSME and Start-Up

### Short Answer Questions

1. State the registration process for Startup
2. Give the main feature of Prime Minister's Employment Generation Programme
3. What do you understand by Seed Funding for Startups in India?
4. State the concept of Angel Investment Tax
5. State two tax benefits for Startup

## **7.7 SUGGESTED READINGS**

- Thamizhazhagan Nallaiyan (2020), How to Grow MSMEs Fast? A Basic Initial Guide for MSMEs & Startups, Notion Press, India.
- Kamal Garg (2021), Start- Ups & MSMEs (Policies, Procedures & Finance) Bharat LawHouse Pvt. Ltd., India.
- Richard M. Hodgetts (1986), Effective Small Business Management, Academic Press Inc.
- G.S. Sudha (2023), Fundamentals of Entrepreneurship, RBD Publication, New Delhi.
- Anil Kumar, S., Poornima, S.C., Mini, K., Abraham and Jayashree, K. (2003), Entrepreneurship Development, New Age International Publishers, New Delhi.
- Gupta, C.B. (2001), Management. Theory and Practice. Sultan Chand and Sons, New Delhi.

**M.A (ECONOMICS)**  
**SEMESTER II**  
**MAEC24203T- ENTREPRENEURSHIP DEVELOPMENT**

**UNIT - VIII- CREATIVITY AND ENTREPRENEURSHIP :**

**STRUCTURE**

**8.0 Learning Objectives**

**8.1 Introduction**

## **8.2 Characteristics of Creative Entrepreneur**

## **8.3 Personality Traits of an Entrepreneur**

## **8.4 Interpersonal Skills**

## **8.5 Critical Thinking**

## **8.6 Practical Skills**

## **8.7 Business Thinking Vs Creative Thinking**

## **8.8 Creative Process**

## **8.9 Questions**

## **8.10 Suggested Readings**

## **8.0 LEARNING OBJECTIVES**

**After completing this unit, students will be able to:**

- Define : – Characteristics of Creative entrepreneur,
- Understand : Personal traits, Interpersonal skills of entrepreneur
- Define : Objectives of startup India
- Explain: Critical thinking and Practical skill of entrepreneur

## **8.1 INTRODUCTION**

Over the years, entrepreneurs have become more and more associated with creativity. So much so that when you meet an entrepreneur (especially a successful one), you automatically assume that they must have some creative and innovative qualities. But why is this assumption and association made?

Well, one of the most important requirements of a successful entrepreneur is to offer something of unique value to the marketplace and to fill a niche gap in the market. To pull this off effectively, it usually requires some levels of creativity and innovation. The ‘creative entrepreneur’ stereotype has been further cemented by eccentric, highly creative, and famous entrepreneurs such as Richard Branson, Elon Musk and the like.

In this article, we have a look at the distinct and interesting links between creativity, innovation, and entrepreneurship and why some of the most successful entrepreneurs are known for being exceptionally creative.

The difference between creativity and innovation

People often get confused about the difference between creativity and innovation and use the terms synonymously.

Creativity can be defined as the ability to develop original concepts and ideas. Aesthetic flair is an important factor when it comes to creativity.

Innovation is the ability to create offshoots, create changes to, or build on already existing ideas, services, and products.

Essentially, creative concepts are usually new and original that take inspiration from outside sources, while innovative concepts are usually built upon a pre existing idea. Inventions would be ideas, products or concepts that are entirely new and never seen before. They represent a leap in forward-thinking and, often, technology.

Entrepreneurs and creativity

Creativity helps entrepreneurs with one of the most important steps in their business journey: coming up with a business idea. Entrepreneurs with high levels of creativity are often able to come up with exceptionally creative business ideas that fill a niche gap in the market.

Entrepreneurial creativity and artistic creativity are very similar in that entrepreneurs may find inspiration from their favourite books, TV shows, nature, conversations, as well as existing products and services. Brainstorming and mind mapping are the two main methods in which entrepreneurs may use creativity to come up with ideas (coming up with ideas is also known as ideation).

But creativity does not only assist entrepreneurs in the initial stages of coming up with a business idea. Creativity will also be highly valuable in terms of:

Coming up with branding and marketing ideas

Ideas for blogs, other SEO-related content

Finding creative solutions to everyday business problems

Fun and exciting social media strategies

A good balance of linear and lateral thinking

Does an entrepreneur need to possess high levels of creativity to be successful? Of course not, but it definitely helps! Creativity is all around us, and when you start noticing it, it is hard not to be inspired! Creativity can be found in fine art, nature, advertisements, and so much more.

But remember, creativity is practically useless if it is not properly harnessed and implemented.

Entrepreneurs and innovation

Innovation is a change that adds value to an existing idea, product, service or concept. Many business ideas are innovations of things that already exist. There should be a focus on the 'adding value' of innovation because just because you change up an existing product or business model slightly does not mean that you are creating a better version of it in order for innovations to be successful.

Innovation is often a response to changes in the market as well as progressions in outside markets. It should be noted that all innovations are purely creative, and many can be primarily logical in their conception.

Having a good hold on innovation is very important for entrepreneurs. We live in a fast-paced and ever-changing society, with new advances in technology occurring all the time. If an entrepreneur can embrace these changes and find ways to add additional value to them, they are bound to find success in their respective field.

Not only will an innovative mindset be advantageous in coming up with products, services, and business ideas, it will also be exceptionally helpful when it comes to adapting to change and finding new and improved ways of doing things in your business structure.

Disruptive innovation should also be mentioned. Disruptive innovation is a process of innovation that significantly affects the market by making a certain product more accessible and affordable to more consumers and has the ability to reshape an entire industry. A great example of this would be Uber.

Can creativity and innovation be cultivated?

Some people believe that you are either born with creative and innovative tendencies...or not. What is more likely is that your creativity levels are developed in your formative years, depending on what activities you were exposed to as a young child. In adulthood, most adults clearly define themselves as either being very creative or not creative at all.

The truth is that even those who do not deem themselves to be creative have dormant creativity lying inside of them. This creativity can be awakened through simple activities such as drawing, creative writing, mind mapping, reading fiction, and more. There are even apps that you can download on your phone that help cultivate your creativity.

Aspiring entrepreneurs that feel that they are not inherently creative could find immense value in dedicating time to expanding their creativity.

More than just creativity and innovation

While innovation and creativity play a big role in the potential success of an entrepreneur, entrepreneurs also need to possess somewhat opposing skills such as organisation, analytical mindset, attention to detail, etc. An entrepreneur cannot only be a dreamer. They need to have the practical skills to bring their dreams and great ideas to life.

What many creatives lack is a sense of direction, as well as a hard work ethic. They can often be somewhat lazy and procrastinate when it comes to putting ideas into motion.

On top of personal skills, they'll also need to gain knowledge on how the economy works, be aware of their competition and know about the regulations surrounding starting up a business. Only then will they know which ideas can be implemented successfully.

## **8.2 CHARACTERISTICS OF CREATIVE ENTREPRENEUR**

For the last seven years, much of my day-to-day work has focused on helping entrepreneurs get ideas out of their heads and onto paper so they can turn those ideas into dream businesses. Along the way, I've learned a lot about the personality traits that are essential if you want to make a living from something that starts with a single thought.

We entrepreneurs are not like other people. We are a special breed. We are dedicated to our ideas and obsessed with bringing them to fruition. Setbacks and failures can be hard blows to us because the course we've chosen is so personal. These aren't someone else's ideas we are trying to make happen; these are our best ideas and strategies. When they don't work, we have to recover quickly and find ways to put positive spins on what we've just learned. We constantly think and talk about how to improve our craft or make our product or service just a little bit better. Because of this, we can be impossible company for our partners and friends.

Entrepreneurs make important contributions to our society. For example, we are narrowing the gender gap in leadership roles. For every 10 men who start their own businesses, seven women are doing the same. We're evading the glass ceiling by designing our own buildings. Plus, most entrepreneurs start businesses to pursue their goals, not because of financial necessity. This tells me we have more opportunities to be happier. In fact, entrepreneurs are more likely to describe their lives as "excellent" and "close to ideal." Working for yourself is so much better than working for someone else's goals, isn't it?

If you're not already one of us, you may be dreaming of the life you'll have when you finally become an entrepreneur. But first you need to consider if you have what it takes to make your great idea a viable business.

Here are the Top 10 Characteristics of a Successful Entrepreneur:

Passion and drive to turn ideas into success stories.

A "big picture" view. Entrepreneurs want to change the world, or at the very least make an ordinary thing so much better. We clearly see how our products or services influence the ways people interact/live/play. This is the fuel we drive on.

Ability to take hard hits. The road to success is littered with small, medium, and large failures. (Some of which can be very costly.) We must shake off failures and emerge stronger.

Refusal to quit. If it's not this, then we find something different. Entrepreneurs keep looking, adjusting, and fine-tuning. There must be a way to bring an idea this good to market—and we will make it happen.

Good dose of narcissism. We carry the belief that we are the only right person to do this and our idea is simply better than anything else out there.

Desire to work hard. Contrary to what most people think, being an entrepreneur involves hard work and long hours. Even the best idea needs a solid business structure, a logical implementation, and constant tweaking.

Courage to take risks. It takes money to fund an idea, often from our own savings or from generous family and friends. There is no risk-free start-up. Entrepreneurs have the courage to overcome their fears on a daily basis.

Ability to think of the business as its own entity. This is a hard one! All business owners I know feel about their businesses as if they are children. But, you need to take a step back. Aside from love, constant affirmation, and attention, we also have to run it with discipline.

Willingness to learn. Nobody can know everything. Successful entrepreneurs go to conferences, take classes, and read books not just about their own fields but also about business and self-improvement. They continuously want to learn how to run their businesses better.

Contagious optimism. As entrepreneurs, we focus on 'how we can make it work' instead of 'can we make this work?' We see the payoff of our ideas and we make our businesses our priority.

1. They constantly look for patterns.

It's called Apophenia: the ability to perceive meaningful patterns within random data. It is a pronounced trait among innovative thinkers. Intentionally looking for patterns and drawing connections will allow you to spot potentials for innovations. The ability to "predict" or foresee a problem is highly valuable. Great innovators can see the subtle thread that produces the outlier.

2. They're brilliantly lazy.

Bill Gates said, "I choose a lazy person to do a hard job. Because a lazy person will find an easy way to do it." Gates could substitute "a lazy person" with "an innovative person." Innovators will indeed find the best and easiest route to get a project done. It boils down to efficiency. Innovators live by the saying, "Work smart, not hard." They don't just strive to create the best product, but also the best process.

3. They're obsessive note-takers.

Your conscious mind (working memory) can only process small chunks of information at a time. With a cacophony of streaming ideas, great innovators are incessant note takers. Thomas Edison left 3,500 notebooks behind at his death.

When Richard Branson revealed a key business tool, it wasn't a complicated gadget, but an old fashioned notepad. He's always seeking feedback from flight passengers and cabin crew and using that information to innovate.

Your million-dollar idea can come from anywhere; while you're waiting for your coffee or getting groceries. Keep a compendium of your ideas, it'll be your trail leading to gold.

#### 4. They preach perfection, but practice progress.

Perfectionism is seen as the bad guy. It can be crippling, but discarding it opens the door for mediocrity. Great innovators still fervently preach perfection, yet they live in the reality of progress. It's a healthy pendulum-swing between the two. They strive for the ideal and get work done in the real. Millionaire trader, Timothy Sykes says to "aim for perfection, but keep firing to make progress."

#### 5. They're allied with their fear.

Described as a "quirky creative genius," founder of Kidrobot and Ello, Paul Budnitz says the key to innovation is changing your relationship with fear:

"Every one of my successful ventures has faced bankruptcy, come close to losing key employees, or just collapsed along the way. But by welcoming fear you get the benefit of what being afraid brings -- heightened awareness, compassion for others you are working with, and an unbreakable commitment to survive at all costs."

Fear can enable progress and innovation. When the feeling of fear arises, rather than a fight/flight response, embrace it as an advantageous adrenaline rush.

#### 6. They don't wait for things to break.

You've heard the adage, "Why fix it if it ain't broke?" Great innovators don't wait for things to break; they're constantly fixing and iterating. CEO of Selfie Stick Gear Alynah Patel says the key to staying ahead and being a pioneer in your business is to live by the mantra, "It can always be better."

Rather than wait for a problem and then provide a solution, great innovators find ways to ensure the problem will never even exist.

Related: Innovation Can Happen in Small But Meaningful Ways

#### 7. They understand the creative process.

Preparation, Incubation, Illumination, Implementation. Those are the four classic stages of the creative process. One of the most crucial stages, just before the eureka moment is "Incubation." Great innovators find novel ways to nurture this stage of creativity; taking long showers, going for a walk in nature, doing yoga headstands.

Incubation requires mental disengagement. It allows for the unconscious process of synthesizing all the information you've consciously encountered. The conscious detachment results in a "marination" of ideas and then solutions coming "out of the blue."



8. They pursue multiple streams.

Elon Musk has Tesla and Solar City. Mark Cuban has too many to name, on top of the Mavericks. It's more than just maximizing income, a hallmark of great innovators is nurturing multiple interests. Just like the creative process, alternative interests overlap and feed off each other. Having multiple projects breaks the psychological-bottleneck and pressure of succeeding in one single venture. It will also expand your breadth of knowledge and overall business acumen.

9. They possess a healthy arrogance.

It may come across as arrogance, but successful entrepreneurs and great innovators are highly confident. When Gallup studied entrepreneurial talent they found that people with high confidence performed better in stressful situations. When others see risk, highly confident and innovative entrepreneurs see opportunity; when others see roadblocks and potential failure, they see victory.

CEO of National Pearl, Emma Schrage says, "A key part of innovation is implementation -- it's not the first to come up with the idea, but the first to produce it." Having a healthy arrogance helped her take action in a saturated field, and against more "competent" competition.

10. They embrace paradoxical thinking.

Great innovators do not see the world in black and white. While many people come to "either/or" conclusions, they strive to see "both/and." When cell phones only made calls, and music devices only played music, innovators overlooked these conventional boundaries.

F. Scott Fitzgerald, the great American novelist said it best, "The test of a first-rate intelligence is the ability to hold two opposing ideas in mind at the same time and still retain the ability to function."

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### **8.3 PERSONALITY TRAITS OF AN ENTREPRENEUR**

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There are many factors that can contribute to the success of an entrepreneur as they launch, operate, and scale their business. These factors can include the timing of their business launch, how competitive their market is, the reliability of their supply chain, the amount of capital they are able to obtain, and the current economic climate.

In addition to these elements, there are a number of traits successful entrepreneurs have in common that contribute to their business success. Let's dive into what they are.

Successful Entrepreneur Personality Traits

Discipline

Creativity

Self-Awareness

Resourcefulness

Process-Oriented

Empathetic

Communicative

Self-Motivated

Confident

Flexible

Risk-Taker

Resilient

## "1. Discipline

Starting and operating a business is no easy feat. Unlike a traditional job where you often have upper-level management driving business objectives and keeping you accountable, being an entrepreneur requires the ability to hold yourself accountable when you don't have a "boss" to do so.

Those who are able to create and execute plans even without external factors holding them accountable have a competitive edge in business. When an entrepreneur has self-discipline they are able to manage the urge to procrastinate and can take decisive action when needed.

Three-time entrepreneur Bill Aulet recognizes that focus and discipline are critical for startup success, and it's even the focus of his book, *Disciplined Entrepreneurship*. He goes so far as to say that, "It is disciplined execution that makes people successful entrepreneurs." His book outlines a 24-step framework for bringing products to market. The rigorous (but fun) methodology comes from Aulet's experience building startups, raising capital, and creating value from shareholders.

## 2. Creativity

Though creativity is often associated with artistic output, it is an important trait for all entrepreneurs to have. Creativity doesn't only apply to visual elements or branding. Entrepreneurs who are able to creatively solve problems and think outside of the box when facing everyday business challenges, they are able to quickly pivot and implement necessary solutions that lead to business growth.

Inspired by a financial guru and the high cost of sweets in her area, Mignon Francois went from "household manager" to founder and CEO. "I got the idea of having a bake sale everyday while listening to a financial guru on the radio. I was a household manager of 6+1 (aka stay at home mom) and I really couldn't afford the luxury of taking my children out for sweets because everything was expensive and we were struggling. Once I started to get my recipes together I would practice all day."

Originally, she didn't even know how to bake, relying on her daughters and grandmother for help. However, her hard work and ingenuity turned a condemned home into a full-blown bakery and a creative endeavor into a ten-million-dollar business.

### 3. Self-Awareness

Entrepreneurs who have a sense of self-awareness that they are able to apply professionally to achieve business success. When an entrepreneur is self-aware they are able to own up to their strengths and weaknesses related to running their business.

With this awareness, they are able to zero in on the tasks and elements of running the business they can excel in and are more willing to delegate the areas they are not as strong in. Another benefit of being self-aware is that it increases one's ability to give, receive, and apply meaningful feedback.

Gary Vaynerchuk, lifelong entrepreneur and social thought leader, says that self-awareness is a trait he wishes the business world paid more attention to, more so than hustle or smarts.

"Self-awareness at its finest is accepting your shortcomings and accentuating your strengths."

In his blog post on the topic, he says that the moment you decide to do so, "things will change."

### 4. Resourcefulness

Many entrepreneurs are faced with tasks and challenges they have never faced before. The ability to be resourceful is a mindset that helps entrepreneurs reach lofty goals without a clear way to achieve them.

When entrepreneurs are able to work resourcefully, they can effectively problem-solve and grow and scale their businesses without having all of the answers or resources to do so. Being resourceful requires a can-do attitude and willingness to work creatively to effectively manage a business without having the immediate know-how.

Mark Cuban — entrepreneur and investor — says that entrepreneurs must have a "willingness to outwork and outlearn everyone." While having access to money and resources can make a difference, a key part of being an entrepreneur is cultivating those resources yourself. "There are no shortcuts, you have to work hard and try to put yourself in a position where, if luck strikes, you can see the opportunity and take advantage of it."

### 5. Process-Oriented

Having solid processes in place is essential for any successful entrepreneur. In the world of business, a process is a repeatable series of steps that help those working within a business to complete necessary tasks. Processes can apply to various aspects of the business including sales, onboarding new team members, production, and product fulfillment.

When business owners have a process-oriented mindset, they are able to work smarter, not harder. Implementing processes in various areas of the business can prevent waste, allowing business owners to scale and grow their businesses. Additionally, when business owners have repeatable processes in place, they are able to easily train new team members to fulfill important aspects of the business without sacrificing time or quality.

Masaaki Imai, management consultant and founder of the Kaizen Institute Consulting Group, says this about processes and systems: "The message of the Kaizen strategy is that not a day should go by without some kind of improvement being made somewhere in the company."

He is, of course, referring to a principle called Kaizen that champions the guiding philosophy of "continual improvement" often applied in lean business and productivity processes. Kaizen's impact can be found in the snowball effect that incremental changes to process can make, and it has been practiced throughout the world — most notably at Toyota as part of the Toyota Way Fieldbook and at Trader Joe's as one of the company's core values.

## 6. Empathetic

Empathy is an essential trait for entrepreneurs. Whether a business owner manages a large team of employees or works directly with their customers as a high-performing solopreneur, they must be able to connect with others on a genuine level.

Successful entrepreneurs are able to put themselves in others' shoes, considering the perspectives of their employees and customers as they navigate key business decisions. In business, empathy can look like anticipating your customer's needs, empowering your team members to take time off to recharge when they need it, and giving both employees and customers space to voice their opinions and concerns.

Business owners who have the soft skills necessary to connect with others, they may experience benefits such as increased customer loyalty, more customer referrals, and increased employee productivity.

Dharmesh Shah, co-founder of HubSpot, considers empathy such an important core value that he modified the organization's Culture Code to include it. "Not too long ago, I found a bug in our Culture Code that needed fixing. We use the acronym HEART to describe qualities we value in our coworkers. For years, these qualities were: Humble, Effective, Adaptable, Remarkable, and Transparent. But something wasn't right. HEART did not clearly capture one of the values that I think is fundamental and part of our core at HubSpot. That value is: empathy."

## 7. Communicative

According to research from Wroclaw University, the top three communication skills for leaders are effective listening, getting a message across clearly and vividly, and providing feedback in a supportive manner.

These skills can put entrepreneurs at a competitive advantage. When a business owner is able to effectively listen to their customer, they are able to implement customer feedback that can help them improve their offerings. Additionally, when business leaders exhibit these skills with their own employees and team members, they are able to build trust which can improve productivity and business performance.

Communication is a big part of Simon Sinek's message to business leaders. In fact, Sinek's TED talk *Start With Why* covers the topic and is one of the most popular to date. "Communication is not about speaking what we think. Communication is about ensuring others hear what we mean." According to Sinek, this is a vital part of leadership.

## 8. Self-Motivated

Simply put, when you're your own boss you have to be able to keep yourself motivated to work effectively and consistently. Entrepreneurs must be able to work through creative ruts and points of feeling uninspired to keep their businesses going. This starts with knowing what drives you to keep going and drawing upon necessary inspiration when motivation is low.

A great example of this is entrepreneur Noëlle Santos, who didn't intend to open a book store — she worked in HR for an IT firm — but was shaken by the news that the Barnes & Noble she frequented was closing.

The joy of reading was important to her, so she had to do something. "I was disgusted knowing that there was just one bookstore at the time. So that petition galvanized the property owners and Barnes & Noble and the politicians, they came to an agreement that they would extend the lease two years. So in my mind, I was like, 'Okay, that means I have two years to open a bookstore.' I took responsibility for it."

Dedicated to her mission, she even worked at other bookstores for free over the course of two and a half years to learn the industry. From there, Santos fundraised and energized a community behind The Lit. Bar, bringing a bookstore back to the Bronx. The lesson here being that grit has to be inspired by something.

## 9. Confident

If you have an idea you want to bring to life and share with others, you have to have the confidence to see it through. Whether you are introducing a new product to market, or are seeking outside funding for your business, you must be able to speak to what you offer clearly and confidently. Successful entrepreneurs stand behind their ideas without letting concern over what others may think get in the way.

In an article on women entrepreneurs in tech, Monica Eaton-Cardone emphasizes the importance of confidence, even in the face of failure. "We fail our way to success. It means you had the courage to try and there's no way you can get to success without confronting failures." To Eaton-Cardone, failure isn't an obstacle for confidence, especially when it's so important for entrepreneurs to market themselves. Instead failure can become strength.

She encountered such failure herself on her journey to revolutionize solutions in payment processing, and such obstacles nearly caused her business to crumble. On her website, she says, "Instead of folding up shop, I decided to dig myself out of this pit ... I built an entire program based on every trial and error lesson I had learned — and it worked. Before long, the very same banks that had tried to shut down my business were calling and asking for my assistance."

#### 10. Flexible

To have a sustainable business and see long-term success, entrepreneurs must be willing to pivot when necessary. Whether it is reformulating a product to make it better, or revising a business strategy to remain competitive, entrepreneurs who are too rigid and afraid to embrace change are at a disadvantage.

When an entrepreneur is flexible in their approach, they are able to take advantage of new opportunities as they come which can pay off in the long run. Business owners who are slow to adapt to change can miss out on valuable opportunities to innovate and adapt to their customer's needs.

The lesson of flexibility is one that entrepreneur Hyungsoo Kim learned during the development of Eone's first product, a tactile wristwatch for the visually impaired. The first iteration of the watch relied on braille, didn't have a strong visually aesthetic appeal, and wasn't functional for non-visually impaired individuals.

During a focus group meeting, Kim and his team found out that their customers wanted a product that would be attractive and inclusive even for those who didn't have a visual impairment. This was something the design team hadn't considered, and they had to go back to the drawing board.

"After that meeting, our concept prototype literally went into the trash bin. We were building something that we thought they wanted based out of common misconceptions and stereotypes." However, this lesson influenced their brand and its values. "We changed our name to Eone which is short for Everyone." Read more about their pivot [here](#).

#### 11. Risk-Taker

The ability to take a calculated risk is one of the most valuable skills an entrepreneur can have. When business owners are willing to take risks, they are able to learn valuable lessons in business that can help their company in the long run.

Taking risks also helps businesses find new ways to differentiate themselves from the competition, which is especially helpful in saturated markets. In the event the risk doesn't have the intended result, the entrepreneur can still apply the valuable lessons learned to future business decisions.

Microsoft's Bill Gates is credited with the quote, "To win big, you sometimes have to take big risks." Gates certainly took risks throughout the history of Microsoft, but perhaps his most notable risk was leaving Harvard during his sophomore year in 1975 to found the company. His vision was "a computer on every desk and in every home," which was something no one could have conceived of at the time. The risk he took to make that vision a reality paid off, and Microsoft is worth more than a Harvard degree.

## 12. Resilient

"Last but certainly not least, successful entrepreneurs must have a sense of resiliency. While running a business, it is common for entrepreneurs to face closed doors and to be told "no" often from potential customers and those they are seeking funding from. Many entrepreneurs may find themselves starting multiple businesses if their initial idea doesn't take off. According to the Bureau of Labor Statistics, nearly half of small businesses fail within the first four years. Some successful business owners may find their first few business ideas weren't sustainable in the long run but can apply those learnings to new businesses. Whether an entrepreneur isn't granted a sale or opportunity or has to start at square one, being resilient and inventive in the face of challenges is a must. Kimberly Bryant, founder and CEO of Black Girls Code, encountered adversity along her career path as a Black woman in electrical engineering and biotechnology. It was when her daughter shared her interests in math and science that Bryant became a champion for STEM education for young girls of color. She founded her organization, Black Girls Code, and was originally met with opposition. In an interview with Shondaland, Bryant details how "People did not want to fund something called Black Girls Code (BGC) — they would try to get us to change our name. Even the few organizations that were doing something similar didn't take us seriously." These roadblocks didn't stop her, and she funded the organization with her own 401k. With perseverance and resilience, the organization gained steam and became a voice for social activism. These traits along with a vision for what you want to accomplish are paramount to your success as an entrepreneur. Once you internalize your drive, you can then begin putting goals to paper and build out concrete action items to realize them

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## 8.4 INTERPERSONAL SKILLS

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Entrepreneurship is all about networking and sharing and it cannot exist as a one-man show. Therefore, interpersonal skills are just as valuable as personal ones to make a good entrepreneur. However, there are researchers who argue that some entrepreneurs function better by themselves and it is true that the online environment as a business environment allows for indirect relations. Considering these instances, generally, entrepreneurship relies on communication and good people skills.

### a) Four essential people skills of an entrepreneur

There are countless lists of people skills to possess as an entrepreneur. However, some four key elements are always taken into account:

1. Empathy - you need to be able to understand a client, a team member or a potential investor if you are going to interact with them in a productive way and if you want to convince, sell and gain trust. Therefore, being empathic is essential when building your network. Try to put yourself in the other person's shoes and anticipate their needs, wishes and concerns in order to deliver the best product, solution, service or business proposal. People need to know that you will answer their wishes, resonate with them, and not get the feeling that they are forced into something they didn't agree to.
2. Good listener skills - being a good listener also means being an active one, so listen carefully and show people you understand their point of view, even if you don't agree with them. This will take a little more effort than just hearing what the other person says, but it is worthwhile. Keep in mind that the most important part in learning is listening.
3. Leadership skills - good leadership is what transforms a group of people in a team oriented towards a common goal. It can make or break the entrepreneurial pursuit. The most successful entrepreneurs out there are also the most inspirational people and true leaders. The difference between a boss and a leader is that a leader inspires his team to be dedicated, he shares the success, creates a family like atmosphere and can communicate accurately a vision so that others can understand and adhere to it.
4. Persuasive and inspiring - being persuasive is all about good storytelling, so instead of selling things to people, try to tell the story. In order to act, people need to feel inspired. The secret to persuading people is to tell an effective story with an engaging introduction and a compelling narrative. Closely related to persuasion, inspiration is a step above it. When you persuade someone, all you are doing is convincing them to share your beliefs and ideals.



Inspiration, however, means that you are persuading a group of people not just to align their beliefs with yours, but you're also persuading them to take action based on these beliefs.

#### b) How to improve your people skills

As with most endeavours, optimising your people skills is a simple task and it will provide you with great feedback in your everyday life, and also in your business relations. The changes you need to make in order to become more sociable are pretty intuitive and you would not guess they have such a significant impact. Simply acknowledging the others and focusing on them rather than always thinking about yourself can modify their reaction to you and the way you feel about yourself.

This next action is elementary, but often overlooked: do not be aggressive in your tone, choice of words, body language and actions, because no one wants to converse with an aggressive person.

Learn positive body language: smile, keep your hands in sight, nod when people speak, point your feet and body directly towards them, since this shows interest and openness; don't cross your arms, don't tap your foot or fingers for a conversation to end, don't gaze into the distance; stay away from your wristwatch and phone.

Being an entrepreneur sometimes feel like you are spinning ten dinner plates on ten sticks without letting any fall. It takes a lot of concentration, consistency, and broken plates to do it perfectly.

Any person that follows the entrepreneurial path needs to master various skills in marketing, sales, bookkeeping, finance, management, leadership, and much more at the same time. No matter if you excel in all these, if you're a poor communicator you'll face difficulties. Poor communication is the falling plate that can ruin the entire performance.

#### The importance of interpersonal skills

The most valuable advice that you can find when asking how to get things done and achieve your goals is to establish good and strong relationships with all the people around you or that you will meet during your path. If you're doing something focused on others, you can't achieve it without collaborating with other people like you that share the same goals. It is crucial that all relationships are in place when you are working toward a goal or when you're part of a team.

#### Good speaker, attentive listener

Among many other skills, effective communication requires the ability to be a good speaker and listener at the same time. These two skills are key to effective working relationships between you and other people and they impact your relationship with the customer or. You

need to listen carefully, to keep eye contact, and to ask questions in order to make sure that you understood things correctly.

In the meantime, you need to be able to communicate your ideas, plans, and expectations correctly and in a simple way, in order that everyone understands you. Good communication skills verbal and non-verbal result in more productive brainstorming processes.

Good manners

The fast pace of tech development requires that we meet new people not only in person. It is common to contact someone stranger by email or to have a video chat.

Good manners and etiquette are essential in business interaction both for the people that you know better and with perfect strangers that can become perfect business partners. What to consider.

Try to be punctual

Dress appropriately

Be kind and smile

Show interest in what to other persons are saying, be there physically and mentally

Don't be rude and don't interrupt

Empathize

Remember to use good manners with everyone, be humble no matter what's your title or position, and always show respect. These will help you in keeping strong relationships, to make decisions, to negotiate, to make people around you feel good, and what's most important to reach your goal within the set deadline.

If you need to learn more entrepreneurial skills, take the free training courses offered by the Entrepreneurship Campus.

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## **8.5 CRITICAL THINKING**

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Critical Thinking Defined

Critical thinking means making reasoned judgments that are logical and well-thought out. It is a way of thinking in which you don't simply accept all arguments and conclusions you are exposed to but rather have an attitude involving questioning such arguments and conclusions. It requires wanting to see what evidence is involved to support a particular argument or conclusion. People who use critical thinking are the ones who say things such as, 'How do you know that? Is this conclusion based on evidence or gut feelings?' and 'Are there alternative possibilities when given new pieces of information?'

In essence, critical thinking requires you to use your ability to reason. It is about being an active learner rather than a passive recipient of information.

Critical thinkers rigorously question ideas and assumptions rather than accepting them at face value. They will always seek to determine whether the ideas, arguments and findings represent the entire picture and are open to finding that they do not.

Critical thinkers will identify, analyse and solve problems systematically rather than by intuition or instinct.

Someone with critical thinking skills can:

Understand the links between ideas.

Determine the importance and relevance of arguments and ideas.

Recognise, build and appraise arguments.

Identify inconsistencies and errors in reasoning.

Approach problems in a consistent and systematic way.

Reflect on the justification of their own assumptions, beliefs and values.

Critical thinking is thinking about things in certain ways so as to arrive at the best possible solution in the circumstances that the thinker is aware of. In more everyday language, it is a way of thinking about whatever is presently occupying your mind so that you come to the best possible conclusion.

Additionally, critical thinking can be divided into the following three core skills:

Curiosity is the desire to learn more information and seek evidence as well as being open to new ideas.

Skepticism involves having a healthy questioning attitude about new information that you are exposed to and not blindly believing everything everyone tells you.

Finally, humility is the ability to admit that your opinions and ideas are wrong when faced with new convincing evidence that states otherwise.

Critical thinking should become a second-nature skill for leaders and employees across your organization.

Critical thinking in the workplace ensures objective and efficient problem-solving; it's essential for your business's success.

When teams employ critical thinking, they gain enhanced analytical competency, communication, emotional intelligence and general problem-solving skills.

Patently teach critical thinking in the workplace until it becomes a second-nature skill for employees across your organization.

This article is for small business owners and managers who want to improve critical thinking in their companies to enhance problem-solving and reduce costly mistakes.

Many professionals hope to pursue careers they're passionate about so they can find joy and meaning in their work. Caring deeply about your work is vital for engagement and productivity, but balancing emotions with critical thinking is essential in the workplace.

When employees engage in critical thinking, they use an independent, reflective thought process to evaluate issues and solve problems based on knowledge and objective evidence.

Critical thinking skills can guide your organization toward success, but to truly maximize the problem-solving benefits of critical thinking, it's crucial to teach this skill to your entire team.

We'll explore critical thinking skills and how to teach them in the workplace to help your business improve its decision-making and problem-solving.

What is critical thinking?

Jen Lawrence, co-author of *Engage the Fox: A Business Fable About Thinking Critically and Motivating Your Team*, defines critical thinking as “the ability to solve problems effectively by systematically gathering information about an issue, generating further ideas involving a variety of perspectives, evaluating the information using logic, and making sure everyone involved is on board.”

This is a complex definition for a challenging concept. Though critical thinking might seem as straightforward as stepping back and using a formal thinking process instead of reacting instinctively to conflicts or problems, it is actually a much more challenging task.

Critical thinking's ultimate goal is ensuring you have the best answer to a problem with maximum buy-in from all parties involved – an outcome that will ultimately save your business time, money and stress.

Why is critical thinking essential in the workplace?

A World Economic Forum report revealed that critical thinking is one of the most in-demand career skills employers seek when trying to attract and retain the best employees – and employers believe critical thinking skills will become even more necessary in the coming years.

Critical thinking in the workplace guarantees objective and efficient problem-solving, ultimately reducing costly errors and ensuring that your organization's resources are used wisely. Team members employing critical thinking can connect ideas, spot errors and inconsistencies, and make the best decisions most often.

Employees with critical thinking are also more likely to accomplish the following:

Analyzing information

Thinking outside the box

Coming up with creative solutions to sudden problems

Devising thought-through, systematic plans

Requiring less supervision

Did you know?Did you know?: Critical thinkers are sure about the reasoning behind their decisions, allowing them to communicate with employees clearly. This level of communication enhances employee engagement.

What are critical thinking skills?

Critical thinking is a soft skill that comprises multiple interpersonal and analytical abilities and attributes. Here are some essential critical thinking skills that can support workforce success.

Observation: Employees with critical thinking can easily sense and identify an existing problem – and even predict potential issues – based on their experience and sharp perception. They're willing to embrace multiple points of view and look at the big picture.

Analytical thinking: Analytical thinkers collect data from multiple sources, reject bias, and ask thoughtful questions. When approaching a problem, they gather and double-check facts, assess independent research, and sift through information to determine what's accurate and what can help resolve the problem.

Open-mindedness: Employees who demonstrate critical thinking are open-minded – not afraid to consider opinions and information that differ from their beliefs and assumptions. They listen to colleagues; they can let go of personal biases and recognize that a problem's solution can come from unexpected sources.

Problem-solving attitude: Critical thinkers possess a positive attitude toward problem-solving and look for optimal solutions to issues they've identified and analyzed. They are usually proactive and willing to offer suggestions based on all the information they receive.

Communication: When managers make a decision, they must share it with the rest of the team and other stakeholders. Critical thinkers demonstrate excellent communication skills and can provide supporting arguments and evidence that substantiate the decision to ensure the entire team is on the same page.

What are the benefits of critical thinking in the workplace?

Many workplaces operate at a frantic tempo that reinforces hasty thinking and rushed business decisions, resulting in costly mistakes and blunders. When employees are trained in critical thinking, they learn to slow the pace and gather crucial information before making decisions.

Along with reducing costly errors, critical thinking in the workplace brings the following benefits:

Critical thinking improves communication. When employees think more clearly and aren't swayed by emotion, they communicate better. "If you can think more clearly and better articulate your positions, you can better engage in discussions and make a much more

meaningful contribution in your job,” said David Welton, managing partner at Grove Critical Thinking.

Critical thinking boosts emotional intelligence. It might seem counterintuitive to associate analytical rationality with emotional intelligence. However, team members who possess critical thinking skills are less prone to rash, emotion-driven decisions. Instead, they take time to analyze the situation and make the most informed decision while being mindful and respectful of the emotional and ethical implications.

Critical thinking encourages creativity. Critical thinkers are open to new ideas and perspectives and accumulate a significant amount of information when facing decisions. Because of this, they’re more likely to come up with creative solutions. They are also curious and don’t shy away from asking open-ended questions.

Critical thinking saves time and money. By encouraging critical thinking in the workplace, you minimize the need for supervision, catch potential problems early, promote independence and initiative, and free managers to focus on other duties. All this helps your company save valuable time and resources.

Did you know?Did you know?: Critical thinking skills are essential for dealing with difficult customers because they help your team make informed decisions while managing stressful situations.

How do you teach critical thinking in the workplace?

Experts agree that critical thinking is a teachable skill. Both Lawrence and Welton recommend exploring critical thinking training programs and methods to improve your workplace’s critical thinking proficiency. Here’s a breakdown of how to teach critical thinking in the workplace:

Identify problem areas. Executives and managers should assess workplace areas most lacking in critical thinking. If mistakes are consistently made, determine whether the issue is a lack of critical thinking or an inherent issue with a team or process. After identifying areas that lack critical thinking, research the type of training best suited to your organization.

Start small. Employees newly embracing critical thinking might have trouble tackling large issues immediately. Instead, present them with smaller challenges. “Start practicing critical thinking as a skill with smaller problems as examples, and then work your way up to larger problems,” Lawrence said.

Act preemptively. Teaching and implementing critical thinking training and methodology takes time and patience. Lawrence emphasized that critical thinking skills are best acquired during a time of calm. It might feel urgent to seek critical thinking during a crisis, but critical thinking is a challenging skill to learn amid panic and stress. Critical thinking training is best done

preemptively so that when a crisis hits, employees will be prepared and critical thinking will come naturally.

Allow sufficient time. From a managerial perspective, giving employees extra time on projects or problems might feel stressful in the middle of deadlines and executive pressures. But if you want those working for you to engage in critical thinking processes, it's imperative to give them ample time. Allowing employees sufficient time to work through their critical thinking process can save the company time and money in the long run.

How do you identify successful critical thinking?

Successful critical thinking happens during a crisis, not after.

Lawrence provided an example involving restaurants and waitstaff: If a customer has a bad experience at a restaurant, a server using critical thinking skills will be more likely to figure out a solution to save the interaction, such as offering a free appetizer or discount. "This can save the hard-earned customer relationship you spent a lot of marketing dollars to create," Lawrence said. This concept is applicable across many business and organizational structures.

You should also be aware of signs of a lack of critical thinking. Lawrence pointed out that companies that change strategy rapidly, moving from one thing to the next, are likely not engaging in critical thinking. This is also the case at companies that seem to have good ideas but have trouble executing them.

As with many issues in business, company leadership determines how the rest of the organization acts. If leaders have excellent ideas but don't follow critical thinking processes, their team will not buy into those ideas, and the company will suffer. This is why critical thinking skills often accompany positive communication skills.

"Critical thinking doesn't just help you arrive at the best answer, but at a solution most people embrace," Lawrence said. Modeling critical thinking at the top will help the skill trickle down to the rest of the organization, no matter your company's type or size.

Critical thinking is the key to your business success

When critical thinking is actively implemented in an organization, mistakes are minimized, and operations run more seamlessly.

With training, time and patience, critical thinking can become a second-nature skill for employees at all levels of experience and seniority. The money, time and conflict you'll save in the long run are worth the extra effort of implementing critical thinking in your workplace.

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## **8.6 PRACTICAL SKILLS**

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While becoming a successful entrepreneur is natural for some, others require certain essential skills to start and lead a business to success. These skills determine your entrepreneurial

success. Successful entrepreneurs have mastery over both hard and soft skills. Hard skills like accounting, marketing and financial planning are critical for running and managing a business and soft skills like communication, problem-solving and decision making help you scale up your business. Mastery of entrepreneur skills requires practice and a dedicated learning plan.

Below are practical business skills you should acquire as an entrepreneur:

1. Marketing: A lot of people see marketing as selling which is wrong. Selling is only a part of marketing. Marketing is all things done by a business from the idea of a need in the market to get a product that meets that need to the final consumer.

On a very basic level marketing is basically providing the right product at the right place, with the right promotional methods at the right price.

Learning to manage your marketing well will boost your business a lot. It's going to help people see your business/product the way you intend for them too.

Me writing this I won't lie to you it's marketing on my own personal brand. I want you to know and see me as a business expert.

So, learn the marketing principles and tactics that align with your business then formulate a good strategy with them.

2. Risk management: Over 80% (this is even conservative; I actually think it's more than 80%) of new businesses do not manage risk properly. This skill in business is what separates the pros from the armatures.

Why do you think those executives at the big corporations are paid well? You think it's just because they can motivate alone

If I ask you "What is your total business risk? And what have you done to reduce/remove it?" most of you can't answer this question and it's a pity.

Now, in business, there are several types of risks, which I'm not going to share in this article go and do your own research.

Learning to manage your risk or business exposure can save you from a lot of disasters like sudden fire, exchange rate depreciation, price of raw material sky rocking, etc.

3. Accounting: Most "entrepreneurs" overlook proper accounting which is very bad. You need good accounting to even know if you are making money or not and even what your business is actually worth.

Most new businesses will say nobody wants to lend them money, when I hear this I laugh because I know why most won't get funding from investors. Most have no proper accounting record from which investors can actually analyze their businesses.

Proper accounting will benefit you a lot. If you are not yet carrying it out, please start now there are a lot of benefits doing so.



4. Strategic management: There is a saying “Strategy without tactics is the slowest route to success, while tactics without strategy are the noise before the fall”.

Most businesses do not have a clear-cut strategy (a combination of tactics) on how they intend to achieve their goals giving the current business environment they find themselves.

Learning strategic management will help you formulate cutting edge strategies to help you reach your business goals like the pros.

5. Human/People management: Businesses revolve all-around people, I know you might say my business is B2B (Business to business) or even B2C (Business to consumer). The truth is both deals with people. People run the business that buys your product, we are all in the business of P2P (People to People).

Learning proper human management skills will help your business a lot. It will help you interact with your employees and customers in the proper and right way to help you achieve your business goals.

If you don’t interact with your employees or customers in the right way it can cost you a lot in business.

6. Research and analytics: I don’t know of any successful company that does not have what is called a “Research & Development” department. They may have another fancy name they call it but It’s the core of business development.

Learning to do proper research can give you an edge in business. Learn skills like data analysis and data presentation, these are some of my best business skills.

When you make business decisions from a well-studied matter you have a better chance of success than the guys who just gamble their way in business.

7. Fundraising: Yes, I think this is a skill every entrepreneur needs to have. Learn all you can about fundraising either as equity or debt.

Your business needs more money but you don’t know how to go about it? It’s a skill, learn it.

There is money everywhere looking for a fertile ground where it can be planted to grow

8. BONUS SKILL (Business Law): I’m not saying you should go and train to be a lawyer but at least have a good legal understanding of your business environment.

I hope you take this seriously. I know most of you may have thought I will say you should go and learn, digital marketing, graphic design or even coding and the likes. Well, all those are good skills but they are not business fundamental skills.

When you have the fundamentals, you have a solid foundation where your coding, digital marketing, graphic design skills, etc. can stand.

If you can’t learn these skills, hire or partner with people that have them. It’s not “waste of time”, it’s what separates pros from armatures.

### Networking skills

Networking involves building and managing relationship with other professionals to grow and promote a business. Effective networking skills open up future opportunities and help build a solid brand. Networking allows entrepreneurs to meet like-minded professionals, build future teams and stay up-to-date with industry trends. It is one of the most desirable skills for entrepreneurs because, through a solid network, they can meet professionals to fund their ideas, access professional business expertise and get feedback on their new venture or idea.

### Critical thinking skills

Critical thinking is an entrepreneur skill that objectively analyses the information and draws a rational conclusion. It helps entrepreneurs assess a situation and come up with a logical solution. Employers look for candidates with critical thinking because it helps solve problems and build strategies for business growth. Usually, a critical thinker is independent, competent and reflective. This skill helps entrepreneurs logically connect ideas, scrutinise information, evaluate arguments, find inconsistencies in work and solve complex issues. Instead of memorising information, such candidates use the information to deduce meaningful insights.

### Customer service skills

Quality customer service promotes the brand and increases loyalty. Regardless of the industry, excellent customer service skills are essential for business success. From talking to clients to discussing funding opportunities, customer service skills help entrepreneurs connect with their potential customers.

### Financial skills

The ability to handle resources, assess investments, calculate ROI is a must for entrepreneurs. Apart from this, they must know how to use accounting and budgeting software to keep track of all the financial processes. By learning financial skills, entrepreneurs avoid overspending and optimally allocate resources.

### Leadership skills

Being able to inspire colleagues, empower the workforce and lead from the front requires excellent leadership skills. Exemplary leaders lead by examples and can take a leadership role and work as a part of a team. Entrepreneurs with leadership skills motivate their employees, manage operations and delegate tasks to reach the business goal.

### Time management and organisational skills

Effective time management increases productivity and organises your workspace. Entrepreneurs with time management and organisational skills understand different ways to prioritise tasks and avoid procrastination. For ensuring timely completion of projects, entrepreneurs analyse their and their team's time, set time limit for each task, complete priority

tasks first, delegate work to others, create a to-do list and use technology to keep the workspace organised.

### Technical skills

Technical skills are hard skills that are gained by using digital tools and software. Entrepreneurs must know how to use planning, marketing and budgeting software. Knowledge of software helps in managing projects, tracking sales and allocating a viable budget for the project.

### **How to improve entrepreneur skills**

Mastery of these entrepreneur skills can help you outperform at your job and steer your business to success. To improve your skills, you may read books, take a course or attend seminars. Here are some steps you must follow to improve your entrepreneur skills:

#### 1. Read business books

Reading books encourages self-improvement and is an excellent way to get advice on effective business strategies. It improves your cognitive ability, increases your decision-making and you get to learn from the failure of others. Therefore, read books to achieve success as an entrepreneur.

#### 2. Enrol in a course

Another way to sharpen your skill set is by enrolling in a management, marketing or finance course. Taking and completing a professional course may help boost your business management and financial planning skills.

#### 3. Attend workshops

Always attend entrepreneurial workshops and networking events. Many of these workshops may have experienced business owners as speakers. It helps fill the knowledge gap and you may gain valuable insights on how to run your business to success. Such workshops are a great way to build networks and talk with industry leaders.

#### 4. Listen to podcasts

One of the best ways to consume business-related information on a busy day is listening to a podcast of successful entrepreneurs. Listening to business podcasts may give you insights into how different entrepreneurs use technology to speed up their business growth. It also improves your listening skills.

#### 5. Hire an experienced business mentor

Experienced mentors can help you develop the skills that you are lacking. You can either work under a successful business owner for some time to understand how to manage a business. You can also meet up regularly with a professional group of like-minded people and discuss

different ways of building and marketing a brand. Mentors help in providing valuable insights and professional advice that is necessary for success.

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## **8.7 BUSINESS THINKING VS CREATIVE THINKING**

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Business Thinking is a process of deconstructing the common factors that affect decision-making — organizational understanding, politics, leadership, culture, and change — to construct new patterns of trust, confidence, and empowerment. It's applying the principles of design, business, and, most importantly, behavior change, to the challenges designers face in being heard; gaps in understanding, silos and politics, lack of leadership, and organizational culture.

At its core, it's a process to develop and demonstrate the ability to understand and respond to different business situations well. I've been developing this process as a way to help individual designers, teams, and organizations gain the strategic impact they seek by better understanding and navigating the politics, cultures, and organizational factors that go into making decisions.

Designers who are applying business thinking are increasing their influence and impact. They are speaking with dialects that are valued, they are perceived as equals at the leadership table, and they are maturing their organizations as a whole, not just design. These designers are pulling together what's desirable for diverse, cross-functional teams with what is operationally feasible and culturally viable for the company. The effects can be felt in multiple ways:

At an individual level, business thinking provides new tools to address the vast range of organizational challenges and career opportunities that designers face.

At an organizational level, business thinking provides executives the clarity they need for the risks, consequences, and opportunities in trade-off decisions.

At the team level, business thinking provides alternate ways for product managers, developers, and designers to develop the competitive advantages executive leaders and customers expect.

At all levels, it's about delivering outcomes that individuals, teams, and organizations can align to rather than relying on the status quo.

The process starts with taking the initiative to understand your colleagues and your company. After doing so, reflecting on what's working (or isn't) and remixing your approach becomes much more manageable. It's about embracing simple shifts in your mindset and tackling decision-making problems in a better way.

### **Creative Thinking**

Creative thinking is the ability to consider something in a new way. Employers in all industries want employees who can think creatively and bring new perspectives to the workplace.<sup>1</sup>

Creative thinking can involve:

A new approach to a problem

A resolution to a conflict between employees

A new result from a data set

A previously untried approach to earn revenue

A new product—or product feature

Creative thinking means thinking outside the box. Often, creativity involves lateral thinking, which is the ability to perceive patterns that are not obvious.

Creative thinking might mean devising new ways to carry out tasks, solve problems, and meet challenges. It means bringing a fresh, and sometimes unorthodox, perspective to your work. This way of thinking can help departments and organizations be more productive.

### Types of Creative Thinking

Creative thinking is expressed in several ways. Here are some types of creative thinking you might see in the workplace.

#### Analysis

Before thinking creatively about something, you first have to be able to understand it. This requires the ability to examine things carefully to know what they mean. Whether you are looking at a text, a data set, a lesson plan, or an equation, you need to be able to analyze it first.

#### Open-Mindedness

To think creatively, set aside any assumptions or biases you may have, and look at things in a completely new way. By coming to a problem with an open mind, you allow yourself the chance to think creatively.

#### Problem-Solving

Employers want creative employees who will help them to solve work-related issues. When faced with a problem, consider ways that you can solve it before asking for help. If you need the input of a manager, suggest solutions rather than just presenting problems.

#### Organization

This might seem counterintuitive: Aren't creative people known for being somewhat disorganized? Actually, organization is an essential part of creativity. While you might need to get a bit messy when trying out a new idea, you need to organize your ideas so others will understand and follow through with your vision.

#### Communication

People will only appreciate your creative idea or solution if you communicate it effectively. You need to have strong written and oral communication skills.

### Benefits of Creative Thinking

Employers want creative thinkers because it benefits their bottom line. Companies that foster creativity may see more revenue growth.<sup>3</sup> Positioning yourself as a creative thinker can make you a more appealing job candidate or leader within your current organization.

### How to Showcase Your Creative Thinking Skills

When you're applying for a job, think about how your creative nature has helped you in the past and how it might be an asset in the job you're seeking.

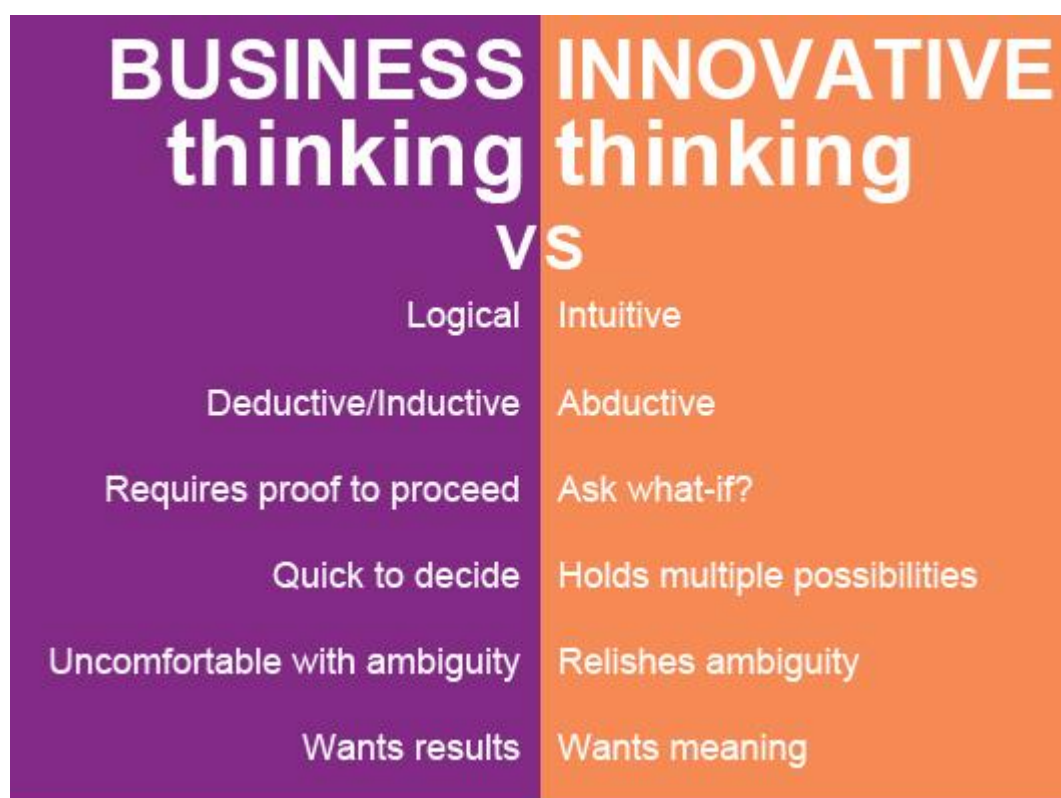
Here's how to showcase your creative thinking throughout the application process.

**Add Keywords:** In your resume and cover letter, consider including keywords that demonstrate your creativity. For instance, you might try "problem-solving."

**Give examples:** In your cover letter, include one or two specific examples of times your creative thinking added value to your employer. Perhaps you came up with a creative way to save your department money, or maybe you developed a new filing system that increased efficiency.

**Tell stories:** Come to your interview prepared with examples of how you've demonstrated your creativity. This is especially important if the job description lists creativity or creative thinking as a requirement.

If you're looking for creative opportunities as a means of personal fulfillment, you can find satisfaction in surprising places. Any job that allows you to put your own spin on your work will end up being.



**Fig :8.1 Business VS Innovative thinking**

## **Creative Process**

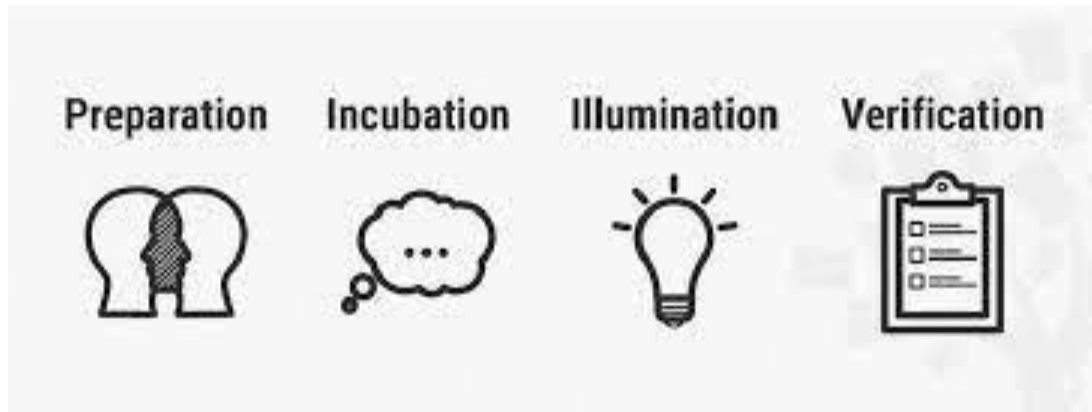
This is also a controlled thinking in which the creative thinker whether artist, writer or a scientist is trying to create something new. It involves characteristics of both reasoning and imagination. Creative thinking is a process in which the individual generates an original, unusual and productive solution to a problem.

It is defined as personal, imaginative thinking which produces a new, novel and useful solution. Unlike ordinary solution to problems, creative solutions are the new one to the effect that other people have not thought before.

The product of creative thinking may be a new and unique way of conceptualizing the world around us. The emphasis in creative thinking is on the word 'new'. In human beings we find two kinds of productive abilities – the convergent and divergent abilities.

Convergent abilities are used to bring together otherwise divergent things. Divergent production abilities are those which are not guided by rules or conventions, but capable of generating new solutions to a problem. Divergent production abilities are particularly important in creative thinking.

**Creative thinking involves four stages:**



**Fig :8.2 Creative thinking involves four stages**

### **1. Preparation:**

In this stage the thinker formulates the problem and collects the facts and materials considered necessary for finding new solutions. Many times the problem cannot be solved even after days, weeks or months of concentrated efforts. Failing to solve the problem, the thinker turns away from it initiating next stage.

### **2. Incubation:**

During this period some of the ideas that were interfering with the solution will tend to fade. The overt activity and sometimes even thinking about the problem is absent in this stage. But the unconscious thought process involved in creative thinking is at work during this period.

Apparently the thinker will be busy in other activities like reading literature or playing games, etc. In spite of these activities the contemplation about finding a solution to problem will be going on in the mind.

### 3. Illumination:

Following the period of incubation the creative ideas occur suddenly. Consequently the obscure thing becomes clear. This sudden flash of solution is known as illumination and is similar to 'aha (eureka)' experience. For example, Archimedes found solution to the crown problem.

### 4. Verification:

Though the solution is found in illumination stage, it is necessary to verify whether that solution is correct or not. Hence in this last stage evaluation of the solution is done. If the solution is not satisfactory the thinker will go back to creative process from the beginning.

If it is satisfactory, the same will be accepted and if necessary, minor modification may also be made in solution.

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## 8.8 CREATIVE PROCESS

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Although every creative person approaches their work differently, there are five stages that the majority of artists unconsciously move through as they work on their projects. Each of the five stages of the creative process logically leads to the following stage. Release your thoughts as you begin your own creative process, letting your concepts develop through the five stages of creativity.

1. Preparation Stage: The initial phase of the creative process entails preparation and idea development. This is the time to acquire information and carry out study that might lead to a creative thought. To encourage divergent thinking, brainstorm and allow your thoughts roam. You can also write in a notebook. This will help you think of all the different ways you could develop your concept. Your brain is using its memory bank at the initial stage of the process to draw from past knowledge and experiences to come up with new ideas.

2. Incubation Stage: The second stage is where you let go of your idea after you have finished actively thinking about it. Taking a break from your idea before you settle down to develop it is a crucial part of creative thinking. Even if you focus on anything else or take a vacation from the creative process, you are not actively striving to develop your idea. Even while giving up on your concept could seem counterproductive, it's a crucial step in the process. Your tale, song, or issue is developing in the background of your thoughts throughout this period.



3. Illumination Stage: The "aha" moment, also known as illumination, occurs at the stage of insight. The epiphany occurs when impromptu new connections are made, and all of the information you've acquired comes together to reveal the answer to your issue. The solution to your creative quest hits you in the third stage. For instance, you can get beyond writer's block by deciding how your story will end. An idea has arisen after the incubation stage, which may surprise you.

4. Evaluation stage: In this phase, you examine the viability of your proposition and compare it to alternatives. This is also a period of contemplation during which you consider your original thought or issue to determine whether your chosen solution is consistent with it. To determine whether the concept is viable, business professionals may do market research. During this stage, you might start over or you might press on, assured in what you've thought of.

Stage 5: Verification The creative process comes to a close at this point. The challenging labour takes place then. Any thing or object that you set out to make, such as a physical object, an advertisement campaign, a song, a novel, or an architectural design, might be considered your creative product.

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## **8.9 QUESTIONS**

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### **A. Descriptive Questions**

#### **Long Answer Questions**

1. Explain the relationship between entrepreneurs and creativity
2. Elaborate on the characteristics of creative entrepreneur
3. Explain any five personality traits of entrepreneur
4. Why critical thinking is important for an entrepreneur
5. Explain the various stages involved in creative process

#### **Short Answer Questions**

1. Explain the concept Entrepreneurs and innovation
2. Explain the role of self motivation in entrepreneurship
3. Elaborate the role of ethics and empathy in entrepreneurship
4. How to improve entrepreneur skills
5. Explain the concept of Business thinking and creative thinking

### **B. Multiple Choice Question**

1. \_\_\_\_\_helps entrepreneurs with one of the most important steps in their business journey: coming up with a business idea
  - a. Creativity
  - b. Managerial skill
  - c. Critical thinking
  - d. Practical skills
2. \_\_\_\_\_is a process of deconstructing the common factors that affect decision-making.
  - a. Business Thinking
  - b. Critical thinking
  - c. Creative thinking
  - d. Entrepreneurial skills
3. The Startup India initiative was announced by Hon'ble Prime Minister of India on \_\_\_\_\_
  - a. 15th August, 2015.
  - b. 15th August, 2016.
  - c. 15th August, 2019.
  - d. 15th August, 2020.
4. An \_\_\_\_\_ is a person who is self – employed, is willing to take a calculated risk and brings in a new idea to start a business.
  - a. Entrepreneur
  - b. Governor
  - c. Minister
  - d. Agent
5. In Swot analysis S stands for
  - a. Survey
  - b. Service
  - c. Strength
  - d. Stories

**Answers**

1-a, 2-b, 3- a, 4-a, 5-c

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**8.10 SUGGESTED READINGS**

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Kotter, J. (1996). Leading Change: An Action Plan from The World's Foremost Expert on Business Leadership.

Mariota, S., & Towel, T. (2010). *Entrepreneurship: Owning your future*. Prentice Hall.

Hirsch, R. D., Peters, M. P., & Shepherd, D. A. (2012). *Entrepreneurship*. McGraw-Hill Education.

Ashton, K. (2016). *How to Fly a Horse: The Secret History of Creation, Invention, and Discovery*. Anchor.

Klein, A. (2020). *Steal Like an Artist: 10 Things Nobody Told You About Being Creative*. Adams Media.



**The Motto of Our University  
(SEWA)**

**SKILL ENHANCEMENT**

**EMPLOYABILITY**

**WISDOM**

**ACCESSIBILITY**

**JAGAT GURU NANAK DEV**

**PUNJAB STATE OPEN UNIVERSITY, PATIALA**

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

**MASTER OF ARTS**

**CORE COURSE (CC): ECONOMICS**

**SEMESTER- II**

**MAEC24204T -QUANTITATIVE METHODS**

Head Quarter: C/28, The Lower Mall, Patiala-147001

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Website: [www.psou.ac.in](http://www.psou.ac.in)

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**JAGAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY, PATIALA**

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

## **PREFACE**

Jagat Guru Nanak Dev Punjab State Open University, Patiala was established in December 2019 by Act 19 of the Legislature of State of Punjab. It is the first and only Open University of the State, entrusted with the responsibility of making higher education accessible to all, especially to those sections of society who do not have the means, time or opportunity to pursue regular education.

In keeping with the nature of an Open University, this University provides a flexible education system to suit every need. The time given to complete a programme is double the duration of a regular mode programme. Well-designed study material has been prepared in consultation with experts in their respective fields.

The University offers programmes which have been designed to provide relevant, skill-based and employability-enhancing education. The study material provided in this booklet is self-instructional, with self-assessment exercises, and recommendations for further readings. The syllabus has been divided in sections, and provided as units for simplification.

The University has a network of 100 Learner Support Centres/Study Centres, to enable students to make use of reading facilities, and for curriculum-based counselling and practicals. We, at the University, welcome you to be a part of this institution of knowledge.

Prof. G.S  
Batra Dean Academic  
Affair

**M.A (ECONOMICS)**

**(MAEC24204T) QUANTITATIVE METHODS II**

**SEMESTER -II**

**MAX. MARKS:100**

**EXTERNAL:70**

**INTERNAL:30**

**PASS:40%**

**CREDITS:6**

**OBJECTIVE:**

**INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER:**

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions each from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any 10 questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
5. The duration of each paper will be three hours.

**INSTRUCTIONS FOR THE CANDIDATES:**

Candidates are required to attempt any two questions each from the sections A, and B of the question paper, and any ten short answer questions from Section C. They have to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.



## **Section - A**

**Unit 1: Measures of Central Tendency:** Mean, Median, Mode

**Unit 2:** Dispersion - Objectives and significance of Good Measures, Measures of Dispersion - Range, Quartile Deviation, Mean Deviation and Standard Deviation (ungrouped data). Unit 2: Co-efficient of variation (CV), Lorenz Curve

**Unit 3: Correlation Analysis:** Karl Pearson's (excluding grouped data) and Spearman's rank formula

**Unit 4: Simple Regression Analysis:** regression meaning, properties, X on Y and Y on X

## **Section - B**

**Unit 5:** Meaning of Hypothesis, Characteristics of Hypothesis, Basic Concepts, Hypothesis Testing Procedures (Steps), Introduction to parametric and non-parametric tests.

**Unit 6:** Sampling distributions of a Statistics- Small Sample test or student-t test and its applications: t-test for single mean, difference of means, Paired t-test

**Unit 7:** Large Sample test: Introduction, Sampling of Attributes- test for Single Proportion, test for difference in proportion and F-test

**Unit 8:** Interpolation and Extrapolation.

### **Suggested Readings:**

- A.M Goon, M.K Gupta and B. Dasgupta, fundamental of statistics Vol-I, World Press Calcutta
- Anderson, D.R.; Sweeney, D.J. and Williams, T.A., —Statistics for Business and Economics, 2<sup>nd</sup> edition (2011), Thompson, New Delhi.
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**GAT GURU NANAK DEV PUNJAB STATE OPEN UNIVERSITY,  
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**M.A (ECONOMICS)**

**SEMESTER -II**

**MAEC24204T: QUANTITATIVE METHODS II**

**COURSE COORDINATOR AND EDITOR: DR. KULDEEP WALIA**

**SECTION A**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
Unit 1	<b>Measures of Central Tendency:</b> Mean, Median, Mode
Unit 2	Dispersion - Objectives and significance of Good Measures, Measures of Dispersion - Range, Quartile Deviation, Mean Deviation and Standard Deviation (ungrouped data). Unit 2: Co-efficient of variation (CV), Lorenz Curve
Unit 3	<b>Correlation Analysis:</b> Karl Pearson's (excluding grouped data) and Spearman's rank formula
Unit 4	<b>Simple Regression Analysis:</b> regression meaning, properties, X on Y and Y on X

**SECTION B**

<b>UNIT NO:</b>	<b>UNIT NAME</b>
Unit 5	Meaning of Hypothesis, Characteristics of Hypothesis, Basic Concepts, Hypothesis Testing Procedures (Steps), Introduction to parametric and non-parametric tests.
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Unit 8	Interpolation and Extrapolation.

**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 1: MEASURES OF CENTRAL TENDENCY: MEAN, MEDIAN, MODE**

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**STRUCTURE**

**1.0 Objectives**

**1.1 Introduction**

**1.2 Meaning of Average or Central Tendency**

**1.3 Objectives and Functions of Average**

**1.4 Requisites or Features of Good Average**

**1.5 Measures of Central Tendency**

**1.6 Arithmetic Mean**

**1.6.1 Arithmetic Mean in Individual Series**

**1.6.2 Arithmetic Mean in discrete series**

**1.6.3 Arithmetic Mean in continuous series**

**1.6.4 Arithmetic Mean in Cumulative Frequency Series**

**1.6.5 Arithmetic Mean in Unequal Series**

**1.6.6 Combined Arithmetic Mean**

**1.6.7 Correcting Incorrect Arithmetic Mean**

**1.6.8 Properties of Arithmetic Mean**

**1.6.10 Limitations of Arithmetic Mean**

**1.7 Median**

**1.7.1 Median in Individual Series**

**1.7.2 Median in Discrete Series**

**1.7.3 Median in Continuous Series**

**1.7.5 Limitations of Median**

**1.8 Mode**

**1.8.1 Mode in Individual Series**

**1.8.2 Mode in Discrete Series**

### **1.8.3 Mode in Continuous Series**

### **1.8.5 Limitations of Mode**

## **1.9 Relation between Mean, Median and Mode**

### **1.10 Other Positional Measures**

### **1.11 Sum Up**

### **1.12 Key Terms**

### **1.13 Questions for Practice**

### **1.14 Further Readings**

## **1.0 Objectives**

After studying the Unit, students will be able to:

- Meaning of Averages.
- Features of good measure of Average.
- Find different types of Averages for various types of data.
- Understand the relation that exists between different types of Averages.

## **1.1 Introduction**

We can say that the modern age is the age of Statistics. There is no field in modern life in which statistics is not used. Whether it is Business, Economics or Education. In government Planning or any other field of our life, statistics is used everywhere. Business managers use statistics for business decision-making, Economists use statistics for economic planning, Investors use statistics for future forecasting and so on. Many techniques in statistics help us for all these purposes. Average or Central Tendency is one such technique that is widely used in statistics. This technique is used almost in every walk of life.

## **1.2 Meaning Of Average Or Central Tendency**

Average or Central tendency is the most used tool of statistics. This is the tool without which statistics is incomplete. In simple words, we can say that the Average is the single value that is capable of representing its series. It is the value around which other values in the series move. We can define Average as the single typical value of the series which represents the whole data of the series. "An average is a single value within the range of data that is used to represent all values in the series. Since an average is somewhere within the range of the data, it is also called a measure of Central Value" -

**Croton and Cowden**

### 1.3 Objectives And Functions Of Average

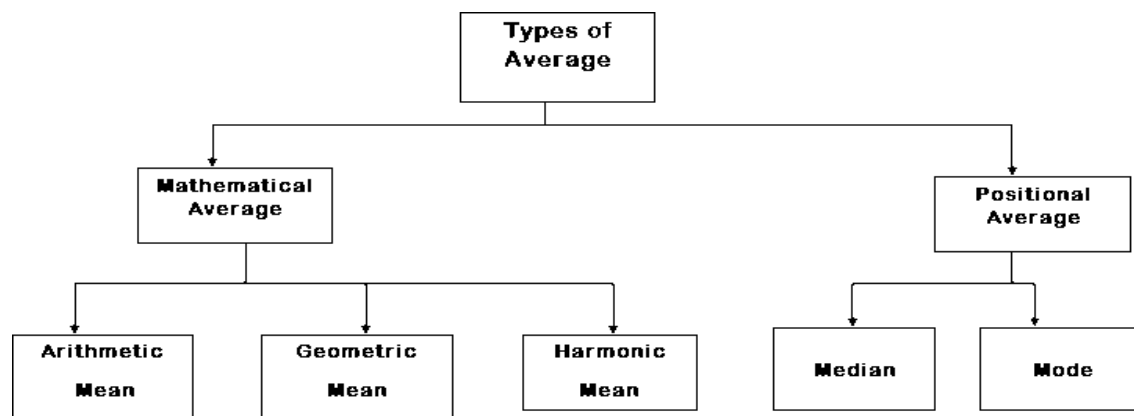
1. **Single Value Representing Whole Data:** In statistics data can be shown with the help of tables and diagrams. But sometimes the data is very large and it is not easy to present in a table or graph. So, we want to represent that data in summarised form. Average helps us to represent data in summarised form. For example, the data on the national income of India is very large but when we calculate per capita income it gives us an idea of the national income.
2. **To Help in Comparison:** In case we want to compare two different series of data, it is very difficult to compare. There are many difficulties like many items in the series may be different. In such cases, the average helps us in making the comparison. For example, if we want to compare the income of people living in different countries like India and Pakistan, we can do so by calculating per capita income which is a form of average.
3. **Conclude the Universe from Sample:** This is one of the important functions of average. If we take the average of a sample, we can draw certain conclusions about the universe from such an Average. For example, mean of a sample is representative of its universe.
4. **Base on other Statistical Methods:** Many Statistical Techniques are based on average. If we don't know the average, we cannot apply those techniques. For example, Dispersion, Skewness, Index Number are based on average.
5. **Base of Decision Making:** Whenever we have to make a certain decision, average plays a very crucial role in the decision making. From the average we could have an idea about the data and based on that information, we can make a decision. For example, a company can decide on its sales based on average yearly sales of the past few years.
6. **Precise Relationship:** Average helps us to find out if there is a precise relation between two variables or two items. It also removes the biases of the person making the analysis. For example, if you say that Rajesh is more intelligent than Ravi it is only our observation and does not make any precise relation. If we compare the average marks of both the students, we could have a precise relation.
7. **Helpful in Policy Formulation:** The average helps the government formulate the policy. Whenever the government has to formulate economic policy it considers various averages like per capita income, average growth rate, etc.

### 1.4 Requisite / Features Of Good Average

1. **Rigidly Defined:** A good measure of average is having a clear-cut definition and no confusion in the mind of a person who is calculating the average. If a person applies his discretion while calculating the average, we cannot say that the average is a good measure.
2. **Easy to Compute:** Good averages do not involve much calculation and are easy to compute. A good average can be calculated even by a person having less knowledge of Statistics. If it is very difficult to calculate the average, we cannot regard it as a good measure.
3. **Based on all Observations:** A good average must consider all the values or data that is available in the series. If the average is based on only a few observations of the series, we cannot say that it is a good measure of the average.
4. **Not affected by Extreme Values:** A good measure of average is not affected by the extreme values present in the Data. Sometimes data contains values that are not within normal limits, these values are called extreme values. If average is affected by these extreme values, we cannot claim that the average is a good measure.
5. **Representative of whole Series:** A good measure of average represents characteristics of a whole series of data.
6. **Easy to Understand:** A good measure of average is not only easy to understand but also easy to interpret.
7. **Not Affected by Fluctuations in the Sampling:** If we take one sample from the universe and calculate average, then we draw another sample from the same universe and calculate the average again, there must not be much difference between these two averages. If the average significantly changes with the change in the sample, we cannot treat it as a good measure of average.

### 1.5 Measures Of Central Tendency

There are many methods through which we can calculate average or central tendency. We can divide these methods into two categories that are Algebraic Method and the Positional Average. Algebraic methods are those in which the value of average depends upon the mathematical formula used in the average. The mathematical average can further be divided into three categories that are Arithmetic Mean, Geometric Mean and Harmonic Mean. On the other hand, positional averages are those averages that are not based on the mathematical formula used in the calculation of average rather these depend upon the position of the variable in the series. As these depend upon the position of the variable, these averages are not affected by the extreme values in the data. The following chart shows different types of averages.



## 1.6 Arithmetic Mean

It is the most popular and most common measure of average. It is so popular that for a common man the two terms Arithmetic Mean and Average are the same thing. However, in reality, these two terms are not same and the arithmetic mean is just one measure of the average. We can define the arithmetic mean as:

—The value obtained by dividing the sum of observations by the number of observations.

So arithmetic mean is very easy to calculate, what we have to do is just add up the value of all the items given in the data and then we have to divide that total by the number of items in the data. The arithmetic mean is represented by a symbol A. M. or  $\bar{x}$ .

### 1.6.1 Arithmetic Mean in Case of Individual Series

Individual series are those series in which all the items of the data are listed individually. There are two methods of finding arithmetic mean in the individual series. These two methods are the Direct method and Shortcut Method.

**1. Direct Method** According to this method calculation of mean is very simple and as discussed above, we have to just add the items and then divide it by number of items. Following are the steps in the calculation of mean by the direct method:

1. Suppose our various items of the data are  $X_1, X_2, X_3, \dots, X_n$
2. Add all the values of the series and find  $\sum X$ .
3. Find out the number of items in the series denoted by  $n$ .
4. Calculate the arithmetic mean by dividing sum value of observation by the number of observations using the following formula:

$$\bar{x} = \frac{X_1 + X_2 + X_3 + \dots + X_n}{N} = \frac{\sum X}{N}$$

Where  $\bar{x}$  = Mean,  $N$  = Number of items,  $\sum X$  = Sum of observation

**Example 1. The daily income of 10 families is as given below (in rupees):**

130, 141, 147, 154, 123, 134, 137, 151, 153, 147

**Find the arithmetic mean by direct method.**

**Solution:** Computation of Arithmetic Mean

Serial No.	Daily Income (in Rs.) X
1	130
2	141
3	147
4	154
5	123
6	134
7	137
8	151
9	153
10	147
N = 10	$\sum X = 1417$

$$\text{A. M., } \bar{x} = \frac{X_1 + X_2 + X_3 + \dots + X_N}{N} = \frac{\sum X}{N} = \frac{1417}{10} = \text{Rs. } 141.7$$

**2. Short Cut Method:** Normally this method is used when the value of items is very large and it is difficult to make calculations. Under this method, we take one value as mean which is known as assumed mean and deviations are calculated from this as you mean. This method is also known as assumed mean method. Following are the steps of this method:

1. Suppose our various items of the data are  $X_1, X_2, X_3, \dots, X_n$
2. Take any value as assumed mean represented by 'A'. This value may be any value among data or any other value even if that is not presented in data.
3. Find out deviations of items from assumed mean. For that deduct an Assumed value from each value of the data. These deviations are represented as 'dx'
4. Find the sum of the deviations represented by  $\sum dx$ .
5. Find out the number of items in the series denoted by n.
6. Calculate the arithmetic mean dividing sum deviations of the observation with the number of observations using the following formula:

$$\bar{x} = A + \frac{\sum dx}{N}$$

Where  $\bar{x}$  = Mean, A = Assumed Mean, N = Number of items,  $\sum dx$  = Sum of deviations



**Example 2. Calculate A. M. by short - cut method for the following data**

R. No.	1	2	3	4	5	6	7	8	9	10
Marks	50	60	65	88	68	70	83	45	53	58

**Solution:** Let assumed Mean (A) be 60

R. No.	Marks (X)	dx = X – A
1	50	-10
2	60	0
3	65	5
4	88	28
5	68	8
6	70	10
7	83	23
8	45	-15
9	53	-7
10	58	-2
N=10		$\sum dx=40$

As  $\bar{X} = A + \frac{\sum dx}{N}$

$\Rightarrow \bar{X} = 60 + \frac{40}{10} = 60 + 4$

$\Rightarrow \bar{X} = 64$  Marks

**1.6.2 Arithmetic Mean in case of Discrete Series**

In individual series if any value is repeated that is shown repeatedly in the series. It makes series lengthy and makes calculation difficult. In case of discrete series, instead of repeatedly showing the items we just group those items and the number of times that item is repeated is shown as frequency. In the case of discrete series, we can calculate Arithmetic mean. By using Direct Method and Shortcut Method.

**1. Direct Method:** In indirect method we multiply the value of items (X) with their respective frequency (f) to find out the product item (fX). Then we take up sum of the product and divide it with the number of items. Following are the steps

1. Multiply the value of items (X) with their respective frequency (f) to find out the the product item (fX)
2. Add up the product so calculated to find  $\sum fX$ .
3. Find out the number of items in the series denoted by n.

4. Calculate arithmetic mean dividing sum of the product by the number of observations using following formula:

$$\bar{x} = \frac{\sum fX}{N}$$

Where  $\bar{x}$  = Mean, N = Number of items,  $\sum fX$  = Sum of product of observations.

**Example 3. Find the average income**

Daily Income (in rupees)	200	500	600	750	800
No. of Workers	2	1	4	2	1

**Solution:**

Daily Income (Rs.) X	No. of Workers f	Product fX
200	2	400
500	1	500
600	4	2400
750	2	1500
800	1	800
	$\sum f = 10$	$\sum fX = 5600$

$$\therefore \text{Average Income } \bar{x} = \frac{\sum fX}{\sum f} = \frac{5600}{10} = \text{Rs. } 560$$

- 2. Short Cut Method:** Under this method, we take one value as mean which is known as assumed mean and deviations are calculated from this as you mean. Then average is calculated using assumed mean. Following are the steps of this method:

1. Suppose our items of the data are  $X$  and its corresponding frequency is  $f$ .
2. Take any value as assumed mean represented by  $A$ .
3. Find out deviations of items from assumed mean. For that deduct an Assumed value from each value of the data. These deviations are represented as  $dx$ .
4. Multiply the values of  $dx$  with the corresponding frequency to find out product denoted by  $fdx$ .
5. Find sum of the product so calculated represented by  $\sum fdx$ .
6. Find out the number of items in the series denoted by  $n$ .
7. Calculate arithmetic mean dividing sum deviations of the observation with the number of observations using following formula:

$$\bar{x} = A + \frac{\sum fdx}{N}$$

Where  $\bar{x}$  = Mean, A = Assumed Mean, N = Number of items

$\sum fdx$  = Sum of product of deviation with frequency.

**Example 4. From the following data find out the mean height of the students.**

Height (in cms.)	14	15	16	17	18	19	20	21	22	23
No. of Students										

**Solution:** Let the Assumed Mean (A) be 150

Height in cms. X	No. of students f	dX = (X – A) = X – 150	fdX
154	1	4	4
155	6	5	30
156	10	6	60
157	22	7	154
158	21	8	168
159	17	9	153
160	14	10	140
161	5	11	55
162	3	12	36
163	1	13	13
	$\Sigma f = 100$		$\Sigma fdX = 813$

Applying the formula

$$\bar{x} = A + \frac{\Sigma fdX}{\Sigma f}$$

We get  $\bar{x} = 150 + \frac{813}{100}$

$$= 150 + 8.13 = 158.13$$

$$\therefore \text{Mean Height} = 158.13 \text{ cm}$$

### 1.6.3 Arithmetic Mean in Case of Continuous Series

Continuous series is also known as Grouped Frequency Series. Under this series the values of the observation are grouped into various classes with some upper and lower limits. For example, classes like 10-20, 20-30, 30-40, and so on. In classes 10-20 lower limit is 10 and upper limit is 20. So, all the observations having values between 10 and 20 are put in this class interval. A similar procedure is adopted for all class intervals. The procedure of calculating Arithmetic Mean in a continuous series is just like a discrete series except that instead of taking values of observations we take mid value of the class interval. The mid value is represented by 'm' and is calculated using following formula:

$$m = \frac{\text{Lower Limit} + \text{Upper Limit}}{2}$$

**1. Direct Method:** In indirect method, we multiply the mid values (m) with their respective frequency (f) to find out the product item (fm). Then we take up sum of the product and divide it by the number of items. Following are the steps

1. Multiply the mid values (m) with their respective frequency (f) to find out the the product item (fm)
2. Add up the product so calculated to find  $\sum fm$ .
3. Find out the number of items in the series denoted by n.
4. Calculate arithmetic mean by dividing sum of the product with the number of observations using following formula:

$$\bar{x} = \frac{\sum fm}{N}$$

Where  $\bar{x}$  = Mean, N = Number of items,  $\sum fm$  = Sum of product of observations of mean and frequencies.

**Example 5. Calculate the arithmetic mean of the following data:**

Class Intervals (C.I.)	0-200	0-300	0-400	0-500	0-600	0-700

**Solution:**

Class Intervals C.I.	Mid Value m	Frequency f	fm
0-200	0		0
0-300	0		50
0-400	0		00
0-500	0		00
0-600	0		50
0-700	0		00
		$\sum f = 70$	$\sum fm = 30,400$

As  $\bar{x} = \frac{\sum fm}{\sum f}$

$\therefore \bar{x} = \frac{30,400}{70} = 434.3$

**2. Short Cut Method:** This method of mean is almost similar to calculation in the discrete series but here the assumed mean is selected and then the deviation are taken from mid value of the observations. Following are the steps of this method:

1. Calculate the Mid Values of the series represented by  $\_m$ .
2. Take any value as assumed mean represented by  $\_A$ .
3. Find out deviations of items from assumed mean. For that deduct Assumed value from mid values of the data. These deviations are representing as  $\_dm$ .
4. Multiply the values of dm with corresponding frequency to find out product denoted by  $fdm$ .
5. Find sum of the product so calculated represented by  $\sum fdm$ .
6. Find out the number of items in the series denoted by n.

7. Calculate arithmetic mean dividing sum deviations of the observation with the number of observations using following formula:

$$\bar{x} = A + \frac{\sum f dm}{N}$$

Where  $\bar{x}$  = Mean, A = Assumed Mean, N = Number of items

$\sum f dm$  = Sum of product of deviation from mid values with frequency.

**Example 6. Calculate the mean from the following data**

Wages (Rs.)	0	0-200	0-300	0-400	0-500	0-600	0-700	0-800	0-900
No. of Workers									

**Solution:** Let the assumed mean, A = 150

Wages (Rs.) C.I.	No. of Workers f	Mid Value m	dm = m - A (m - 150)	f dm
0-100	1	50	-100	-100
100-200	4	150	0	0
200-300	10	250	100	1000
300-400	22	350	200	4400
400-500	30	450	300	9000
500-600	35	550	400	14,000
600-700	10	650	500	5000
700-800	7	750	600	4200
0-900		0	0	0
	$\sum f = 120$			$\sum f dm = 38,200$

As  $\bar{x} = A + \frac{\sum f dm}{\sum f}$

$$= 150 + \frac{38,200}{120}$$

$$= 150 + 318.33 = 468.33$$

$\Rightarrow \bar{x} = 468.33$

**3. Step Deviation Method:** Step Deviation method is the most frequently used method of finding Arithmetic Mean in case of continuous series. This method is normally used when the class interval of the various classes is same. This method makes the process of calculation simple. Following are the steps of this method:

1. Calculate the Mid Values of the series represented by  $m$ .
2. Take any value as assumed mean represented by  $A$ .

- Find out deviations of items from assumed mean. For that deduct Assumed value from mid values of the data. These deviations are representing as  $\text{dm}'$ .
- Find out if all the values are divisible by some common factor  $\text{C}'$  and divide all the deviations with such common factor to find out  $\text{dm}'$  which is  $\text{dm}/c$
- Multiply the values of  $\text{dm}'$  with corresponding frequency to find out product denoted by  $\text{fdm}'$
- Find sum of the product so calculated represented by  $\sum \text{fdm}'$ .
- Find out the number of items in the series denoted by  $n$ .
- Calculate arithmetic mean dividing sum deviations of the observation with the number of observations using following formula:

$$\bar{x} = A + \frac{\sum \text{fdm}'}{\sum f} \times C$$

Where  $\bar{x}$  = Mean, A = Assumed Mean, N = Number of items, C = Common Factor

$\sum \text{fdm}'$  = Sum of product of deviation after dividing with common factors and multiplying it with frequency.

**Example 7. Use step deviation method to find  $\bar{x}$  for the data given below:**

Income (Rs.)	00-2000	00-3000	00-4000	00-5000	00-6000	00-7000
No. of Persons	4	7	16	20	15	8

**Solution:** Let the assumed mean A = 4500

Income (Rs.) C.I.	No. of Persons f	Mid Value m	$\text{dm} = m - A$ $= (m - 4500)$	$\text{dm}' = \frac{\text{dm}}{C}$ $C = 1000$	$\text{fdm}'$
1000-2000	4	1500	-3000	-3	-12
2000-3000	7	2500	-2000	-2	-14
3000-4000	16	3500	-1000	-1	-16
4000-5000	20	4500	0	0	0
5000-6000	15	5500	1000	1	15
6000-7000	8	6500	2000	2	16
	$\sum f = 70$				$\sum \text{fdm}' = -11$

As  $\bar{x} = A + \frac{\sum \text{fdm}'}{\sum f} \times C$

$$\begin{aligned}
 \therefore \bar{x} &= 4500 + \frac{(-11)}{70} \times 1000 \\
 &= 4500 - \frac{1100}{7} = 4500 - 157.14 \\
 &= 4342.86 \quad \bar{x} = 4342.86
 \end{aligned}$$

### Other Special case of Continuous Series

#### 1.6.4 Arithmetic Mean in case of Cumulative Frequency Series:

The normal continuous series give frequency of the particular class. However, in case of cumulative frequency series, it does not give frequency of particular class rather it gives the total of frequency including the frequency of preceding classes. Cumulative frequency series may be of two types, that are 'less than' type and 'more than' type. For calculating Arithmetic mean in cumulative frequency series, we convert such series into the normal frequency series and then apply the same method as in case of normal series.

### Less than Cumulative Frequency Distribution

**Example 8. Find the mean for the following frequency distribution:**

Marks Less Than						
No. of Students						0

**Solution:** Convert the given data into exclusive series:

Marks C. I.	No. of Students F	Mid Value m	$dm = m - A$ $A = 25$	$dm' = \frac{dm}{C}$ $C = 10$	$fdm'$
0-10	5	5	-20	-2	-10
10-20	15-5=10	15	-10	-1	-10
20-30	40-15=25	25	0	0	0
30-40	70-40=30	35	10	1	30
40-50	90-70=20	45	20	2	40
50-60	100-90=10	55	30	3	30
	$\Sigma f = 100$				$\Sigma fdm' = 80$

$$\begin{aligned} \text{As } \bar{x} &= A + \frac{\Sigma fdm'}{\Sigma f} \times C \\ \Rightarrow \bar{x} &= 25 + \frac{80}{100} \times 10 = 33 \\ \Rightarrow \bar{x} &= 33 \end{aligned}$$

### More Than Cumulative Frequency Distribution

**Example 9. Find the mean for the following frequency distribution**

Marks More Than										
No. of Students										

**Solution:** Convert the given data into exclusive series

Marks C. I.	No. of Students f	Mid Value	$dm = m - A$ $A = 55$	$dm' = \frac{dm}{C}$ $C = 10$	$fdm'$
0-10	80-77=3	5	-50	-5	-15
10-20	77-72=5	15	-40	-4	-20

20-30	72-65=7	25	-30	-3	-21
30-40	65-55=10	35	-20	-2	-20
40-50	55-43=12	45	-10	-1	-12
50-60	43-28=15	55	0	0	0
60-70	28-16=12	65	10	1	12
70-80	16-10=6	75	20	2	12
80-90	10-8=2	85	30	3	6
90-100	8	95	40	4	32
	$\Sigma f = 80$				$\Sigma f dm' = -26$

As  $\bar{x} = A + \frac{\Sigma f dm'}{\Sigma f} \times C$

$$\therefore \bar{x} = 55 + \frac{(-26)}{80} \times 10 = 55 - \frac{13}{4} = \frac{220-13}{4} = \frac{207}{4} = 51.75 \Rightarrow \bar{x} = 51.75$$

### 1.6.5 Arithmetic Mean in Case of Unequal Class Interval Series:

Sometimes the class interval between two classes is not the same, for example, 10-20, 20-40 etc. These series are known as unequal class interval series. However, it does not affect the finding of arithmetic mean as there is no precondition of equal class interval in the case of arithmetic mean. So, the mean will be calculated in usual manner.

**Example 10. Calculate Mean of the data is given below:**

C.I.	4-8	8-20	20-28	28-44	44-68	68-80
F	3	8	12	21	10	6

**Solution:**

C. I.	f	d Value m	dm = m - A A = 26	f dm
4-8	3	6	-20	-60
8-20	8	14	-12	-96
20-28	12	24	-2	-24
28-44	21	36	+10	210
44-68	10	56	+30	300
68-80	6	74	+48	288
	$\Sigma f = 60$			$\Sigma f dm = 618$

As  $\bar{x} = A + \frac{\Sigma f dm}{\Sigma f}$

$$\Rightarrow \bar{x} = 26 + \frac{618}{60} = 26 + 10.3 = 36.3$$

$$\Rightarrow \bar{x} = 36.3$$

### 1.6.6 Combined Arithmetic Mean:

Sometimes we have the knowledge of mean of two or more series separately but we are interested in



finding the mean that will be obtained by taking all these series as one series, such mean is called combined mean. It can be calculated using the following formula.

$$\overline{X}_{12} = \frac{N_1\overline{X}_1 + N_2\overline{X}_2}{N_1 + N_2}$$

Where  $N_1$  = Number of items in first series.  $N_2$  = Number of items in second series

$\overline{X}_1$  = Mean of first series, and  $\overline{X}_2$  = Mean of second series

**Example 11. Find the combined mean for the following data**

	Firm A	Firm B
No. of Wage Workers	586	648
Average Monthly Wage (Rs.)	52.5	47.5

**Solution:** Combined mean wage of all the workers in the two firms will be

$$\overline{X}_{12} = \frac{N_1\overline{X}_1 + N_2\overline{X}_2}{N_1 + N_2}$$

Where  $N_1$  = Number of workers in Firm A

$N_2$  = Number of workers in Firm B

$\overline{X}_1$  = Mean wage of workers in Firm A

and  $\overline{X}_2$  = Mean wage of workers in Firm B

We are given that

$$N_1 = 586 \quad N_2 = 648$$

$$\overline{X}_1 = 52.5 \quad \overline{X}_2 = 47.5$$

∴ Combined Mean,  $\overline{X}_{12}$

$$= \frac{(586 \times 52.5) + (648 \times 47.5)}{586 + 648}$$

$$= \frac{61,545}{1234} = \text{Rs. } 49.9$$

### 1.6.7 Correcting Incorrect Mean

Many a time it happens that we take some wrong items in the data or overlook some items. This results in wrong calculation of Mean. Later we find the correct values and we want to find out correct mean. This can be done using the following steps:

1. Multiply the incorrect mean of the data (incorrect  $\overline{x}$ ) with number of items to find out incorrect  $\sum \overline{x}$ .
2. Now subtract all the wrong observations from the above values and add the correct observation to the above value to find out correct  $\sum \overline{x}$ .
3. by Now divide the correct  $\sum \overline{x}$  with the number of observations to find correct mean.

**Example12.** The italics Rs. 98 and Rs. 69 were misread as Rs. 89 and Rs. 96. Find out the correct mean wage.

**Solution:** We know that

$$\text{Correct } \sum X = \text{Incorrect } \sum X - (\text{Incorrect items}) + (\text{Correct Items})$$

$$\text{Also } \bar{X} = \frac{\sum X}{N}$$

$$\Rightarrow \text{Incorrect } \sum X = 100 \times 75 = 7500 \therefore \text{Correct } \sum X = 7500 - (89 + 96) + (98 + 69) = 7482$$

$$\Rightarrow \text{Correct } \bar{X} = \frac{\text{Correct } \sum X}{N} = \frac{7482}{100} = 74.82$$

### Determination of Missing Frequency

**Example 13.** Find the missing frequencies of the following series, if  $\bar{X} = 33$  and  $N = 100$

X	5	15	25	35	45	55
f	5	10	?	30	?	10

**Solution:** Let the missing frequencies corresponding to  $X = 25$  and  $X = 45$  be  $f_1$  and  $f_2$  respectively.

X	f	fX
5	5	25
15	10	150
25	$f_1$	$25f_1$
35	30	1050
45	$f_2$	$45f_2$
55	10	550
	$\sum f = 55 + f_1 + f_2$	$\sum fX = 1775 + 25f_1 + 45f_2$

Now,  $N = 100$  (Given)

$$\therefore 55 + f_1 + f_2 = 100$$

$$\Rightarrow f_1 + f_2 = 45 \quad \dots(i)$$

$$\text{Also } \bar{X} = \frac{\sum fX}{N}$$

$$\Rightarrow 33 = \frac{1775 + 25f_1 + 45f_2}{100}$$

$$\Rightarrow 3300 = 1775 + 25f_1 + 45f_2$$

$$\Rightarrow 25f_1 + 45f_2 = 1525 \quad \dots(ii)$$

Solving (i) and (ii), we get

$$25 \times (f_1 + f_2 = 45) \Rightarrow 25f_1 + 25f_2 = 1125$$

$$1 \times (25f_1 + 45f_2 = 1525) \Rightarrow 25f_1 + 45f_2 = 1525$$

$$(-) \quad (-) \quad (-)$$

$$-20f_2 = -400$$

$$f_2 = \frac{400}{20} = 20$$

$$\therefore f_2 = 20$$

$$\text{Put } f_2 = 20 \text{ in (i)}$$

$$f_1 + 20 = 45$$

$$\Rightarrow f_1 = 45 - 20 = 25$$

$$\therefore f_1 = 25$$

$$\therefore f_1 = 25, f_2 = 20$$

### 1.6.8 Properties of Arithmetic mean

1. If we take the deviations of the observations from its Arithmetic mean and then sum up such deviations, then the sum of such deviations will always be zero.
2. If we take the square of the deviations of items from its Arithmetic mean and then sum up such squares, the value obtained will always be less than the square of deviation taken from any other values.
3. If we have a separate mean of two series, we can find the combined mean of the series.
4. If the value of all items in that data is increased or decreased by some constant value say  $\_k$ , then the Arithmetic mean is also increased or decreased by same  $\_k$ . In other words, if  $k$  is added to the items, then actual mean will be calculated by deducting that  $k$  from the mean calculated.
5. If value of all items in the series is divided or multiplied by some constant  $\_k$  then the mean is also multiplied or divided by the same constant  $\_k$ . In other words if we multiply all observations by  $\_k$  then actual mean can be calculated by dividing the mean to be obtained by the constant  $\_k$ .

### 1.6.10 Limitations of Arithmetic Mean

1. The biggest limitation of the Arithmetic mean is that it is affected by extreme values.
2. If we have an open-end series, it is difficult to measure Arithmetic mean.
3. In the case of qualitative data, it is not possible to calculate the Arithmetic mean.
4. Sometimes it gives an absurd result like we say that there are 20 students in one class and 23 students in other class then the average number of students in a class is 21.5, which is not possible because the students cannot be in fractions.
5. It gives more importance to large-value items than small-value items.
6. Mean cannot be calculated with the help of a graph.
7. It cannot be located by just inspections of the items.

## TEST YOUR PROGRESS (A)

1. The following data pertains to the monthly salaries in rupees of the employees of Mohanta Enterprises. Calculate the average salary per employ

3000, 4100, 4700, 5400, 2300, 3400, 3700, 5100, 5300, 4700

2. Calculate the mean for the following data using the shortcut method.

700, 650, 550, 750, 800, 850, 650, 700, 950

3. Following is the height of students in class tenth of a school. Find out the mean height of the students.

Height in Inches	64	65	66	67	68	69	70	71	72	73
No. of students	1	6	10	22	21	17	14	5	3	1

4. Calculate A.M for the following frequency distribution of Marks.

Marks	5	10	15	20	25	30	35	40
No of students	5	7	9	10	8	6	5	2

5. Calculate mean for the following data

Marks	5-15	15-25	25-35	35-45	45-55	55-65
No of Students	8	12	6	14	7	3

6. Calculate mean for the given data by step deviation method

C.I	0-10	10-20	20-30	30-40	40-50	50-60	60-70
f	8	12	14	16	15	9	6

7. From the following data, find the average sale per shop.

Sales in _000; units	10-12	13-15	16-18	19-21	22-24	25-27	28-30
No. shops	34	50	85	60	30	15	7

8. For the following data (Cumulative Series) , find the average income .

Income Below in (Rs.)	30	40	50	60	70	80	90
No. of persons	16	36	61	76	87	95	100

9. Calculate the average marks for the following cumulative frequency distribution.

Marks Above	0	10	20	30	40	50	60	70	80	90
No of students	80	77	72	65	55	43	28	16	10	8

10. Find missing frequency when the mean is 35 and number is 68.

X;                    0-10    10-20   20-30   30-40   40-50   50-60

F:                    4        10       12       ?        20       ?

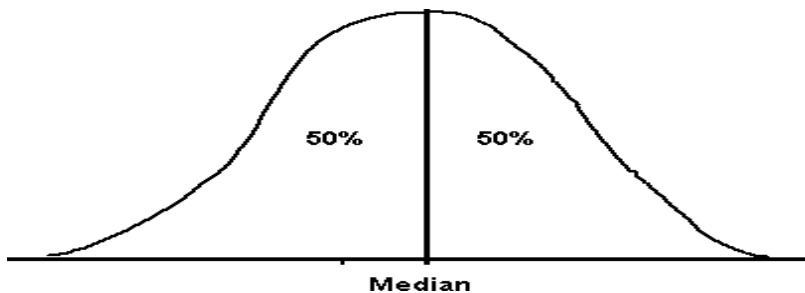
11. The mean age of a combined group of men and women is 30 years. The mean age of a group of men is 32 years and women are 27 years. Find the percentage of men and women in the group

### Answers:

1) 4170	2) 4170	3) 68.13 inches	4) 20.48	5) 31.8
6) 33.625	7) 17.8 (in 000 units)	8) 48	9) 51.75	10) 10,12
11) Men 60%				

## 1.7 MEDIAN

Median is the positional measure of Central tendency. It means the median does not depend upon the value of the item under the observation, rather it depends on the position of the item in the series. Median is a value that divides the series exactly into two equal parts, it means 50% of the observations lie below the median and 50% of the observations lie above the median. However, it is important to arrange the series either in ascending order or in descending order before calculation of the Median. If the series is not arranged, then Median cannot be calculated



For calculating Median

1. Series should be in ascending or descending order
2. Series should be exclusive, not inclusive

### 1.7.1 Median in case of Individual series.

For calculating the median in individual series, following are the steps:

1. Arrange the series in ascending or descending order.
2. Calculate the number of observations. It is denoted by N.
3. Calculate the  $\left(\frac{N+1}{2}\right)^{\text{th}}$  term
4. Corresponding value to this item is the median of the data
5. In case there are even number of items in the series, this value will be in fraction. In that case take the arithmetic mean of the adjacent items in which Median is falling. For example, if it is 4.5 then take arithmetic mean of 4<sup>th</sup> item and 5<sup>th</sup> item.

$$\text{Median} = \text{value } \left(\frac{N+1}{2}\right)^{\text{th}} \text{ term}$$

### When the number of observations N is odd

**Example 20.** Calculation median from the following observations:

15, 17, 19, 22, 18, 47, 25, 35, 21

**Solution:** Arranging the given items in ascending order, we get

15, 17, 18, 19, 21, 22, 25, 35, 47

Now Median,  $M = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th}} \text{ item}$

$$M = \text{Size of } \left(\frac{9+1}{2}\right)^{\text{th}} \text{ item}$$

$$= \text{Size of } 5^{\text{th}} \text{ item}$$

$$= 21$$

$$\Rightarrow M = 21$$

### When the number of observations N is even

**Example 21.** Find the median from the following data

28, 26, 24, 21, 23, 20, 19, 30

**Solution:** Arranging the given figures in ascending order, we get

19, 20, 21, 23, 24, 26, 28, 30

Now Median,  $M = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th}} \text{ item}$

$$M = \text{Size of } \left(\frac{8+1}{2}\right)^{\text{th}} \text{ item}$$

$$= \text{Size of } 4.5^{\text{th}} \text{ item}$$

$$= \frac{4^{\text{th}} \text{ item} + 5^{\text{th}} \text{ item}}{2}$$

$$= \frac{23+24}{2} = \frac{47}{2} = 23.5$$

$$\Rightarrow M = 23.5$$

### 1.7.2 Median in case of Discrete series

Following are the steps in case of discrete series:

1. Arrange the data in ascending or descending order.
2. Find the cumulative frequency of the series.
3. Find the  $\left(\frac{N+1}{2}\right)^{\text{th}}$  term
4. Now look at this term in the cumulative frequency of the series.
5. Value against which such cumulative frequency falls is the median value.

$$\text{Median} = \text{value } \left(\frac{N+1}{2}\right)^{\text{th}} \text{ term}$$

**Example 22.** Calculate the value of median, if the data is as given below:

Height (in cms.)	110	125	150	180	200	250
No. of Students	8	12	13	15	10	3

**Solution:** Arranging the given data in ascending order, we get

Height (in cms.)	No. of Students f	Cumulative Frequency C · f
110	8	8 (1-8)
125	12	20 (9-20)
150	13	33 (21-33)
180	15	48 (34-48)
200	10	58 (49-58)
250	3	61 (59-61)
	$\sum f = N = 61$	

Now Median,  $M = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th}} \text{ item}$

$$M = \text{Size of } \left(\frac{61+1}{2}\right)^{\text{th}} \text{ item}$$

$$= \text{Size of } 31^{\text{st}} \text{ item}$$

$$= 150$$

$\Rightarrow$  Median,  $M = 150$  cms.

### 1.7.3 Median in case of Continuous Series

Following are the steps in case of continuous series:

1. Arrange the data in ascending or descending order.
2. Find the cumulative frequency of the series.
3. Find the  $\left(\frac{N}{2}\right)^{\text{th}}$  term
4. Now look at this term in the cumulative frequency of the series. The value equal to or higher than term calculated in third step is the median class.
5. Find median using following formula.
6.  $M = L + \frac{\frac{N}{2} - C \cdot f}{f} \times i$
7. Where  $M = \text{Median}$
8.  $L = \text{Lower Limit of Median Class}$
9.  $N = \text{Number of Observations.}$

10. c.f. = Cumulative frequency of the Median Class.
11. f = Frequency of the class preceding Median Class.
12. i = Class interval of Median Class

### Example 23. Calculate Median

arks		-15	-20	-25	-30	-35
. of Students						

**Solution:**

C. I.	. of Students f	mulative Frequency C · f
5-10	8	8 (1-8)
10-15	7	15 (9-15)
15-20	14	29 (16-29)
20-25	16	45 (30-45)
25-30	9	54 (46-54)
30-35	6	60 (55-60)
	$\sum f = N = 60$	

Median, M = Size of  $\left(\frac{N}{2}\right)^{\text{th}}$  item

$$M = \text{Size of } \left(\frac{60}{2}\right)^{\text{th}} \text{ item}$$

$$= \text{Size of } 30^{\text{th}} \text{ item}$$

⇒ Median lies in the class interval 20 – 25

As Median,  $M = L + \frac{\frac{N}{2} - C.f}{f} \times i$

Here L = Lower limit of the median class = 20

$$N = 60$$

$$C \cdot f = 29$$

$$f = 16$$

$$i = \text{Class – length of the median class} = 5$$

$$\begin{aligned} \therefore M &= 20 + \frac{(30-29)}{16} \times 5 \\ &= 20 + \frac{5}{16} = 20 + 9.312 = 29.312 \end{aligned}$$

$$\Rightarrow M = 29.312$$

**Inclusive Series** – It must be converted to Exclusive Series before calculation of the Median.

### Example 24. Find Median from the given data

	-19	-29	-39	-49	-59	-69	-79	-89



**Solution:** Converting the given data into exclusive form, we get

$$[\text{Correction factor} = \frac{L_2 - U_1}{2} = \frac{20 - 19}{2} = \frac{1}{2} = 0.5]$$

(0.5 is subtracted from all lower limits and added to all upper limits)

X	f	Cumulative frequency C · f
9.5-19.5	6	6
19.5-29.5	53	59
29.5-39.5	85	144
39.5-49.5	56	200
49.5-59.5	21	221
59.5-69.5	16	237
69.5-79.5	4	241
79.5-89.5	4	245
	$\sum f = N = 245$	

Median, M = Size of  $(\frac{N}{2})^{\text{th}}$  item

$$M = \text{Size of } (\frac{245}{2})^{\text{th}} \text{ item}$$

$$= \text{Size of } 122.5^{\text{th}} \text{ item}$$

∴ The real class limits of the median class = (29.5 – 39.5)

So 
$$M = L + \frac{(\frac{N}{2} - C \cdot f)}{f} \times i$$

$$\Rightarrow M = 29.5 + (\frac{122.5 - 59}{85}) \times 10$$

$$= 29.5 + (\frac{63.5}{85} \times 10)$$

$$= 29.5 + (\frac{635}{85})$$

$$= 29.5 + 7.47 = 36.97$$

$$\Rightarrow M = 36.97$$

**Cumulative Series (More than and less than)**

**Example 25.** Find median, if the data is as given

**below:**

Marks More than	20	35	50	65	80	95
No. of Students	100	94	74	30	4	1

**Solution:** Converting the given data into class – interval form, we get

Marks (C. I.)	Frequency (f)	Cumulative Frequency (C · f)
20-35	100-94=6	6
35-50	94-74=20	26
50-65	74-30=44	70
65-80	30-4=26	96
80-95	4-1=3	99
95-110	1	100
	$\sum f = N = 100$	

Now Median,  $M = \text{Size of } \left(\frac{N}{2}\right)^{\text{th}} \text{ item}$

$$M = \text{Size of } \left(\frac{100}{2}\right)^{\text{th}} \text{ item}$$

$$= \text{Size of } 50^{\text{th}} \text{ item}$$

⇒ Median lies in the class interval = 50 – 65

So  $M = L + \frac{\left(\frac{N}{2} - C \cdot f\right)}{f} \times i$

$$\Rightarrow M = 50 + \left(\frac{50-26}{44}\right) \times 15$$

$$= 50 + \left(\frac{24}{44} \times 15\right)$$

$$= 50 + 8.18 = 58.18$$

$$\Rightarrow M = 58.18$$

**Example 26. Find median, if the data is as given below:**

Marks Less than	10	20	30	40	50	60	70	80
No. of Students	20	30	50	94	96	127	198	250

**Solution:** Converting the given data into class interval form, we get

Marks (C.I.)	No. of Students (f)	Cumulative Frequency (C·f)
0-10	20	20
10-20	30-20=10	30
20-30	50-30=20	50
30-40	94-50=44	94
40-50	96-94=2	96
50-60	127-96=31	127
60-70	198-127=71	198
70-80	250-198=52	250
	$\sum f = N = 250$	

Now Median,  $M = \text{Size of } \left(\frac{N}{2}\right)^{\text{th}} \text{ item}$

$$M = \text{Size of } \left(\frac{250}{2}\right)^{\text{th}} \text{ item}$$

$$= \text{Size of } 125^{\text{th}} \text{ item}$$

⇒ Median lies in the class – interval = 50 – 60

So  $M = L + \frac{\frac{N}{2} - C.f}{f} \times i$

⇒  $M = 50 + \left(\frac{125-96}{31}\right) \times 10$

$$= 50 + \left(\frac{29}{31} \times 10\right)$$

$$= 50 + \frac{290}{31}$$

$$= 50 + 9.35 = 59.35$$

⇒  $M = 59.35$

### Mid – Value Series

**Example 27. Find the value of median for the following data:**

d Value									
					6				

**Solution:** It is clear from the mid – value that the class size is 10. For finding the limits of different classes, apply the formula:

$$L = m - \frac{i}{2} \quad \text{and} \quad U = m + \frac{i}{2}$$

Where, L and U denote the lower and upper limits of different classes,  $m$  denotes the mid – value of the corresponding class interval and  $i$  denotes the difference between mid values.

∴ Corresponding to mid – value  $15$ , we have

$$L = 15 - \frac{10}{2} \quad \text{and} \quad U = 15 + \frac{10}{2}$$

i.e. C.I. = 10 – 20

Similarly other class intervals can be located

d Value	f	C. I.	mulative Frequency $C \cdot f$
15	8	10-20	8
25	26	20-30	34
35	45	30-40	79
45	72	40-50	151
55	116	50-60	267
65	60	60-70	327
75	38	70-80	365
85	22	80-90	387
95	13	90-100	400

	N = 100		
--	---------	--	--

Now Median,  $M = \text{Size of } \left(\frac{N}{2}\right)^{\text{th}} \text{ item}$

$$M = \text{Size of } \left(\frac{400}{2}\right)^{\text{th}} \text{ item}$$

$$= \text{Size of } 200^{\text{th}} \text{ item}$$

$\Rightarrow$  Median lies in the class – interval = 50 – 60

$$\text{So } M = L + \frac{\frac{N}{2} - C \cdot f}{f} \times i$$

$$\Rightarrow M = 50 + \left(\frac{200 - 151}{116}\right) \times 10$$

$$= 50 + \left(\frac{49}{116} \times 10\right)$$

$$= 50 + \frac{490}{116}$$

$$= 50 + 4.224 = 54.224$$

$$\Rightarrow M = 54.224$$

### Determination of Missing Frequency

**Example 28.** Find the missing frequency in the following distribution if  $N = 72$ ,  $Q_1 = 25$  and  $Q_3 = 50$

L.		20	30	40	50	60	70	80

**Solution:** Let the missing frequencies be  $f_1, f_2$  and  $f_3$  respectively.

Now	C.I.	f	mulative Frequency ( $C \cdot f$ )
	0 – 10	4	4
	10 – 20	8	12
	20 – 30	$f_1$	$12 + f_1$
	30 – 40	19	$31 + f_1$
	40 – 50	$f_2$	$31 + f_1 + f_2$
	50 – 60	10	$41 + f_1 + f_2$
	60 – 70	5	$46 + f_1 + f_2$
	70 – 80	$f_3$	$46 + f_1 + f_2 + f_3$
	$N = 72 = \sum f$		
	$\sum f = 46 + f_1 + f_2 + f_3$		

$$N = 72$$

$$= \sum f = 46 + f_1 + f_2 + f_3$$

$$\Rightarrow f_1 + f_2 + f_3 = 72 - 46 = 26$$

$$\Rightarrow f_1 + f_2 + f_3 = 26 \quad \dots(i)$$

$$\text{Also, } Q_1 = 25 \quad (\text{Given})$$

$$\Rightarrow Q_1 \text{ lies in the class – interval } 20 - 30$$

$$\Rightarrow Q_1 = L + \frac{\frac{N}{4} - C \cdot f}{f} \times i$$

$$25 = 20 + \frac{\frac{72}{4} - 12}{f_1} \times 10$$

$$25 = 20 + \frac{18 - 12}{f_1} \times 10$$

$$25 - 20 = \frac{6}{f_1} \times 10$$

$$5f_1 = 60$$

$$f_1 = \frac{60}{5}$$

$$\Rightarrow f_1 = 12 \quad \dots(ii)$$

Similarly, we are given that

$$Q_3 = 50$$

$$\Rightarrow Q_3 \text{ lies in the class – interval } 50 - 60$$

$$\Rightarrow Q_3 = L + \frac{\frac{3N}{4} - C \cdot f}{f} \times i$$

$$50 = 50 + \frac{\frac{3 \times 72}{4} - (31 + f_1 + f_2)}{10} \times 10$$

$$50 = 50 + \frac{54 - (31 + 12 + f_2)}{1} \quad (\because f_1 = 12 \text{ By (ii)})$$

$$50 - 50 = 54 - (43 + f_2)$$

$$0 = 54 - (43 + f_2)$$

$$43 + f_2 = 54$$

$$f_2 = 54 - 43$$

$$\Rightarrow f_2 = 11 \quad \dots(iii)$$

Putting (ii) and (iii) in (i), we get

$$f_1 + f_2 + f_3 = 26$$

$$12 + 11 + f_3 = 26$$

$$23 + f_3 = 26$$

$$f_3 = 26 - 23$$

$$\Rightarrow f_3 = 3$$

### 1.7.5 Limitations of Median

1. It is not capable of further algebraic treatment.
2. It is positional average and is not based on all observation.
3. It is very much affected by fluctuation in sampling.
4. Median needs arrangement of data before calculation.
5. In case of continuous series, it assumes that values are equally distributed in a particular class.

### TEST YOUR PROGRESS (C)

1. Calculate Median

30, 45, 75, 65, 50, 52, 28, 40, 49, 35, 52,

2. Find Median

Wages:	100	150	80	200	250	180
No. of workers	24	26	16	20	6	30

3. Calculate Median

X;	0-5	5-10	10-15	15-20	20-25	25-30	30-35
F:	4	6	10	16	12	8	4

4. Find Median:

Income	100-200	200-400	400-700	700-1200	1200-2000
Number of firms	40	100	260	80	20

5. Find missing frequency when median is 50 and number is 100.

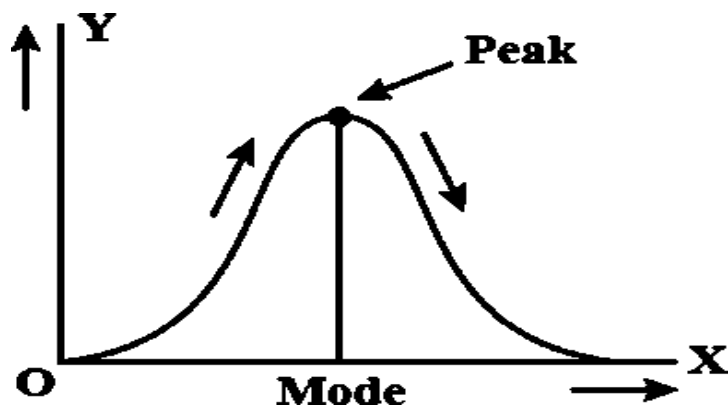
X;	0-20	20-40	40-60	60-80	80-100
F:	14	?	27	?	15

**Answers:**

<b>1) 49</b>	<b>2) 150</b>	<b>3) 18.125</b>
<b>4) 526.92</b>	<b>5) 23,21</b>	

### 1.8 MODE

Mode is another positional measure of Central Tendency. Mode is the value that is repeated most number of times in the series. In other words, the value having the highest frequency is called Mode. The term 'Mode' is taken from French word 'La Mode' which means the most fashionable item. So, Mode is the most popular item of the series.



#### For calculating Mode

1. Series should be in ascending or descending order.
2. Series should be exclusive, not inclusive.
3. Series should have equal class intervals.

#### 1.8.1 Mode in Individual Series

In case of Individual series, following are the steps of finding the Mode.

1. Arrange the series either in ascending order or descending order.
2. Find the most repeated item.
3. This item is Mode.

**Example 32. Calculate mode from the following data of marks obtained by 10 students**

No.	1	2	3	4	5	6	7	8	9	10
arks obtained	10	27	24	12	27	27	20	18	15	30

**Solution:** By Inspection

It can be observed that 27 occur most frequently i. e. 3 times. Hence, mode = 27 marks

By converting into discrete series

Marks Obtained	Frequency
10	1
12	1
15	1
18	1
20	1
24	1
27	3
30	1
	N = 10

Since, the frequency of 27 is maximum i. e. 3

It implies the item 27 occurs the maximum number of times. Hence the modal marks are 27.

$$\text{Mode} = 27$$

### 1.8.2 Mode in discrete series

In case of discrete series, we can find mode by two methods that are Observation Method and Grouping Method.

**Observation Method:** Under this method value with highest frequency is taken as mode.

**Grouping Method:** Following are the steps of Grouping method:

- Prepare a table and put all the values in the table in ascending order.
- Put all the frequencies in first column. Mark the highest frequency.
- In second column put the total of frequencies taking two frequencies at a time like first two, then next two and so on. Mark the highest total.
- In third column put the total of frequencies taking two frequencies at a time but leaving the first frequency like second and third, third and fourth and so on. Mark the highest total.
- In fourth column put the total of frequencies taking three frequencies at a time like first three, than next three and so on. Mark the highest total.
- In fifth column put the total of frequencies taking three frequencies at a time but leaving the first frequency like second, third and fourth; than fifth, sixth and seventh and so on. Mark the highest total.
- In sixth column put the total of frequencies again taking three frequencies at a time but leaving the first two frequencies. Mark the highest total.
- Value that is marked highest number of times is the mode.

**Example 33. Find the modal value for the following distribution**

e (in years)								
. of Persons								

**Solution:** Here, as maximum frequency 9 belongs to two age values 12 and 14, so its not possible to determine mode by inspection. We will have to determine the modal value through grouping and analysis table.

Grouping Table						
e (in years)	Frequency					
	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	G <sub>5</sub>	G <sub>6</sub>
8	5	11	14	19	21	24
9	6					
10	8	15	16	24	26	23
11	7					
12	9	17	17	24	26	23
13	8					



14	9	15				
15	6					

Analysis Table								
Group No.	8	9	10	11	12	13	14	15
G <sub>1</sub>					×		×	
G <sub>2</sub>					×	×		
G <sub>3</sub>						×	×	
G <sub>4</sub>				×	×	×		
G <sub>5</sub>					×	×	×	
G <sub>6</sub>			×	×	×			
Tal	×	×	1	2	5	4	3	×

Since, 12 occurs maximum number of times i. e. 5 times, the modal age is 12 years

$$\text{Mode} = 12$$

### 1.8.3 Mode in Continuous series

In the case of continuous series, we can find mode by two methods that are Observation Method and Grouping Method.

- Observation Method:** Under this method value with the highest frequency is taken as mode class then the mode formula is applied which is given below.
- Grouping Method:** The following are the steps of Grouping method:
  - Prepare a table and put all the classes of data in the table in ascending order.
  - Put all the frequencies in first column. Mark the highest frequency.
  - In the second column put the total of frequencies taking two frequencies at a time like the first two, then next two, and so on. Mark the highest total.
  - In the third column put the total of frequencies taking two frequencies at a time but leaving the first frequency like second and third, third and fourth and so on. Mark the highest total.
  - In the fourth column put the total of frequencies taking three frequencies at a time like the first three, then next three and so on. Mark the highest total.
  - In the fifth column put the total of frequencies taking three frequencies at a time but leaving the first frequency like second, third and fourth; then fifth, sixth and seventh and so on. Mark the highest total.
  - In sixth column put the total of frequencies again taking three frequencies at a time but leaving the first two frequencies. Mark the highest total.
  - The class that is marked highest number of times is the mode class.
  - Apply the following formula for calculating the mode:

$$Z = L + \frac{f_m - f_1}{2f_m - f_1 - f_2} \times i$$

Where, Z = Mode, L = Lower limit of the mode class,  $f_m$  = Frequency of mode class.

$f_1$  = Frequency of class proceeding mode class,  $f_2$  = Frequency of class succeeding mode class

i = Class interval

**Example 34. Find the mode for the following frequency distribution**

e (in years)	-35	-40	-45	-50	-55	-60
. of Persons						

**Solution:** Here, the maximum frequency is corresponding to the class – interval 45 – 50.

So, the modal class is 45 – 50.

Now, the mode is given by the formula

$$\text{Mode, } Z = L + \frac{f_m - f_1}{2f_m - f_1 - f_2} \times i$$

Here L = Lower limit of modal class = 45

$f_m$  = Frequency of modal class = 20

$f_1$  = Frequency of class preceeding the modal class = 12

$f_2$  = Frequency of class succeeding the modal class = 15

i = Class length of modal class = 5

$$\begin{aligned} \therefore \text{Mode, } Z &= 45 + \frac{20-12}{(2 \times 20) - 12 - 15} \times 5 \\ &= 45 + \frac{8}{40-27} \times 5 \\ &= 45 + 3.07 \\ &= 48.1 \text{ years (approx.)} \end{aligned}$$

$$\Rightarrow Z = 48.1 \text{ year}$$

**Example 35. Calculate mode from the following data**

L.		-20	-30	-40	-50	-60	-70	-80	-90	-100

**Solution:** Here as it is not possible to find modal class by inspection, so we have to determine it through grouping and analysis table.

Grouping Table						
C. I.	Frequency					
	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	G <sub>5</sub>	G <sub>6</sub>
0 – 10	2	11		21		
10 – 20	9		19		32	
20 – 30	10	23		34		
30 – 40	13		24		30	

40 – 50	11	17			30	26
50 – 60	6		19			
60 – 70	13	20	11	24	12	
70 – 80	7					
80 – 90	4	5				
90 – 100	1					

Analysis Table										
Group No.		-20	-30	-40	-50	-60	-70	-80	-90	-100
G <sub>1</sub>				×			×			
G <sub>2</sub>			×	×						
G <sub>3</sub>				×	×					
G <sub>4</sub>				×	×	×				
G <sub>5</sub>		×	×	×						
G <sub>6</sub>			×	×	×					
Total	×	1	3	6	3	1	1	×	×	×

Clearly the modal class is 30 – 40

Now the mode is given by the formula

$$\text{Mode, } Z = L + \frac{f_m - f_1}{2f_m - f_1 - f_2} \times i$$

Here L = Lower limit of modal class 30 – 40 = 30

$f_m$  = Frequency corresponding to modal class = 13

$f_1$  = Frequency of interval preceding modal class

$f_2$  = Frequency of interval succeeding and

$i$  = Class length of modal class

$$\begin{aligned}
 \therefore \text{Mode, } Z &= 30 + \frac{13-10}{(2 \times 13) - 10 - 11} \times 10 \\
 &= 30 + \frac{3}{26-21} \times 10 \\
 &= 30 + \frac{30}{5} \\
 &= 30 + 6 \\
 &= 36
 \end{aligned}$$

$$\Rightarrow Z = 36$$

**Example 36.** Determine the missing frequencies when it is given that  $N = 230$ , Median,  $M = 233.5$

and Mode,  $Z = 234$

	0-210	0-220	0-230	0-240	0-250	0-260	0-270
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**Solution:** Let the missing frequencies be  $f_1, f_2$  and  $f_3$  respectively.

**Solution:** Let the missing frequencies be  $f_1, f_2$  and  $f_3$  respectively.

C.I	f	C · f
200 – 210	4	4
210 – 220	16	20
220 – 230	$f_1$	$20 + f_1$
230 – 240	$f_2$	$20 + f_1 + f_2$
240 – 250	$f_3$	$20 + f_1 + f_2 + f_3$
250 – 260	6	$26 + f_1 + f_2 + f_3$
260 – 270	4	$30 + f_1 + f_2 + f_3$
	$N = 230 = \sum f$	
	$\sum f = 30 + f_1 + f_2 + f_3$	

Now  $N = 230 = \sum f$  (Given)

$$= 30 + f_1 + f_2 + f_3$$

$$\Rightarrow f_1 + f_2 + f_3 = 230 - 30 = 200$$

$$\Rightarrow f_1 + f_2 + f_3 = 200 \quad \dots(i)$$

Also, Median = 233.5 (Given)

$$\Rightarrow \text{Median class is } 230 - 240$$

$$\Rightarrow M = L + \frac{\frac{N}{2} - C.f}{f} \times i$$

$$233.5 = 230 + \frac{\frac{230}{2} - (20 + f_1)}{f_2} \times 10$$

$$3.5 = \frac{115 - 20 - f_1}{f_2} \times 10$$

$$3.5f_2 = 950 - 10f_1$$

$$\Rightarrow 10f_1 + 3.5f_2 = 950 \quad \dots(ii)$$

Now Mode = 234 lies in 230 – 240

$$\therefore Z = L + \frac{f_2 - f_1}{2f_2 - f_1 - f_3} \times i$$

$$\Rightarrow 234 = 230 + \frac{f_2 - f_1}{2f_2 - f_1 - f_3} \times 10$$

$$\Rightarrow 4 = \frac{f_2 - f_1}{2f_2 - f_1 - (200 - f_1 - f_2)} \times 10 \quad [\text{Using (i)}]$$

$$\Rightarrow 4 = \frac{f_2 - f_1}{2f_2 - f_1 - 200 - f_1 - f_2} \times 10$$

$$\Rightarrow 4 = \frac{(f_2 - f_1) \times 10}{3f_2 - 200}$$

$$\Rightarrow 12f_2 - 800 = 10f_2 - 10f_1$$

$$\Rightarrow 2f_2 - 800 + 10f_1 = 0$$

$$\Rightarrow 10f_1 + 2f_2 = 800 \quad \dots(iii)$$

Solving (ii) and (iii), we get

$$10f_1 + 3.5f_2 = 950$$

$$10f_1 + 2f_2 = 800$$

$$\begin{array}{r} (-) \quad (-) \quad (-) \\ \hline \end{array}$$

$$1.5f_2 = 150$$

$$\Rightarrow f_2 = \frac{150}{1.5} = 100$$

$$f_2 = 100$$

...(iv)

Put (iv) in (iii)

$$10f_1 + 2(100) = 800$$

$$\Rightarrow 10f_1 = 800 - 200 = 600$$

$$\Rightarrow 10f_1 = 600$$

$$\Rightarrow f_1 = 60$$

...(v)

Put (iv) and (v) in (i)

$$60 + 100 + f_3 = 200$$

$$\Rightarrow f_3 = 40$$

$\therefore$  The missing frequencies are 60, 100 and 40.

### 1.9 RELATION BETWEEN MEAN, MEDIAN AND MODE

In a normal series the value of Mean, Median and Mode is always same. However, Karl Pearson studied the empirical relation between the Mean, Median and Mode and found that in moderately skewed series the Median always lies between the Mean and the Mode. Normally it is two third distance from Mode and one third distance from Mean.

On the basis of this relation following formula emerged

$$\begin{array}{l} \text{Mode} = 3 \text{ Median} - 2 \text{ Mean} \\ \text{or } Z = 3M - 2\bar{X} \end{array}$$

**Example.** Calculate M when  $\bar{X}$  and Z of a distribution are given to be 35.4 and 32.1 respectively.

**Solution:** We are given that

$$\text{Mean, } \bar{X} = 35.4$$

$$\text{Mode, } Z = 32.1$$

As we know the empirical relation between Mean, Median and Mode.

i. e.  $\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$

$$\Rightarrow Z = 3M - 2\bar{X}$$

$$\Rightarrow M = \frac{1}{3}(Z + 2\bar{X})$$

$$\begin{aligned}\Rightarrow M &= \frac{1}{3}(32.1 + 2(35.4)) \\ &= \frac{1}{3}(32.1 + 70.8) \\ &= \frac{1}{3}(102.9) = 34.3\end{aligned}$$

$$\Rightarrow \text{Median, } M = 34.3$$

### TEST YOUR PROGRESS - D

1. Find Mode:

X 22, 24, 17, 18, 19, 18, 21, 20, 21, 20, 23, 22, 22, 22

2. Find Mode by inspection method

X	6	12	18	24	30	36	42	48
f	9	11	25	16	9	10	6	3

3. Find Mode by Grouping Method and inspection method

X;	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
F:	2	18	30	45	35	20	6	4

4. Find Mode

X	0-100	100-200	200-400	400-500	500-700
F:	5	15	40	32	28

**Answers:**

1) 22	2) 18	3) 36	4) 440
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### 1.10 OTHER POSITIONAL MEASURES (QUARTILES, DECILES AND PERCENTILES)

As median divide the series into two equal parts, there are many other positional measures also. These Positional measures are also known as partition values. Following are some of the positional measure

#### A) Quartiles

Quartile are the values that divide the series in four equal parts. There are total three quarter in number denoted by  $Q_1$ ,  $Q_2$  and  $Q_3$ . First quartile is placed at 25% of the items, second quartile at 50% of the

A horizontal number line with five tick marks. Above the line, the word "Quartiles" is centered. Below the line, the tick marks are labeled from left to right as "Min",  $Q_1$ ,  $Q_2 = Me$ ,  $Q_3$ , and "Max". Above the line, between each pair of adjacent tick marks, the percentage "25%" is written, indicating that each quartile represents 25% of the data.

Deciles are the values that divide the series in ten equal parts. There are total nine Deciles in number denoted by  $D_1, D_2, D_3$  and so on upto  $D_9$ . The first decile is placed at 10% of the items, second quartile at 20% of the items, similarly last at 90% of the items. The value of fifth Decile is always equal to Median.



A horizontal line representing a distribution of data. Above the line, the word "Percentiles" is centered. Below the line, several points are marked with upward-pointing arrows and labeled:  $P_1$ ,  $P_{25}$ ,  $P_{40}$ ,  $P_{50}$ ,  $P_{75}$ , and  $P_{99}$ . At the far left end of the line, an arrow points to the line with the label "Min". At the far right end, an arrow points to the line with the label "Max". Above the line, at the far left and far right, the label "1%" is placed with a downward-pointing arrow.

## 1.11 Sum Up

- Average is the value that represent its series.
- A good average has many characteristics.
- Average is also known as Central Tendency.
- There are mainly five main types of average Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, and Mode.
- Arithmetic mean is most popular average.



- Median divide the series into two equal parts.
- Mode is the value repeated most number of times.
- There are other positional measures like Quartile, Decile and Percentile.

### 1.12 Key Terms

- **Average:** Average is the single value that is capable of representing its series. It is the value around which other values in the series move.
- **Arithmetic Mean:** —The value obtained by dividing the sum of observations with the number of observations.
- **Median:** It is a value that divides the series into two equal parts.
- **Mode:** It is the most repeated value of the series.
- **Quartile:** It is a value that divides the series into four equal parts.
- **Decile:** It is a value that divides the series into ten equal parts.
- **Percentile:** It is a value that divides the series in hundred equal parts.

### 1.13 Questions for Practice

#### Short Answer Type

- Q1. What is central tendency?
- Q2. What is arithmetic mean?
- Q3. How you can calculate combined arithmetic mean.
- Q4. What is the median?
- Q5. What is mode?
- Q6. What is Quartile, Percentile and Deciles?
- Q7. According to you which measure of average is best.

#### Long Answer Type

- Q1. What are the uses of measuring central tendency?
- Q2. Give features of ideal measure of average.
- Q3. Give properties, advantages and limitations of Arithmetic mean.
- Q4. Give merits and limitations of Median.
- Q5. How Mode is calculated for grouping method. Give its merits and limitations.
- Q6. Explain relation between Mean, Median and Mode.
- Q7. What is positional average? Give various positional average.

### 1.14 Further Readings

- J. K. Sharma, Business Statistics, Pearson Education.
- S.C. Gupta, Fundamentals of Statistics, Himalaya Publishing House.
- S.P. Gupta and Archana Gupta, Elementary Statistics, Sultan Chand and Sons, New Delhi.
- Richard Levin and David S. Rubin, Statistics for Management, Prentice Hall of India, New Delhi.

**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 2: MEASURES OF DISPERSION**

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**STRUCTURE**

**2.0 Objectives**

**2.1 Introduction and Meaning of Dispersion**

**2.2 Benefits / Uses of Dispersion**

**2.3 Features of Good Measure of Dispersion**

**2.4 Absolute and Relative Measure of Dispersion**

**2.5 Measure of Dispersion - Range**

**2.5.1 Range in Individual Series**

**2.5.2 Range in Discrete Series**

**2.5.3 Range in Continuous Series**

**2.5.4 Merits and Limitations of Range**

**2.6 Measure of Dispersion – Quartile Deviations**

**2.6.1 Quartile Deviations in Individual Series**

**2.6.2 Quartile Deviations in Discrete Series**

**2.6.3 Quartile Deviations in Continuous Series**

**2.6.4 Merits and Limitations of Quartile Deviations**

**2.7 Measure of Dispersion – Mean Deviation**

**2.7.1 Mean Deviation in Individual Series**

**2.7.2 Mean Deviation in Discrete Series**

**2.7.3 Mean Deviation in Continuous Series**

**2.7.4 Merits and Limitations of Mean Deviation**

**2.8 Measure of Dispersion – Standard Deviation**

**2.8.1 Standard Deviation in Individual Series**

**2.8.2 Standard Deviation in Discrete Series**

**2.8.3 Standard Deviation in Continuous Series**

#### 2.8.4 Combined Standard Deviation

#### 2.8.5 Properties of Standard Deviation

#### 2.8.6 Merits and Limitations of Standard Deviation

#### 2.10 Sum Up

#### 2.11 Key Terms

#### 2.12 Questions for Practice

#### 2.13 Further Readings

### 2.0 OBJECTIVES

After studying the Unit, students will be able to:

- Explain the meaning of Dispersion
- Compare absolute and relative measures of Dispersion
- Understand features of a good measure of Dispersion
- Calculate the Range and Quartile Deviation
- Measure the Dispersion using Mean and Standard Deviation
- Compare the variation of the two series

### 2. 1 INTRODUCTION AND MEANING

Statistics is a tool that helps us in the extraction of information from a large pool of data. Many tools in statistics help us in the extraction of data. Central tendency of data is one such tool. A good measure of central tendency could represent the whole data. However, many a time we find that the average is not representing it data. The following example will make this clear:

Series X	Series Y	Series Z
100	94	1
100	105	2
100	101	3
100	98	4
100	102	490
$\sum X = 500$	$\sum Y = 500$	$\sum Z = 500$
$\bar{X} = \frac{\sum X}{N} = \frac{500}{5} = 100$	$\bar{Y} = \frac{\sum Y}{N} = \frac{500}{5} = 100$	$\bar{Z} = \frac{\sum Z}{N} = \frac{500}{5} = 100$

We can see that in all the above series the average is 100. However, in the first series average fully represents its data as all the items in the series are 100 and the average is also 100. In the second series, the items are very near to its average which is 100, so we can say that average is a good representation

of the series. But in case of third series, average is not represent its data as there is a lot of difference between items and the average. To understand the nature of data it is very important to see the difference between items and the data. This could be done by using dispersion.

Dispersion is a very important statistical tool that helps us in progress the nature of data. Dispersion shows the extent to which individual items in the data differ from its average. It is a measure of the difference between data and the individual items. It indicates how that lacks uniformity. Following are some of the definitions of Dispersion.

**According to Spiegel,** —The degree to which numerical data lend to spread about an average value is called the variation, or dispersion of the data. As the dispersion gives average of difference between items and their Central tendency, it is also known as average of the second order.

## **2.2 BENEFITS / USES OF DISPERSION**

The benefits of Dispersion analysis are outlined as under:

- 1. To examine the reliability of Central tendency:** We have already discussed that a good measure of Central tendency could represent its series. Dispersion gives us the idea of whether average is in a position to represent its series or not. Based on this we can calculate the reliability of the average.
- 2. To compare two series:** In case there are two series and we want to know which series has more variation, we can use dispersion as its tool. In such cases normally we use a relative measure of dispersion for comparing two series.
- 3. Helpful in quality control:** Dispersion is a tool that is frequently used in quality control by the business houses. Every manufacturer wants to maintain same quality and reduce the variation in production. Dispersion can help us in finding the deviations and removing the deviations in quality.
- 4. Base of further statistical analysis:** Dispersion is a tool that is used in some statistical analyses. For example, we use dispersion while calculating correlation, Regression, Skewness and Testing the Hypothesis, etc.

## **2.3 FEATURES OF GOOD MEASURE OF DISPERSION**

A good measure of dispersion has some features which are mentioned below:

- A good tool of dispersion must be easy to understand and simple to calculate.
- A good measure of dispersion must be based on all the values in the data.
- It should not be affected by the presence of extreme values in the data.
- A good measure is rigidly defined.
- A good measure of dispersion must be capable of further statistical analysis.
- A good measure must not be affected by the sampling size.

## 2.4 ABSOLUTE AND RELATIVE MEASURE OF DISPERSION

Two measures of dispersion are absolute measure and relative measure:

1. **Absolute measure:** the absolute measure of dispersion is expressed in the same statistical unit in which the original values of that data are expressed. For example, if the original data is represented in kilograms, the dispersion will also be represented in kilograms. Similarly, if data is represented in rupees the dispersion will also be represented in rupees. However, this measure is not useful when we have to compare two or more series that have different units of measurement or belong to different populations.
2. **Relative measure of Dispersion:** The relative measure of dispersion is independent of the unit of measurement and is expressed in pure numbers. Normally it is a ratio of the dispersion to the average of the data. It is very useful when we have to compare two different series that have different units of measurement or belong to different populations.

### Absolute Measure of Dispersion

- Range
- Quartile Deviation
- Mean Deviation
- Standard Deviation

### Relative Measure of Dispersion

- Coefficient of Range
- Coefficient of Quartile Deviation
- Coefficient of Mean Deviation
- Coefficient of Standard Deviation

## 2.5 MEASURE OF DISPERSION - RANGE

The range is one of the simplest and oldest measures of Dispersion. We can define Range as the difference between highest value of the data and the lowest value of the data. The more is the difference between highest and the lowest value, more is the value of Range which shows high dispersion. Similarly, less is the difference between the highest and lowest value, and less is value of the Range that shows less dispersion. Following is a formula for calculating the value of range:

$$\text{Range} = \text{Highest Value} - \text{Lowest Value}$$
$$\text{Value } R = H - L$$

**Coefficient of Range:** Coefficient of Range is a relative measure of Range and can be calculated using the following formula.

$$\text{Coefficient of Range} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{Highest Value} + \text{Lowest Value}} = \frac{H - L}{H + L}$$

### 2.5.1 Range in Individual Series:

**Example 1.** Following are the daily wages of workers, find out the value of Range and Coefficient of Range.

Wage (Rs.)	330	300	470	500	410	380	425	360
------------	-----	-----	-----	-----	-----	-----	-----	-----

**Solution:** Range = Highest Value – Lowest Value  
 $= 500 - 300 = 200$

$$\text{Coefficient of Range} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{Highest Value} + \text{Lowest Value}}$$
$$= \frac{500 - 300}{500 + 300} = .25$$

### 2.5.2 Range in Discrete Series:

**Example 2.** Following are the daily wages of workers, find out value of Range and Coefficient of Range.

Wage (Rs.)	300	330	360	380	410	425	470	500
No. of Workers	5	8	12	20	18	15	13	9

**Solution:** Range = Highest Value – Lowest Value  
 $= 500 - 300 = 200$

$$\text{Coefficient of Range} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{Highest Value} + \text{Lowest Value}}$$
$$= \frac{500 - 300}{500 + 300} = .25$$

### 2.5.3 Range in Continuous Series:

**Example 3.** Following are the daily wages of workers, find out value of Range and Coefficient of Range.

Wage (Rs.)	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Workers	5	8	12	20	18	15	13	9

**Solution:** Range = Highest Value – Lowest Value  
 $= 90 - 10 = 80$

$$\text{Coefficient of Range} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{Highest Value} + \text{Lowest Value}}$$
$$= \frac{90 - 10}{90 + 10} = .80$$

### 2.5.4 Merits and Limitations of Range

As far as the merits are concerned,

1. Range is one of the easiest and simplest methods of dispersion.
2. The range is a measure that is rigidly defined.

3. This method gives a broad picture of variation in the data.
4. Range is very useful in various fields of business such as quality control and checking the difference between share prices in the stock exchange.
5. Range is also useful in forecasting.

### Limitations of range

1. Range is not an exact measure of depreciation as only gives vague picture.
2. It is not based on all the values of data.
3. It is affected by the extreme values of the data.
4. It is also affected by fluctuations in the sample.
5. In the case of open-ended series range cannot be calculated.

### TEST YOUR PROGRESS (A)

1. Compute for the following data Range and Coefficient of Range

28	110	27	77	19	94	63	25	111
----	-----	----	----	----	----	----	----	-----

2. Given below are heights of students of the two classes. Compare Range of the heights:

Class I	167	162	155	180	182	175	185	158
Class II	169	172	168	165	177	180	195	167

3. Find Range and coefficient of Range

X	5	10	15	20	25	30	35	40
f	6	4	12	7	24	21	53	47

4. Calculate the coefficient of Range:

X:	10-20	20-30	30-40	40-50	50-60
F:	8	10	12	8	4

### Answers:

- 1) 92, 0.7, 2) .088, .083, 3) 35, 0.778, 4) .714

## 2.6 MEASURE OF DISPERSION – QUARTILE DEVIATION

The range is simple to calculate but suffers from the limitation that it takes into account only extreme values of the data and gives a vague picture of variation. Moreover, it cannot be calculated in case of an open-end series. In such case, we can use another method of Deviation which is Quartile Deviation or Quartile Range. The Quartile Range is the difference between Third Quartile and the First Quartile of the data. Following is a formula for calculating Quartile Range.

$$\text{Quartile Range} = Q_3 - Q_1$$

**Quartile Deviation:** Quartile deviation is the Arithmetic mean of the difference between Third Quartile and the First Quartile of the data.



$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2}$$

**Coefficient of Quartile Deviation:** Coefficient of Quartile Deviation is relative measure of Quartile Deviation and can be calculated using the following formula.

$$\text{Coefficient of Range} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

### 6.6.1 Quartile Deviation in Individual Series:

**Example 4.** Following are daily wages of workers, find out value of Quartile Range, Quartile Deviation and Coefficient of Quartile Deviation.

Wage (Rs.)	300	330	380	410	425	470	500
------------	-----	-----	-----	-----	-----	-----	-----

**Solution:**

$$Q_1 = \text{Value of } \frac{N+1}{4} \text{ th item} = \text{Value of } \frac{7+1}{4} \text{ th item}$$

$$= \text{Value of 2n item} = 330$$

$$Q_3 = \text{Value of } \frac{3(N+1)}{4} \text{ th item} = \text{Value of } \frac{3(7+1)}{4} \text{ th item}$$

$$= \text{Value of 6th item} = 470$$

$$\text{Quartile Range} = Q_3 - Q_1$$

$$= 470 - 330 = 140$$

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2}$$

$$= \frac{470 - 330}{2} = 70$$

$$\text{Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

$$= \frac{470 - 330}{470 + 330} = .175$$

### 2.6.2 Quartile Deviation in Discrete Series:

**Example 5.** Following are daily wages of workers, find out value of Quartile Range, Quartile Deviation and Coefficient of Quartile Deviation.

Wage (Rs.)	300	330	380	410	425	470	500
No. of Workers	5	8	12	20	18	15	13

**Solution:** Calculation of Quartile

Wage (Rs.) (X)	No. of Workers (f)	Cumulative Frequency (cf)
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300	5	5
330	8	13
380	12	25
410	20	45
425	18	63
470	15	78
500	13	91

$$Q_1 = \text{Value of } \frac{N+1}{4} \text{ th item} = \text{Value of } \frac{91+1}{4} \text{ th item}$$

$$= \text{Value of 23rd item} = 380$$

$$Q_3 = \text{Value of } \frac{3(N+1)}{4} \text{ th item} = \text{Value of } \frac{3(91+1)}{4} \text{ th item}$$

$$= \text{Value of 69th item} = 470$$

$$\text{Quartile Range} = Q_3 - Q_1$$

$$= 470 - 380 = 90$$

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2}$$

$$= \frac{470 - 380}{2} = 45$$

$$\text{Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

$$= \frac{470 - 380}{470 + 380} = .106$$

### 2.6.3 Quartile Deviation in Continuous

Series:

**Example 6.** Following are daily wages of workers, find out value of Quartile Range, Quartile Deviation and Coefficient of Quartile Deviation.

Wage (Rs.)	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Workers	5	8	12	20	18	15	13	9

**Solution:** Calculation of Quartile

Wage (Rs.) (X)	No. of Workers (f)	Cumulative Frequency (cf)
10-20	5	5
20-30	8	13
30-40	12	25
40-50	20	45
50-60	18	63
60-70	15	78
70-80	13	91
80-90	9	100

Calculation of  $Q_1$

$$Q_1 \text{ Class} = \text{Value of } \frac{N}{4} \text{ th item} = \text{Value of } \frac{100}{4} \text{ th item}$$

$$Q_1 \text{ Class} = \text{Value of 25th item}$$

$$Q_1 \text{ Class} = 30-40$$

$$Q_1 = L_1 + \frac{\frac{n}{4} - cf}{f} \times c$$

$$\text{Where } L_1 = 30, n = 100; cf = 13; f = 12; c = 10$$

$$Q_1 = 30 + \frac{\frac{100}{4} - 13}{12} \times 10 = 40$$

#### Calculation of $Q_3$

$$Q_3 \text{ Class} = \text{Value of } \frac{3N}{4} \text{ th item} = \text{Value of } \frac{300}{4} \text{ th item}$$

$$Q_3 \text{ Class} = \text{Value of 75th item}$$

$$Q_3 \text{ Class} = 60-70$$

$$Q_3 = L_1 + \frac{\frac{3n}{4} - cf}{f} \times c$$

$$\text{Where } L_1 = 60, n = 100; cf = 63; f = 15; c = 10$$

$$Q_3 = 60 + \frac{\frac{3(100)}{4} - 63}{15} \times 10 = 68$$

#### Calculation of Quartile Range, Quartile Deviation and Coefficient of Quartile Deviation

$$\text{Quartile Range} = Q_3 - Q_1$$

$$= 68 - 40 = 28$$

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2}$$

$$= \frac{68 - 40}{2} = 14$$

$$\text{Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

$$= \frac{68 - 40}{68 + 40} = .259$$

#### **2.6.4 Merits and Limitations of Quartile Deviation**

1. Quartile deviation is a tool which is easy to calculate and understand.
2. Quartile deviation is the best tool of dispersion in case of open-ended series.
3. This method of dispersion is better than range.
4. Unlike the range, it is not affected by the extreme values.
5. This method of dispersion is rigidly defined.

6. This method is very useful specially when we want to know the variability of middle half of the data. Under this method first 25% items that are less than  $Q_1$  and upper 25% items that are more than  $Q_3$  are excluded and only middle 50% items are taken.

### Limitations of Quartile Deviation

1. Quartile deviation considers only middle 50% items of the data and ignore rest of the items.
2. It is not possible to make any further algebraic treatment of the quartile deviation.
3. It is not based on all the items.
4. Quartile deviation is highly affected by fluctuation in the sample.
5. It is comparatively difficult to calculate quartile deviation than range.

### TEST YOUR PROGRESS (B)

1. Find Quartile deviation and coefficient of Quartile Deviation:

X: 59, 60, 65, 64, 63, 61, 62, 56, 58, 66

2. Find Quartile deviation and coefficient of Quartile Deviation:

X	58	59	60	61	62	63	64	65	66
F	15	20	32	35	33	22	20	10	8

3. Find Quartile deviation and coefficient of Quartile Deviation

X	0-100	100-200	200-300	300-400	400-500	500-600	600-700
F:	8	16	22	30	24	12	6

4. Calculate Inter Quartile Range, Q.D and coefficient of Q.D

X	0-10	10-20	20-30	30-40	0-500	50-60	60-70	70-80	80-90
F:	11	18	25	28	30	33	22	15	22

### Answers

1. 2.75, 0.0447,
2. 1.5, .024
3. 113.54, 0.335,
4. 34.84, 17.42, .3769

### 2.7 MEASURE OF DISPERSION – MEAN DEVIATION

Both Range and Quartile Deviation are positional methods of Dispersion and take into consideration only two values. Range considers only highest and lowest values while calculating Dispersion, while Quartile Deviation considers on First and Third Quartile for calculating Dispersion. Both these methods are not based on all the values of the data and are considerably affected by the sample unit. A good measure of Dispersion considers all the values of data.

Mean Deviation is a tool for measuring the Dispersion that is based on all the values of Data. Contrary to its name, it is not necessary to calculate Mean Deviation from Mean, it can also be calculated using

the Median of the data or Mode of the data. In the Mean deviation, we calculated deviations of the items of data from its Average (Mean, Median or Mode) by taking positive signs only. When we divide the sum of deviation by the number of items, we get the value of Mean Deviation. In simple words: —Mean Deviation is the value obtained by taking the arithmetic mean of the deviations obtained by deducting average of data whether Mean, Median or Mode from values of data, ignoring the signs of the deviations.¶

### 2.7.1 Mean Deviation in case of Individual Series:

As we have already discussed that Mean Deviation can be calculated from Mean, Median or Mode. Following are the formula for calculating Mean Deviation in case of Individual series.

$$\text{Mean Deviation from Mean (MD}_{\bar{X}}) = \frac{\sum |X - \bar{X}|}{n} = \frac{\sum |D_X|}{n}$$

$$\text{Mean Deviation from Median (MD}_M) = \frac{\sum |X - M|}{n} = \frac{\sum |D_M|}{n}$$

$$\text{Mean Deviation from Mode (MD}_Z) = \frac{\sum |X - Z|}{n} = \frac{\sum |D_Z|}{n}$$

In case we want to calculate Coefficient of Mean Deviation, it can be done using the following formulas.

$$\text{Coefficient of Mean Deviation from Mean (MD}_{\bar{X}}) = \frac{MD_{\bar{X}}}{\bar{X}}$$

$$\text{Coefficient of Mean Deviation from Median (MD}_M) = \frac{MD_M}{M}$$

$$\text{Coefficient of Mean Deviation from Mode (MD}_Z) = \frac{MD_Z}{Z}$$

**Example 7.** Following are the marks obtained by Students of a class in a test. Calculated Mean Deviation from (i) Mean (ii) Median (iii) Mode. Also calculate Coefficient of Mean Deviation.

Wage (Rs.)	5	7	8	8	9	11	13	14	15
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**Solution:** Let us calculate Mean Median and Mode

$$\text{Mean } (\bar{X}) = \frac{5+7+8+8+9+11+13+14+15}{9} = \frac{90}{9} = 10$$

$$\begin{aligned} \text{Median (M)} &= \text{Value of } \frac{N+1}{2} \text{ th item} = \text{Value of } \frac{9+1}{2} \text{ th item} \\ &= \text{Value of 5th item} = 9 \end{aligned}$$

Mode = Item having maximum frequency i.e. 8.

## Calculation of Deviations

Marks X	$D_X =  X - \bar{X} $ (Where $\bar{X} = 10$ )	$D_M =  X - M $ (Where $M = 9$ )	$D_Z =  X - Z $ (Where $Z = 8$ )
5	5	4	3
7	3	2	1
8	2	1	0
8	2	1	0
9	1	0	1
11	1	2	3
13	3	4	5
14	4	5	6
15	5	6	7
	$\sum D_X = 26$	$\sum D_M = 25$	$\sum D_Z = 26$

1. **Mean Deviation from Mean**  
 $(MD_{\bar{X}}) = \frac{\sum |X - \bar{X}|}{n} = \frac{\sum |D_X|}{n} = \frac{26}{9} = 2.88$

**Coefficient of Mean Deviation from Mean**  $(MD_{\bar{X}}) = \frac{MD_{\bar{X}}}{\bar{X}} = \frac{2.88}{10} = .288$

2. **Mean Deviation from Median**  
 $(MD_M) = \frac{\sum |X - M|}{n} = \frac{\sum |D_M|}{n} = \frac{25}{9} = 2.78$

**Coefficient of Mean Deviation from Median**  $(MD_M) = \frac{MD_M}{M} = \frac{2.78}{9} = .309$

3. **Mean Deviation from Mode**  
 $(MD_Z) = \frac{\sum |X - Z|}{n} = \frac{\sum |D_Z|}{n} = \frac{26}{9} = 2.88$

**Coefficient of Mean Deviation from Mode**  $(MD_Z) = \frac{MD_Z}{Z} = \frac{2.88}{8} = .36$

### 2.7.2 Mean Deviation in case of Discrete Series:

Following is the formula for calculating Mean Deviation in case of Discrete series.

$$\text{Mean Deviation from Mean } (MD_{\bar{X}}) = \frac{\sum f|X - \bar{X}|}{n} = \frac{\sum f|D_X|}{n}$$

$$\text{Mean Deviation from Median } (MD_M) = \frac{\sum f|X - M|}{n} = \frac{\sum f|D_M|}{n}$$

$$\text{Mean Deviation from Mode } (MD_Z) = \frac{\sum f|X - Z|}{n} = \frac{\sum f|D_Z|}{n}$$

**Example 8.** Following are the wages of workers that are employed in a factory. Calculate Mean Deviation from (i) Mean (ii) Median (iii) Mode. Also, calculate Coefficient of Mean Deviation.

Wage (Rs.)	300	330	380	410	425	470	500
No. of Workers	6	8	15	25	18	15	13

**Solution:** Let us calculate Mean Median and Mode

X	F	fX	cf
300	5	1500	5
330	8	2640	13
380	15	5700	28
410	26	10660	54
425	18	7650	72
470	15	7050	87
500	13	6500	100
		<b><math>\Sigma X = 41700</math></b>	

$$\text{Mean } (\bar{X}) = \frac{\Sigma X}{n} = \frac{41700}{100} = 417$$

$$\begin{aligned} \text{Median (M)} &= \text{Value of } \frac{N+1}{2} \text{ th item} = \text{Value of } \frac{100+1}{2} \text{ th item} \\ &= \text{Value of 50.5 item} = 410 \end{aligned}$$

Mode = Item having maximum frequency i.e. 410.

#### Calculation of Deviations

X	f	$D_{\bar{X}} =  X - \bar{X} $ ( $\bar{X} = 417$ )	$fD_{\bar{X}}$	$D_M =  X - M $ ( $M = 410$ )	$fD_M$	$D_Z =  X - Z $ ( $Z = 410$ )	$fD_Z$
300	5	117	585	110	550	110	550
330	8	87	696	80	640	80	640
380	15	37	555	30	450	30	450
410	26	7	182	0	0	0	0
425	18	8	144	15	270	15	270
470	15	53	795	60	900	60	900
500	13	83	1079	90	1170	90	1170
			$\Sigma fD_{\bar{X}} = 4036$		$\Sigma fD_M = 3980$	$\Sigma D_Z = 26$	$\Sigma fD_Z = 3980$

$$1. \text{ Mean Deviation from Mean } (MD_{\bar{X}}) = \frac{\Sigma f|X - \bar{X}|}{n} = \frac{\Sigma fD_{\bar{X}}}{n} = \frac{4036}{100} = 40.36$$

$$\text{Coefficient of Mean Deviation from Mean } (MD_{\bar{X}}) = \frac{MD_{\bar{X}}}{\bar{X}} = \frac{40.36}{417} = .097$$

$$2. \text{ Mean Deviation from Median } (MD_M) = \frac{\Sigma f|X - M|}{n} = \frac{\Sigma fD_M}{n} = \frac{3980}{100} = 39.80$$

$$\text{Coefficient of Mean Deviation from Median } (MD_M) = \frac{MD_M}{M} = \frac{39.80}{410} = .097$$

$$3. \text{ Mean Deviation from Mode } (MD_Z) = \frac{\Sigma f|X - Z|}{n} = \frac{\Sigma fD_Z}{n} = \frac{3980}{100} = 39.80$$

$$\text{Coefficient of Mean Deviation from Mode } (MD_Z) = \frac{MD_Z}{Z} = \frac{39.80}{410} = .097$$

#### 2.7.3 Mean Deviation in case of Continuous Series:

In case of calculation of Mean Deviation in continuous series, the formula will remain same as we have done in Discrete Series but only difference is that instead of taking deviation from Data, we take

deviations from mid value of the data. Further in case of continuous series also the Mean Deviation can be calculated from Mean, Median or Mode. However, in most of the cases it is calculated from Median. Following formulas are used for continuous series:

$$\text{Mean Deviation from Mean (MD}_{\bar{X}}) = \frac{\sum f|X - \bar{X}|}{n} = \frac{\sum f|D_{\bar{X}}|}{n}$$

$$\text{Mean Deviation from Median (MD}_M) = \frac{\sum f|X - M|}{n} = \frac{\sum f|D_M|}{n}$$

$$\text{Mean Deviation from Mode (MD}_Z) = \frac{\sum f|X - Z|}{n} = \frac{\sum f|D_Z|}{n}$$

**Example 9.** Following are daily wages of workers, find out value of Mean Deviation and Coefficient of Mean Deviation.

Wage (Rs.)	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Workers	5	8	12	20	18	15	13	9

**Solution:**

Wage (Rs.) (X)	No. of Workers (f)	Cumulative Frequency (cf)	Mid Value m	D <sub>M</sub>    m – M	f D <sub>M</sub>
10-20	5	5	15	37.78	188.9
20-30	8	13	25	27.78	222.24
30-40	12	25	35	17.78	213.36
40-50	20	45	45	7.78	155.6
50-60	18	63	55	2.22	39.96
60-70	15	78	65	12.22	183.3
70-80	13	91	75	22.22	288.86
80-90	9	100	85	32.22	289.98
	<b>N = 100</b>				<b>∑  f D<sub>M</sub>  = 1582.2</b>

Calculation of Median

$$\text{Median Class} = \text{Value of } \frac{N}{2} \text{ th item} = \text{Value of } \frac{100}{2} \text{ th item}$$

$$\text{Median Class} = \text{Value of 50th item}$$

$$\text{Median Class} = 50-60$$

$$M = L_1 + \frac{\frac{n}{2} - cf}{f} \times c$$

Where  $L_1 = 50$ ,  $n = 100$ ;  $cf = 45$ ;  $f = 18$ ;  $c = 10$

$$M = 50 + \frac{\frac{100}{2} - 45}{18} \times 10 = 52.78$$



### Calculation of Mean Deviation from Median

$$\text{Mean Deviation from Median (MD}_M) = \frac{\sum f|X-M|}{n} = \frac{\sum f|D_M|}{n} = \frac{1582.2}{100} = 15.82$$

$$\text{Coefficient of Mean Deviation from Median (MD}_M) = \frac{MD_M}{M} = \frac{15.82}{52.78} = .30$$

### **2.7.4 Merits and Limitations of Mean Deviation**

1. We can calculate mean deviation very easily.
2. Mean deviation is based on all the items of the Data. Change in any value of the data is also going to affect mean deviation.
3. As it is based on all the items of the data, it is not affected by the extreme values of the data.
4. Mean deviation can be calculated from Mean, Median or Mode.
5. Mean deviation is a rigidly defined method of measuring dispersion.
6. Mean deviation can be used for comparison of two different series.

### **Limitations of Mean Deviation**

1. While calculating the mean deviation, we consider only positive sign and ignore the negative sign.
2. In case mean deviation is calculated from mode, it is not a reliable measure of dispersion as mode is not a true representative of the series.
3. It is very difficult to calculate Mean Deviation in case of open-ended series.
4. Mean deviation is not much capable of further statistical calculations.
5. In case we have Mean Deviation of two different series, we cannot calculate combined mean deviation of the data.
6. In case value of Mean, Median or Mode is in fraction, it is difficult to calculate mean deviation.

### **TEST YOUR PROGRESS (C)**

1. Calculate Mean Deviation from i) Mean, ii) Median, iii) Mode

X: 7, 4, 10, 9, 15, 12, 7, 9, 7

2. With Median as base calculate Mean Deviation of two series and compare variability:

Series A: 3484 4572 4124 3682 5624 4388 3680 4308

Series B: 487 508 620 382 408 266 186 218

3. Calculate Co-efficient of mean deviation from Mean, Median and Mode from the following data

X: 4 6 8 10 12 14 16

f: 2 1 3 6 4 3 1

4. Calculate Co-efficient of Mean Deviation from Median.

X; 20-25 25-30 30-40 40-45 45-50 50-55 55-60 60-70 70-80

F: 7 13 16 28 12 9 7 6 2

### 5. Calculate M.D. from Mean and Median

X	0-10	10-20	20-30	30-40	40-50
f	6	28	51	11	4

### 6. Calculate Co-efficient of Mean Deviation from Median.

X;	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
F:	8	13	15	20	11	7	3	2	1

### Answers

1. 2.35, 2.33, 2.56,      2. 11.6%, 30.73%,      3. 0.239, 0.24, 0.24,      4.      0.214

5. M.D. (Mean) =6.572, Coefficient of M.D. (Mean) =0.287, M.D. (Median) =6.4952,      Coefficient of M.D. (Median) 0.281,      6.      0.22

## 2.8 MEASURE OF DISPERSION – STANDARD DEVIATION

Standard deviation is assumed as best method of calculating deviations. This method was given by great statistician Karl Pearson in the year 1893. In case of Mean deviation, when we take deviations from the actual mean, the sum of deviations is always zero. To avoid this problem, we have to ignore the sign of the deviations. However, in case of Standard Deviation this problem is solved by taking the square of the deviations because when we take a square of the negative sign, it is also converted into the positive sign. Then after calculating the Arithmetic mean of the deviations, we again take square root, to find out standard deviation. In other words, we can say that —Standard Deviation is the square root of the Arithmetic mean of the squares of deviation of the item from its Arithmetic mean.¶

The standard deviation is always calculated from the Arithmetic mean and is an absolute measure of finding the dispersion. We could also find a relative measure of standard deviation which is known as coefficient of standard deviation.

**Coefficient of Standard Deviation** – Coefficient of Deviation is the relative measure of the standard deviation and can be calculated by dividing the Value of Standard Deviation with the Arithmetic Mean. The value of coefficient always lies between 0 and 1, where 0 indicates no Standard Deviation and 1 indicated 100% standard deviation. Following is the formula for calculating coefficient of Standard Deviation.

$$\text{Coefficient of Standard Deviation} = \frac{SD}{\bar{X}}$$

**Coefficient of Variation** – Coefficient of Variation is also relative measure of the standard deviation, but unlike Coefficient of Standard Deviation it is not represented in fraction rather it is represented in terms of % age. It can be calculated by dividing the Value of Standard Deviation with the Arithmetic Mean and then multiplying resulting figure with 100. The value of coefficient always lies between 0 and 100. Following is the formula for calculating coefficient of Standard Deviation. Low Coefficient of

Variation implies less variation, more uniformity and reliability. Contrary to this higher Coefficient of Variation implies more variation, less uniformity and reliability.

$$\text{Coefficient of Standard Deviation} = \frac{SD}{\bar{X}} \times 100$$

**Variance** – Variance is the square of the Standard Deviation. In other words, it is Arithmetic mean of square of Deviations taken from Actual Mean of the data. This term was first time used by R. A. Fischer in 1913. He used Variance in analysis of financial models. Mathematically:

$$\text{Variance} = (\text{Standard Deviation})^2 \text{ or } \sigma^2$$

### 2.8.1 Standard Deviation in case of Individual Series

Following are the formula for calculating Standard Deviation in case of the Individual Series:

- 1. Actual Mean Method** – In this method we take deviations from actual mean of the data.

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\sum x^2}{n}}$$

Where  $x = X - \bar{X}$ ,  $n$  = Number of Items.

- 2. Assumed Mean Method** - In this method we take deviations from assumed mean of the data. Any number can be taken as assumed mean, however for sake of simplicity it is better to take whole number as assumed mean.

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\sum dx^2}{n} - \left(\frac{\sum dx}{n}\right)^2}$$

Where  $dx = X - A$ ,  $n$  = Number of Items.

- 3. Direct Methods** - In this method we don't take deviations and standard deviation is calculated directly from the data.

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\sum X^2}{n} - \left(\frac{\sum X}{n}\right)^2}$$

**Example 10.** Following are the marks obtained by Students of a class in a test. Calculate Standard Deviation using (i) Actual Mean (ii) Assumed Mean (iii) Direct Method. Also calculate Coefficient of Standard Deviation.

Marks	5	7	11	16	15	12	18	12
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**Solution:**

#### 1. Standard Deviation using Actual Mean

Marks X	$x = X - \bar{X}$ (Where $\bar{X} = 12$ )	$x^2$
5	-7	49
7	-5	25
11	-1	01
16	4	16

15	3	09
12	0	00
18	6	36
12	0	00
<b><math>\sum X = 96</math></b>		<b><math>\sum x^2 = 136</math></b>

$$\text{Mean } (\bar{X}) = \frac{\sum X}{n} = \frac{96}{8} = 12$$

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\sum x^2}{n}} = \sqrt{\frac{136}{8}} = \sqrt{17} = 4.12$$

$$\text{Coefficient of Standard Deviation} = \frac{SD}{\bar{X}} = \frac{4.12}{12} = .34$$

## 2. Standard Deviation using Assumed Mean

<b>Marks X</b>	<b>dx = X - A (Where A = 11)</b>	<b>dx<sup>2</sup></b>
5	-6	36
7	-4	16
11	0	00
16	5	25
15	4	16
12	1	01
18	7	49
12	1	01
<b><math>\sum X = 96</math></b>	<b><math>\sum dx = 8</math></b>	<b><math>\sum dx^2 = 144</math></b>

$$\text{Mean } (\bar{X}) = A + \frac{\sum dx}{n} = 11 + \frac{8}{8} = 12$$

$$\text{Standard Deviation } (\sigma) = \sqrt{\frac{\sum dx^2}{n} - \left(\frac{\sum dx}{n}\right)^2} = \sqrt{\frac{144}{8} - \left(\frac{8}{8}\right)^2} = \sqrt{18 - 1} = \sqrt{17} = 4.12$$

$$\text{Coefficient of Standard Deviation} = \frac{SD}{\bar{X}} = \frac{4.12}{12} = .34$$

## 3. Standard Deviation by Direct Method

<b>Marks X</b>	<b>X<sup>2</sup></b>
5	25
7	49
11	121
16	256
15	225
12	144
18	324
12	144
<b><math>\sum X = 96</math></b>	<b><math>\sum X^2 = 1288</math></b>

$$\text{Mean } (\bar{X}) = \frac{\sum X}{n} = \frac{96}{8} = 12$$

$$\text{Standard Deviation } (\sigma) = \sqrt{\frac{\sum X^2}{n} - \left(\frac{\sum X}{n}\right)^2} = \sqrt{\frac{1288}{8} - \left(\frac{96}{8}\right)^2} = \sqrt{161 - 144} = \sqrt{17} = 4.12$$

$$\text{Coefficient of Standard Deviation} = \frac{SD}{\bar{X}} = \frac{4.12}{12} = .34$$

**Example 11.** Two Players scored following scores in 10 cricket matches. On base of their performance find out which is better scorer and also find out which player is more consistent.

Player X	26	24	28	30	35	40	25	30	45	17
Player Y	10	15	24	26	34	45	25	31	20	40

**Solution: Mean and Standard Deviation of Player X**

Score X	$x = X - \bar{X}$ (Where $\bar{X} = 30$ )	$x^2$
26	-4	16
24	-6	36
28	-2	2
30	0	0
35	5	25
40	10	100
25	-5	25
30	0	0
45	15	225
17	-13	169
<b><math>\sum X = 300</math></b>		<b><math>\sum x^2 = 600</math></b>

$$\text{Mean } (\bar{X}) = \frac{\sum X}{n} = \frac{300}{10} = 30$$

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\sum x^2}{n}} = \sqrt{\frac{600}{10}} = \sqrt{60} = 7.746$$

$$\text{Coefficient of Variation} = \frac{SD}{\bar{X}} \times 100 = \frac{7.746}{30} \times 100 = 25.82\%$$

**Mean and Standard Deviation of Player Y**

Score Y	$y = Y - \bar{Y}$ (Where $\bar{Y} = 27$ )	$y^2$
10	-17	289
15	-12	144
24	-3	9
26	-1	1
34	7	49
45	18	324
25	-2	4

31	4	16
20	-7	49
40	13	169
$\Sigma X = 270$		$\Sigma x^2 = 1054$

$$\text{Mean } (\bar{Y}) = \frac{\Sigma Y}{n} = \frac{270}{10} = 27$$

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\Sigma y^2}{n}} = \sqrt{\frac{1054}{10}} = \sqrt{105.40} = 10.27$$

$$\text{Coefficient of Variation} = \frac{SD}{Y} \times 100 = \frac{10.27}{27} \times 100 = 38.02\%$$

Conclusion:

1. As average score of Player X is more than Player Y, he is better scorer.
2. As Coefficient of Variation of Player X is less than Player Y, he is more consistent also.

### 2.8.2 Standard Deviation in case of Discrete Series

Following are the formula for calculating Standard Deviation in case of the Discrete Series:

1. **Actual Mean Method** – In this method we take deviations from actual mean of the data.

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\Sigma fx^2}{n}}$$

Where  $x = X - \bar{X}$ ,  $f$  = Frequency,  $n$  = Number of Items.

2. **Assumed Mean Method** - In this method we take deviations from assumed mean of the data.

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\Sigma fdx^2}{n} - \left(\frac{\Sigma fdx}{n}\right)^2}$$

Where  $dx = X - A$ ,  $n$  = Number of Items.

3. **Direct Methods** - In this method we don't take deviations and standard deviation is calculated directly from the data.

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\Sigma fx^2}{n} - \left(\frac{\Sigma fx}{n}\right)^2}$$

**Example 12.** Following are the marks obtained by Students of a class in a test. Calculate Standard Deviation using (i) Actual Mean (ii) Assumed Mean (iii) Direct Method.

Marks	5	10	15	20	25	30	35
Frequency	2	7	11	15	10	4	1

**Solution: 1. Standard Deviation using Actual Mean**

Marks X	f	fX	$x = X - \bar{X}$ ( $\bar{X} = 19$ )	$x^2$	$fx^2$
5	2	10	-14	196	392
10	7	70	-9	81	567
15	11	165	-4	16	176
20	15	300	1	1	15

25	10	250	6	36	360
30	4	120	11	121	484
35	1	35	16	256	256
	<b>N = 50</b>	<b>ΣfX = 950</b>			<b>Σx<sup>2</sup> = 2250</b>

$$\text{Mean } (\bar{X}) = \frac{\Sigma fX}{n} = \frac{950}{50} = 19$$

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\Sigma fx^2}{n}} = \sqrt{\frac{2250}{50}} = \sqrt{45} = 6.708$$

## 2. Standard Deviation using Assumed Mean

Marks X	f	dx = X - A (A = 20)	dx <sup>2</sup>	fdx	fdx <sup>2</sup>
5	2	-15	225	-30	450
10	7	-10	100	-70	700
15	11	-5	25	-55	275
20	15	0	0	0	0
25	10	5	25	50	250
30	4	10	100	40	400
35	1	15	225	15	225
	<b>N = 50</b>			<b>Σfdx = -50</b>	<b>Σfdx<sup>2</sup> = 2300</b>

$$\begin{aligned} \text{Standard Deviation } (\sigma) &= \sqrt{\frac{\Sigma fdx^2}{n} - \left(\frac{\Sigma fdx}{n}\right)^2} \\ &= \sqrt{\frac{2300}{50} - \left(\frac{-50}{50}\right)^2} = \sqrt{46 - 1} = \sqrt{45} = 6.708 \end{aligned}$$

## 3. Standard Deviation using Direct Method

Marks (X)	f	X <sup>2</sup>	fX	fX <sup>2</sup>
5	2	25	10	125
10	7	70	70	700
15	11	225	165	2475
20	15	400	300	6000
25	10	625	250	6250
30	4	900	120	3600
35	1	1225	35	1225
	<b>N = 50</b>		<b>ΣfX = 950</b>	<b>ΣfX<sup>2</sup> = 20300</b>

$$\begin{aligned} \text{Standard Deviation } (\sigma) &= \sqrt{\frac{\Sigma fX^2}{n} - \left(\frac{\Sigma fX}{n}\right)^2} \\ &= \sqrt{\frac{20300}{50} - \left(\frac{950}{50}\right)^2} = \sqrt{406 - 361} = \sqrt{45} = 6.708 \end{aligned}$$

### 2.8.3 Standard Deviation in case of Continuous Series

In case of continuous series, the calculation will remain same as in case of discrete series but the only difference is that instead of taking deviations from data, deviations are taken from Mid value of the data. Formulas are same as discussed above for discrete series.

**Example 13.** Following are the marks obtained by Students of a class in a test. Calculate Standard Deviation using (i) Actual Mean (ii) Assumed Mean (iii) Direct Method. Also calculate coefficient of variation and Variance.

Marks	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	2	7	11	15	10	4	1

**Solution: 1. Standard Deviation using Actual Mean**

Marks X	m	f	fX	$x = m - \bar{X}$ ( $\bar{X} = 21.5$ )	$x^2$	$fx^2$
5-10	7.5	2	15	-14	196	392
10-15	12.5	7	87.5	-9	81	567
15-20	17.5	11	192.5	-4	16	176
20-25	22.5	15	337.5	1	1	15
25-30	27.5	10	275	6	36	360
30-35	32.5	4	130	11	121	484
35-40	37.5	1	37.5	16	256	256
		<b>N = 50</b>	<b><math>\sum fX = 1075</math></b>			<b><math>\sum x^2 = 2250</math></b>

$$\text{Mean } (\bar{X}) = \frac{\sum fX}{n} = \frac{1075}{50} = 21.5$$

$$\text{Standard Deviation (SD or } \sigma) = \sqrt{\frac{\sum fx^2}{n}} = \sqrt{\frac{2250}{50}} = \sqrt{45} = 6.708$$

**2. Standard Deviation using Assumed Mean**

Marks X	m	f	$dx = X - A$ ( $A = 22.5$ )	$dx^2$	$fdx$	$fdx^2$
5-10	7.5	2	-15	225	-30	450
10-15	12.5	7	-10	100	-70	700
15-20	17.5	11	-5	25	-55	275
20-25	22.5	15	0	0	0	0
25-30	27.5	10	5	25	50	250
30-35	32.5	4	10	100	40	400
35-40	37.5	1	15	225	15	225
		<b>N = 50</b>			<b><math>\sum fdx = -50</math></b>	<b><math>\sum fdx^2 = 2300</math></b>

$$\begin{aligned} \text{Standard Deviation } (\sigma) &= \sqrt{\frac{\sum fdx^2}{n} - \left(\frac{\sum fdx}{n}\right)^2} \\ &= \sqrt{\frac{2300}{50} - \left(\frac{-50}{50}\right)^2} = \sqrt{46 - 1} = \sqrt{45} = 6.708 \end{aligned}$$



### 3. Standard Deviation using Direct Method

Marks X	m	f	X <sup>2</sup>	fX	fX <sup>2</sup>
5-10	7.5	2	56.25	15	112.5
10-15	12.5	7	156.25	87.5	1093.75
15-20	17.5	11	306.25	192.5	3368.75
20-25	22.5	15	506.25	337.5	7593.75
25-30	27.5	10	756.25	275	7562.5
30-35	32.5	4	1056.25	130	4225
35-40	37.5	1	1406.25	37.5	1406.25
		<b>N = 50</b>		<b>ΣfX = 1075</b>	<b>ΣfX<sup>2</sup> = 25366.5</b>

$$\text{Standard Deviation } (\sigma) = \sqrt{\frac{\sum fX^2}{n} - \left(\frac{\sum fX}{n}\right)^2} = \sqrt{\frac{25366.5}{50} - \left(\frac{1075}{50}\right)^2} = \sqrt{507.25 - 462.25}$$

$$= \sqrt{45} = 6.708$$

$$\text{Coefficient of Standard Deviation} = \frac{SD}{\bar{X}} \times 100 = \frac{6.708}{21.5} \times 100 = 31.2\%$$

$$\text{Variance} = (\text{Standard Deviation})^2 \text{ or } \sigma^2 = (6.708)^2 = 45$$

#### 2.8.4 Combined Standard Deviation

The main benefit of standard deviation is that if we know the mean and standard deviation of two or more series, we can calculate combined standard deviation of all the series. This feature is not available in other measures of dispersion. That's why we assume that standard deviation is best measure of finding the dispersion. Following formula is used for this purpose:

$$\sigma_{123} = \sqrt{\frac{n_1 \sigma_1^2 + n_2 \sigma_2^2 + n_3 \sigma_3^2 + n_1 d_1^2 + n_2 d_2^2 + n_3 d_3^2}{n_1 + n_2 + n_3}}$$

Where,  $n_1, n_2, n_3$  = number of items in series 1, 2 and 3

$\sigma_1, \sigma_2, \sigma_3$  = standard deviation of series 1, 2 and 3

$d_1, d_2, d_3$  = difference between mean of the series and combined mean for 1, 2 and 3.

**Example14. Find the combined standard deviation for the following data**

	Firm A	Firm B
. of Wage Workers	70	60
verage Daily Wage (Rs. )	40	35
D of wages	8	10

**Solution:** Combined mean wage of all the workers in the two firms will be

$$\bar{X}_{12} = \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2}{N_1 + N_2}$$

Where  $N_1$  = Number of workers in

Firm A  $N_2$  = Number of workers in

Firm B

$\bar{X}_1$  = Mean wage of workers in Firm A

and  $\bar{X}_2$  = Mean wage of workers in Firm

B We are given that

$$N_1 = 70 \quad N_2 = 60$$

$$\bar{X}_1 = 40 \quad \bar{X}_2 = 35$$

$\therefore$  Combined Mean,  $\bar{X}_{12}$

$$= \frac{(70 \times 40) + (60 \times 35)}{70 + 60}$$

$$= \frac{4900}{130}$$

$$= \text{Rs. } 37.69$$

$$\text{Combined Standard Deviation} = \sigma_{123} = \sqrt{\frac{n_1 \sigma_1^2 + n_2 \sigma_2^2 + n_1 d_1^2 + n_2 d_2^2}{n_1 + n_2}}$$

$$d_1 = 40 - 37.69 = 2.31$$

$$d_2 = 35 - 37.69 = -2.69$$

$$\sigma_{123} = \sqrt{\frac{70(8)^2 + 60(10)^2 + 70(2.31)^2 + 60(-2.69)^2}{70 + 60}} = 9.318$$

### Example 15. Find the missing values

	Firm A	Firm B	Firm C	Combined
Number of Wage Workers	50	?	90	200
Average Daily Wage (Rs.)	113	?	115	116
Standard Deviation of wages	6	7	?	7.746

**Solution:** Combined  $n = n_1 + n_2 + n_3$

$$200 = 50 + n_2 + 90, \quad N_2 = 60$$

Now Combined mean wage of all the workers in the two firms will be

$$\bar{X}_{12} = \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2 + N_3 \bar{X}_3}{N_1 + N_2 + N_3}$$

We are given that

$$N_1 = 50, N_2 = 60, N_3 = 90, \bar{X}_1 = 113, \bar{X}_2 = ?, \bar{X}_3 = 115, \bar{X}_{123} = 116$$

$\therefore$  Combined Mean,  $\bar{X}_{12}$

$$116 = \frac{(50 \times 113) + (60 \times \bar{X}_2) + (90 \times 115)}{50 + 60 + 90}$$

$$116 = \frac{565 + (60 \times \bar{X}_2) + 1035}{50 + 60 + 90}$$

$$2320 = 1600 + 6 \bar{X}_2$$

$$\bar{X}_2 = 120$$

$$\text{Combined Standard Deviation} = \sigma_{123} = \sqrt{\frac{n_1 \sigma_1^2 + n_2 \sigma_2^2 + n_3 \sigma_3^2 + n_1 d_1^2 + n_2 d_2^2 + n_3 d_3^2}{n_1 + n_2 + n_3}}$$

$$d_1 = 113 - 116 = -3, \quad d_2 = 120 - 116 = 4, \quad d_3 = 115 - 116 = -1$$

$$\sigma_{123} = \sqrt{\frac{50(6)^2 + 60(7)^2 + 90(\sigma_3)^2 + 50(-3)^2 + 60(4)^2 + 90(-1)^2}{50 + 60 + 90}} = 7.746$$

Squaring both sides

$$60 = \frac{180 + 294 + 9\sigma_3^2 + 45 + 96 + 9}{200}$$

$$1200 = 9\sigma_3^2 + 624$$

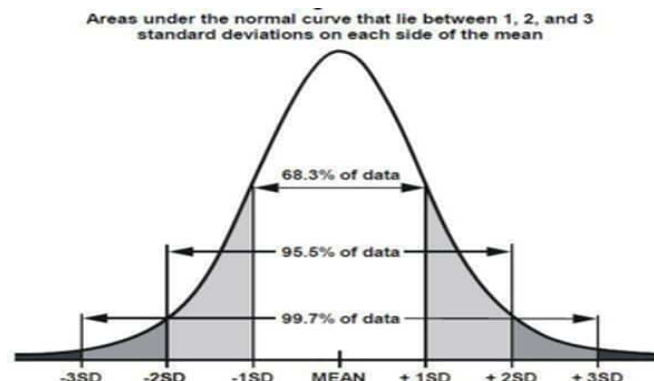
$$\sigma_3 = 8$$

## 2.8.5 Properties of Standard Deviation

1. Standard Deviation of first 'n' natural numbers is  $\sqrt{\frac{n^2 - 1}{12}}$
2. It is independent of change in origin it means it is not affected even if some constant is added or subtracted from all the values of the data.
3. It is not independent of change in scale. So, if we divide or multiply all the values of the data with some constant, Standard Deviation is also multiplied or divided by the same constant.
4. We can calculate combined Standard Deviation by following the formula:

$$\sigma_{123} = \sqrt{\frac{n_1 \sigma_1^2 + n_2 \sigma_2^2 + n_3 \sigma_3^2 + n_1 d_1^2 + n_2 d_2^2 + n_3 d_3^2}{n_1 + n_2 + n_3}}$$

5. In case of normal distribution following results are found:



68.27% item lies within the range of:  $\bar{X} \pm \sigma$

95.45% item lies within the range of:  $\bar{X} \pm 2\sigma$

99.73% item lies within the range of:  $\bar{X} \pm 3\sigma$

6. In case of normal distribution there is relation between Quartile Deviation, Mean Deviation and Standard Deviation which is as follows:

$$6 (Q.D.) = 5 (M.D.) = 4 (S.D.)$$

7. In perfect symmetric distribution following result follows:

$$\text{Range} = 6 (S.D.)$$

8. When we take square of Standard Deviation it is called Variance.

$$\text{Variance} = (S.D.)^2$$

### 2.8.6 Merits and Limitations of Standard Deviation

1. It is rigidly defined.
2. It is the best measure to find out deviations.
3. It is based on arithmetic mean.
4. It is based on all the values.
5. We can find the combined standard deviation of different series under this.
6. It is capable of further algebraic treatment.
7. By finding the coefficient of variation, we can compare two different series.

#### Limitations of Standard Deviation

1. It is comparatively difficult to calculate.
2. It is mostly affected by extreme values.
3. Common people are not aware of the concept of standard deviation.

### TEST YOUR PROGRESS (D)

1. Calculate Standard Deviation and find Variance:

X:	5	7	11	16	15	12	18	12
----	---	---	----	----	----	----	----	----

2. Two Batsmen X and Y score following runs in ten matches. Find who is better Scorer and who is more consistent.

X:	26	24	28	30	35	40	25	30	45	17
Y:	10	15	24	26	34	45	25	31	20	40

3. Calculate S.D, coefficient of SD, coefficient of Variation:

X	15	25	35	45	55	65
f	2	4	8	20	12	4

4. Find Standard Deviation.

X:	5-10	10-15	15-20	20-25	25-30	30-35
F:	2	9	29	24	11	6

**Answers:** 1) 4.12, 16.97, 2) X is better and consistent, X means 30 CV 25.82%, Y means 27 CV 38.02%, 3) 11.83, 0.265, 26.5%, 4) 5.74

## 2.10 SUM UP

- Dispersion shows whether the average is a good representative of the series or not.
- High dispersion means values differ more than their average.
- There are two measures of dispersion, Absolute measure and relative measure.
- four methods can be used for measuring the dispersion namely, Range, Quartile Deviation, Mean Deviation and Dispersion.
- Mean deviation can be calculated from Mean, Median or Mode
- Standard Deviation is the best measure of Dispersion.
- If we know the standard deviation of two series, we can calculate the combined standard deviation.

## 2.11 KEY TERMS

- **Dispersion:** Dispersion shows the extent to which individual items in the data differs from its average. It is a measure of the difference between data and the individual items. It indicates that how that are lacks the uniformity.
- **Range:** Range is the difference between highest value of the data and the lowest value of the data. The more is the difference between highest and the lowest value, more is the value of Range which shows high dispersion.
- **Quartile Deviation:** Quartile deviation is the Arithmetic mean of the difference between Third Quartile and the First Quartile of the data.
- **Mean Deviation:** Mean Deviation is the value obtained by taking arithmetic mean of the deviations obtained by deducting average of data whether Mean, Median or Mode from values of data, ignoring the signs of the deviations.
- **Standard Deviation:** Standard Deviation is the square root of the Arithmetic mean of the squares of deviation of the item from its Arithmetic mean.
- **Variance:** It is square of Standard Deviation.

- **Absolute Measure:** Absolute measure of dispersion is one which is expressed in the same statistical unit in which the original values of that data are expressed. For example, if original data is represented in kilograms, the dispersion will also be represented in kilogram.
- **Relative Measure:** The relative measure of dispersion is independent of unit of measurement and is expressed in pure number. Normally it is a ratio of the dispersion to the average of the data.
- **Coefficient of Standard Deviation:** Coefficient of Deviation is the relative measure of the standard deviation and can be calculated by dividing the Value of Standard Deviation with the Arithmetic Mean. The value of coefficient always lies between 0 and 1, where 0 indicates no Standard Deviation and 1 indicated 100% standard deviation.

## 2.12 QUESTIONS FOR PRACTICE

### Short Answer Type

- Q1. What is Dispersion?
- Q2. What are absolute and relative measure of dispersion?
- Q3. What is range?
- Q4. What is mean deviation?
- Q5. What are Quartile deviations? Give its merits and limitations.

### Long Answer Type

- Q6. What are uses of measuring Dispersion?
- Q7. What are the features of good measure of Dispersion.
- Q8. Give its merits and limitations of Range.
- Q9. How to calculate mean deviation. Give its merits and limitations.
- Q10. What is standard deviation? How it is calculated. Give its merits and limitations.
- Q11. How combined standard deviation can be calculated.
- Q12. Give properties of standard deviation.

## 2.13 FURTHER READINGS

- J. K. Sharma, Business Statistics, Pearson Education.
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**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 3: CORRELATION ANALYSIS**

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**STRUCTURE**

**3.0 Objectives**

**3.1 Introduction**

**3.2 Meaning of Correlation**

**3.3 Uses of Correlation**

**3.4 Types of Correlation**

**3.5 Degrees of Correlation**

**3.6 Scatter Diagram Method**

**3.7 Properties of Correlation**

**3.8 Meaning Karl Pearson's Coefficient of Correlation**

**3.9 Different methods to calculate Coefficient of Correlation**

**3.9.1 Direct Method of Karl Pearson's Coefficient of Correlation**

**3.9.2 Actual Mean Method of Karl Pearson's Coefficient of Correlation**

**3.9.3 Assumed Mean Method of Karl Pearson's Coefficient of Correlation**

**3.9.4 Step Deviation Method of Karl Pearson's Coefficient of Correlation**

**3.9.5 Karl Pearson's Coefficient of Correlation from Standard Deviation**

**3.9.6 Limitations of Karl Pearson's Coefficient of Correlation**

**3.10 Spearman's Rank Correlation**

**3.10.1 Features of Spearman's Rank Correlation**

**3.10.2 Spearman's Rank Correlation when Ranks are given**

**3.10.3 Spearman's Rank Correlation when Ranks are not given**

**3.10.4 Spearman's Rank Correlation when there is repetition in Ranks**

**3.10.5 Limitations of Spearman's Rank Correlation**

**3.11 Sum Up**

**3.12 Key Terms**



### **3.13 Questions for Practice**

### **3.14 Suggested Readings**

## **3.0 OBJECTIVES**

After studying the Unit, students will be able to:

- Define Correlation
- Distinguish between different types of correlation
- Understand the benefits of correlation
- Find correlation using the graphic method
- Calculate correlation by Karl Pearson Method
- Measure correlation using Rank correlation method

## **3.1 INTRODUCTION**

When we study measurement of central tendency, dispersion analysis, skewness analysis etc., we study the nature and features of data in which only one variable is involved. However, In our daily life, we come across many things in which two or more variables are involved and such variables may be related to each other. As these variables are related to each other, it is important to understand the nature of such a relation and its extent. Identification of such relations helps us in solving many problems of daily life. This is not only helpful in our daily lives but also helpful in solving many business problems.

## **3.2 MEANING OF CORRELATION**

Correlation is a statistical technique that studies the relationship between two or more variables. It studies how two variables are related to each other. It studies how the change in the value of one variable affects the other variable, for example in our daily life we will find the relation between income and expenditure, income and demand, Price and Demand age of husband-and-wife etcetera correlation helps in understanding such relations of different variables two variables are said to be related to each other when a change in the value of one variable so results in to change in the value of other variables.

Therefore, when X and Y are related to each other, then it has four possibilities:

- X may be causing Y
- Y may be causing X
- X and Y both are bidirectionally related, i.e., X is causing Y and Y is causing X
- X and Y are related to each other through some third variable

However, correlation has nothing to do with causation. It simply attempts to find the degree of mutual association between them. Two variables might be found highly correlated, but they are not causing the change in each other. There may be a correlation due to pure chance. For example, we may find a high degree of correlation between the number of trees in a city and number of drug addicts. However, there is no theoretical base that relates these variables together. Such correlation is known as Spurious Correlation or Non-sense Correlation.

**According to W.I. King,** —Correlation means that between two series or groups of data, there exists some causal connection.‖

### **3.3 USES OF CORRELATIONS**

1. It helps us in understanding the extent and direction of the relation between two variables. It shows, whether two variables are positively correlated or negatively correlated. It also shows whether a relation between two variables is high or low.
2. Correlation also helps in the prediction of the future, for example, if we know the relation between monsoon and agricultural produce, we can predict that what will be the level of produce on basis of monsoon prediction. We can also predict the price of Agricultural Products depending on the level of produce.
3. With the help of correlation, we can find the value of one variable when the value of another variable is known. This can be done by using the statistical technique called regression analysis.
4. Correlation also helps in business and Commerce. A businessman can fix price of its product using correlation analysis. Correlation also helps him in deciding business policy.
5. Correlation also helps government in deciding its economic policy. With the help of correlation, government can study relation between various economic variables, thus government can decide their economic policies accordingly.
6. Correlation is also helpful in various statistical Analyses. Many Statistical techniques use correlation for further analysis.

### **3.4 TYPES OF CORRELATION**

#### **A. Positive, Negative and No Correlation**

- a. **Positive correlation:** It is a situation in which two variables move in the same direction. In this case, if the value of one variable increases the value of the other variable also increases. Similarly, if the value of one variable decreases, the value of other variables also decreases. So, when both the variables either increase or decrease, it is known as a positive correlation. For example, we can find

a Positive correlation between Income and Expenditure, Population and Demand for food products, Incomes and Savings, etc. The following data shows a positive correlation between two variables:

Height of Persons: X	158	161	164	166	169	172	174
Weight of Person: Y	61	63	64	66	67	69	72

- b. Negative or Inverse Correlation:** When two variables move in opposite directions from each other, it is known as negative or inverse correlation. In other words, we can say that when the value of one variable increases value of another variable decreases, it is called a negative correlation. In our life we find a negative correlation between some variables, for example, there is a negative correlation between Price and Demand, the Number of Workers and Time required to complete the work, etc. The following data shows the negative correlation between two variables:

Price of Product: X	1	2	3	4	5
The demand of Product: Y	50	45	40	35	30

- c. Zero or No Correlation:** When two variables do not show any relation, it is known as zero or no correlation. In other words, we can say that in the case of zero correlation, the change in the value of one variable does not affect the value of other variables. In this case, two variables are independent from each other. For example, there is zero correlation between the height of the student and the marks obtained by the student.

## B. Simple and Multiple Correlation

- a. Simple Correlation:** When we study the relation between two variables only, it is known as simple correlation. For example, relation between income and expenditure, Price and Demand, are situations of simple correlation.
- b. Multiple Correlation:** Multiple correlation is a situation in which more than two variables are involved. Here relation between more than two variables is studied together, for example, if we are studying the relation between the income of the consumer, price of the product and demand for the product, it is a situation of multiple correlations.

## C. Total and Partial Correlation

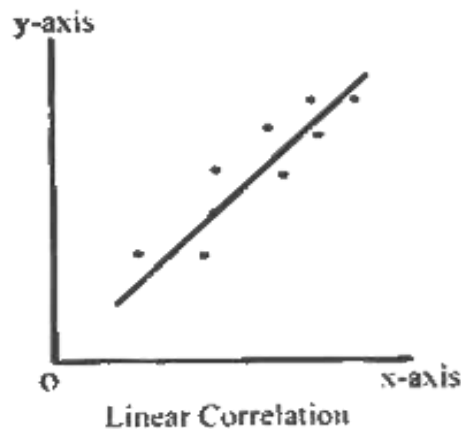
- a. Total Correlation:** In case we study relation of more than two variables and all the variables are taken together, it is a situation of total correlation. For example, if we are studying the relationship between the income of the consumer, the price of the product and the demand of the product, taking all the factors together it is called total correlation.
- b. Partial Correlation:** In the case of partial correlation more than two variables are involved, but

while studying the correlation we consider only two factors assuming that the value of other factors is constant. For example, while studying the relationship between the income of the consumer, price of the product and demand for the product, we take into consideration only relation between price of the product and demand for the product assuming that the income of the consumer is constant.

#### D. Linear and Non-Linear Correlation

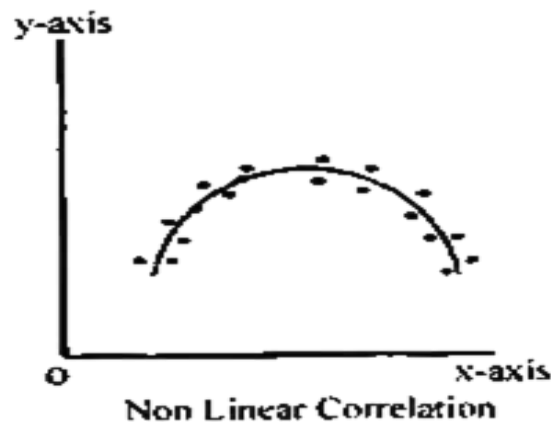
**a. Linear Correlation:** When the change in value of one variable results in a constant ratio of change in the value of other variables, it is called linear correlation. In such a case, if we draw the values of two variables on the graph paper, all the points on the graph paper will fall on a straight line. For example, every change in income of a consumer by Rs. 1000 results in an increase in consumption by 10 kg., which is known as linear correlation. The following data shows an example of linear correlation:

Price of Product: X	1	2	3	4	5
Demand for Product: Y	50	45	40	35	30



**b. Non-Linear Correlation:** When the change in value of one variable does not result in a constant ratio of change in the value of other variables, it is called nonlinear correlation. In such case, if we draw the value of two variables on the graph paper all the points will not fall in the straight line on the graph. The following data shows a nonlinear correlation between two variables:

Price of Product: X	1	2	3	4	5
Demand of Product: Y	50	40	35	32	30



### 3.5 DEGREES OF CORRELATION

Here degrees of correlation shown in the following table:

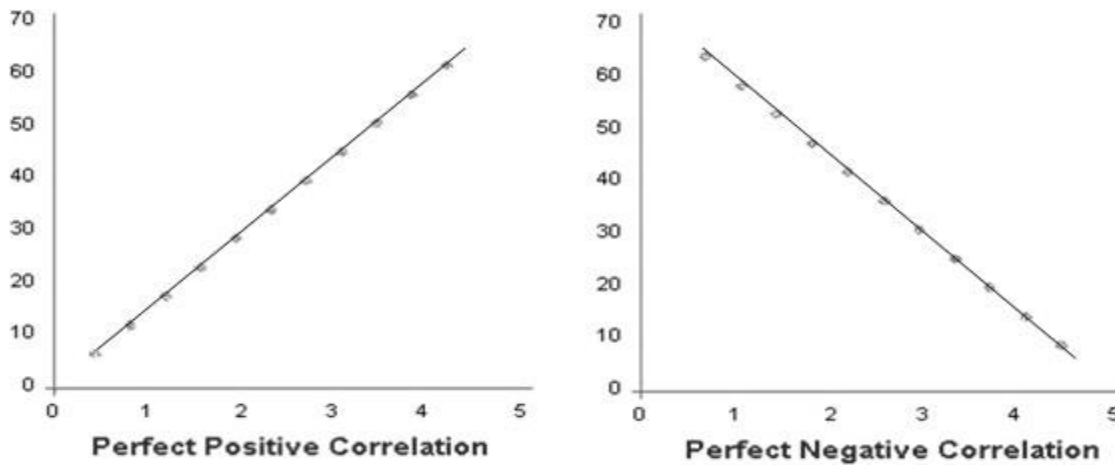
Degrees of Correlation	Positive	Negative
1. Perfect Degree	+1	-1
2. Very High Degree	+0.9 0and more	-0.9 0and more
3. High Degree	+0.75 to .90	-0.75 to .90
4. Moderate Degree	+0.50 to 0.75	-0.50 to 0.75
5. Low degree	+0.25 to 0.50	-0.25 to 0.50
6. Very Low Degree	+Less than 0.25	-Less than 0.25
7. Zero Degree	0	0

### 3.6 SCATTER DIAGRAM METHOD

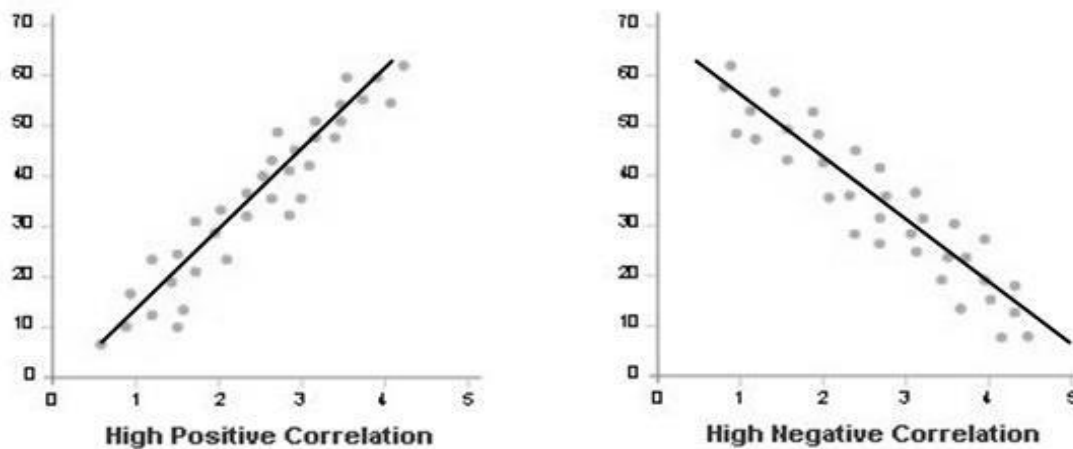
Scatter Diagram is one of the oldest and simplest methods of measuring the correlation. This is a graphic method of measuring the correlation. This method uses a diagram representation of bivariate data to find out the degree and direction of correlation. Under this method, values of the data are plotted on a graph paper by taking one variable on the x-axis and other variables on the y-axis. Normally independent variable is shown on the x-axis whereas the value of the dependent variable is taken on the y-axis. Once all the values are drawn on the graph paper, we can find out degree of correlation between two variables by looking at direction of dots on the graph. Scatter Diagram shows whether two variables are co-related to each other or not. It also shows the direction of correlation whether positive or negative and the shows extent of correlation whether high or low. The following situations are possible in the scatter diagram.

- 1. Perfect Positive Correlation:** After we plot two variables on the graph, if the points of the graph fall in a straight line that moves from the lower left-hand side to the upper corner on the right-hand side, then it is assumed that there is perfect positive correlation between the variables.

- 2. Perfect Negative Correlation:** After drawing the variables on the graph, if all the points fall in a straight line but direction of the points is downward from right-hand corner to left-hand side corner, then it is assumed that there is perfect negative correlation between the variables.

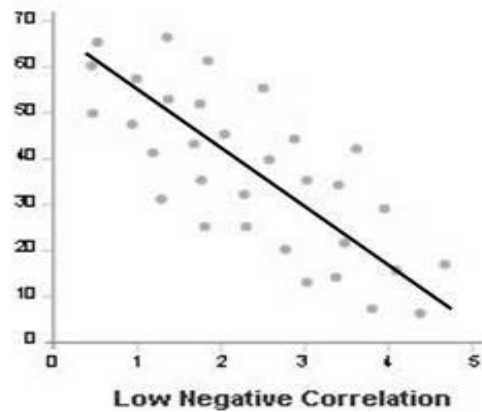
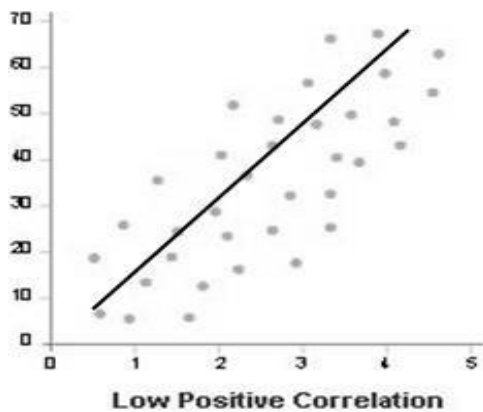


- 3. High Degree of Positive Correlation:** If we draw two variables on the graph and we find that the points move in an upward direction from left-hand corner to the right-hand corner but not in a straight line, rather these are in narrow band, we can assume that there is a high degree of positive correlation between the variables.
- 4. High Degree of Negative Correlation:** After plotting the dots on a graph, if we find that all the dots move downward from left-hand corner to the right-hand side corner but not in a straight line but rather in a narrow band, we can say that there is high degree of negative correlation between the variables.



- 5. Low Degree of Positive Correlation:** In case the dots drawn on a graph paper move upward from left side to right side but the dots are widely scattered, it can be said that there is a low degree of positive correlation between the variables.

- 6. Low Degree of Negative Correlation:** In case the points drawn on a graph are in a downward direction from left side to right side but the points are widely scattered, it is the situation of low degree of negative correlation between the variables.



- 7. Zero or No Correlation:** Sometimes find that the dots drawn on a graph paper do not move in any direction and are widely scattered in the graph paper, we can assume that there is no correlation between the two variables.

**NOTE:**

- Correlation coefficient shows the linear relationship between X and Y. Thus, even if there is a strong non-linear relationship between X and Y, the correlation coefficient may be low.
- Correlation coefficient is independent of scale and origin. If we subtract some constant from one (or both) of the variables, the correlation coefficient will remain unchanged. Similarly, if we divide one (or both) of the variables by some constant, the correlation coefficient will not change.
- Correlation coefficient varies between -1 and +1. This means  $r$  cannot be smaller than -1 and cannot be greater than +1.

The existence of a linear relationship between two variables is not to be interpreted to mean a cause-

effect relationship between the two.

### 3.7 PROPERTIES OF CORRELATION

1. **Range:** The coefficient of Correlation always lies between -1 to +1.
2. **Degree Of Measurement:** Correlation Coefficient is independent of units of measurement.
3. **Direction:** The sign of Correlation is positive (+ve) if the values of variables move in the same direction, if -ve then the opposite direction.
4. **Symmetry:** Correlation Coefficient deals with the property of symmetry. It means  $r_{xy}=r_{yx}$ ,
5. **Geometric Mean:** The coefficient of Correlation is also the geometric mean of two regression coefficients  $R_{xy}= b_{xy} \cdot b_{yx}$
6. If x and y are independent then  $r_{xy}=0$
7. **Change of Origin:** The correlation coefficient is independent of change of origin
8. **Change of Scale:** The correlation coefficient is independent of change in Scale
9. **Coefficient of determination:** The square of the correlation coefficient ( $r_{xy}$ ) is known as the coefficient of determination.

### 3.8 KARL PEARSONS'S COEFFICIENT OF CORRELATION

Karl Pearson's Coefficient of Correlation is the most important method of measuring the correlation. Karl Pearson's Coefficient of correlation is also denoted as 'Product Moment Correlation'. The coefficient of correlation given by Karl Pearson is denoted as a symbol  $r$ . It is the relative measure of finding the correlation.

### 3.9 DIFFERENT METHODS TO CALCULATE COEFFICIENT OF CORRELATION

#### 3.9.1 Direct method of calculating Correlation

Correlation can be calculated using the direct method without taking any mean. The following are the steps:

1. Take two series X and Y.
2. Find the sum of these two series denoted as  $\sum X$  and  $\sum Y$ .
3. Take the square of all the values of the series X and series Y.
4. Find the sum of the square so calculated denoted by  $\sum X^2$  and  $\sum Y^2$ .
5. Multiply the corresponding values of series X and Y and find the product.
6. Sum up the product so calculated denoted by  $\sum X Y$ .
7. Apply the following formula for calculating the correlation.



**Coefficient of Correlation,  $r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}$**

**Example 1: Find the coefficient of correlation**

X	Y
2	4
3	5
1	3
5	4
6	6
4	2

**Solution:**

X	Y	X <sup>2</sup>	Y <sup>2</sup>	XY
2	4	4	16	8
3	5	9	25	15
1	3	1	9	3
5	4	25	16	20
6	6	36	36	36
4	2	16	4	8
$\sum X = 21$	$\sum Y = 24$	$\sum X^2 = 91$	$\sum Y^2 = 106$	$\sum XY = 90$

N = 6

Coefficient of Correlation,  $r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}$

$$= \frac{6 \times 90 - 21 \times 24}{\sqrt{6 \times 91 - (21)^2} \sqrt{6 \times 106 - (24)^2}}$$

$$= \frac{540 - 504}{\sqrt{546 - 441} \sqrt{636 - 576}}$$

$$= \frac{36}{\sqrt{105} \sqrt{60}} = \frac{36}{10.246 \times 7.7459}$$

$$= \frac{36}{79.31} = 0.4539$$

$\Rightarrow r = 0.4539$

### 3.9.2 Actual Mean method of calculating Correlation

Under this Correlation is calculated by taking the deviations from actual mean of the data. The following are the steps:

1. Take two series X and Y.
2. Find the mean of both the series X and Y, denoted by  $\bar{X}$  and  $\bar{Y}$ .
3. Take deviations of series X from it mean and it is denoted by  $\_x'$ .
4. Take deviations of series Y from it mean and it is denoted by  $\_y'$ .
5. Take square of deviation of series X denoted by  $x^2$ .

6. Sum up square of deviations of series X denoted by  $\sum x^2$ .
7. Take square of deviation of series Y denoted by  $y^2$ .
8. Sum up square of deviations of series Y denoted by  $\sum y^2$ .
9. Find the product of x and y and it is denoted by xy.
10. Find the sum of  $\_xy\_$  it is denoted by  $\sum xy$
11. Apply the following formula for calculating the correlation.

$$r = \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2} \sqrt{\sum (Y - \bar{Y})^2}}$$

**Example 2. Calculate Karl Pearson's coefficient of correlation**

X	50	50	55	60	65	65	65	60	60	50
Y	11	13	14	16	16	15	15	14	13	13

**Solution:** When deviations are taken from actual arithmetic mean,  $\_r\_$  is given by

$$r = \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2} \sqrt{\sum (Y - \bar{Y})^2}}$$

Where  $x = X - \bar{X}$  = Deviation from A. M. of X series

$y = Y - \bar{Y}$  = Deviation from A. M. of Y series

X	Y	x = (X - $\bar{X}$ )	$x^2$	y = (Y - $\bar{Y}$ )	$y^2$	xy
50	11	-8	64	-3	9	24
50	13	-8	64	-1	1	8
55	14	-3	9	0	0	0
60	16	2	4	2	4	4
65	16	7	49	2	4	14
65	15	7	49	1	1	7
65	15	7	49	1	1	7
60	14	2	4	0	0	0
60	13	2	4	-1	1	-2
50	13	-8	64	-1	1	8
$\sum X$ = 580	$\sum Y$ = 140		$\sum x^2$ = 360		$\sum y^2$ = 22	$\sum xy$ = 70

Here, N = 10

$$\text{A. M. of X series, } \bar{X} = \frac{\sum X}{N} = \frac{580}{10} = 58$$

$$\text{A. M. of Y series, } \bar{Y} = \frac{\sum Y}{N} = \frac{140}{10} = 14$$

$$\text{Coefficient of Correlation, } r = \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{70}{\sqrt{360 \times 22}} = \frac{70}{\sqrt{7920}} = 0.7866$$

$$\Rightarrow r = 0.7866$$

### 3.9.3 Assumed Mean method of calculating Correlation

Under this Correlation is calculated by taking the deviations from assumed mean of the data. Following are the steps:

1. Take two series X and Y.
2. Take any value as assumed mean for series X.
3. Take deviations of series X from its assumed mean and it is denoted by  $\_dx'$ .
4. Find sum of deviations denoted by  $\sum dx$ .
5. Take square of deviation of series X denoted by  $dx^2$
6. Sum up square of deviations of series X denoted by  $\sum dx^2$ .
7. Take any value as assumed mean for series Y.
8. Take deviations of series Y from its assumed mean and it is denoted by  $\_dy'$ .
9. Find sum of deviations of series Y denoted by  $\sum dy$ .
10. Take square of deviation of series Y denoted by  $dy^2$
11. Sum up square of deviations of series Y denoted by  $\sum dy^2$ .
12. Find the product of dx and dy and it is denoted by  $dx dy$ .
13. Find the sum of  $\_dx dy'$  it is denoted by  $\sum dx dy$
14. Apply the following formula for calculating the correlation.

$$r = \frac{N \sum dx dy - (\sum dx)(\sum dy)}{\sqrt{N \sum dx^2 - (\sum dx)^2} \sqrt{N \sum dy^2 - (\sum dy)^2}}$$

#### Example 3. Compute coefficient of correlation from the following figures

City	A	B	C	D	E	F	G
Population (in „000)	78	25	16	14	38	61	30
Accident Rate (Per million)	80	62	53	60	62	69	67

**Solution:** Here,  $N = 7$

Coefficient of Correlation, r is given by

$$r = \frac{N \sum dx dy - (\sum dx)(\sum dy)}{\sqrt{N \sum dx^2 - (\sum dx)^2} \sqrt{N \sum dy^2 - (\sum dy)^2}}$$

Where  $dx$  = Deviations of terms of X series from assumed mean  $A_X = X - A_X$

$dy$  = Deviations of terms of Y series from assumed mean  $A_Y = Y - A_Y$

X	Y	$dx = X - A_X$ $A_X = 38$	$dy = Y - A_Y$ $A_Y = 67$	$dx^2$	$dy^2$	$dx dy$
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70	80	32	13	1024	169	416
25	62	-13	-5	169	25	65
16	53	-22	-14	482	196	308
14	60	-24	-7	576	49	168
38	62	0	-5	0	25	0
61	69	23	2	529	4	46
30	67	-8	0	64	0	0
		$\sum dx$ = -12	$\sum dy$ = -16	$\sum dx^2$ = 2846	$\sum dy^2$ = 468	$\sum dxdy$ = 1003

Here,  $N = 7$

$$\begin{aligned}
 \therefore \text{Coefficient of Correlation, } r &= \frac{7 \times 1003 - (-12)(-16)}{\sqrt{7 \times 2846 - (-12)^2} \sqrt{7 \times 468 - (-16)^2}} \\
 &= \frac{7021 - 192}{\sqrt{19,922 - 144} \sqrt{3276 - 256}} \\
 &= \frac{6829}{\sqrt{19,778} \sqrt{3020}} = 0.8837 \\
 r &= 0.8837
 \end{aligned}$$

### 3.9.4 Step Deviation method of calculating Correlation

Under this method assumed mean is taken but the difference is that after taking the deviation, these are divided by some common factor to get the step deviations. The following are the steps:

1. Take two series X and Y.
2. Take any value as assumed mean for series X.
3. Take deviations of series X from its assumed mean and it is denoted by  $\_dx'$ .
4. Divide the value of  $\_dx'$  so obtained by some common factor to get  $dx'$
5. Find sum of deviations denoted by  $\sum dx'$ .
6. Take square of deviation of series X denoted by  $dx'^2$
7. Sum up square of deviations of series X denoted by  $\sum dx'^2$ .
8. Take any value as assumed mean for series Y.
9. Take deviations of series Y from its assumed mean and it is denoted by  $\_dy'$ .
10. Divide the value of  $\_dy'$  so obtained by some common factor to get  $dy'$
11. Find sum of deviations of series Y denoted by  $\sum dy'$ .
12. Take square of deviation of series Y denoted by  $dy'^2$
13. Sum up square of deviations of series Y denoted by  $\sum dy'^2$ .
14. Find the product  $dx'$  of and  $dy'$  and it is denoted by  $dx' dy'$ .
15. Find the sum of  $\_dxdy'$  it is denoted by  $\sum dx' dy'$

16. Apply the following formula for calculating the correlation.

$$\text{Coefficient of Correlation, } r = \frac{N \sum dx' dy' - (\sum dx')(\sum dy')}{\sqrt{N \sum dx'^2 - (\sum dx')^2} \sqrt{N \sum dy'^2 - (\sum dy')^2}}$$

**Example 4. Find the coefficient of correlation by Karl Pearson's method**

Price (Rs.)	5	10	15	20	25
Demand (kg)	40	35	30	25	20

Solution:

X	Y	$dx = X - A$ A = 15	$dx' = \frac{dx}{C_1}$ C <sub>1</sub> = 5	$dy = Y - B$ B = 30	$dy' = \frac{dy}{C_2}$ C <sub>2</sub> = 5	$dx'^2$	$dy'^2$	$dx' dy'$
5	40	-10	-2	10	2	4	4	-4
10	35	-5	-1	5	1	1	1	-1
15	30	0	0	0	0	0	0	0
20	25	5	1	-5	-1	1	1	-1
25	20	10	2	-10	-2	4	4	-4
			$\sum dx' = 0$		$\sum dy' = 0$	$\sum dx'^2 = 10$	$\sum dy'^2 = 10$	$\sum dx' dy' = -10$

Here, N = 5

$$\begin{aligned} \text{Coefficient of Correlation, } r &= \frac{N \sum dx' dy' - (\sum dx')(\sum dy')}{\sqrt{N \sum dx'^2 - (\sum dx')^2} \sqrt{N \sum dy'^2 - (\sum dy')^2}} \\ &= \frac{5 \times (-10) - 0 \times 0}{\sqrt{5 \times 10 - 0^2} \sqrt{5 \times 10 - 0^2}} \\ &= \frac{-50}{\sqrt{50} \times \sqrt{50}} = -1 \end{aligned}$$

$$\Rightarrow r = -1$$

### 3.9.5 Calculating Correlation with help of Standard Deviations

Under this method assumed mean is taken but the difference is that after taking the deviation, these are divided by some common factor to get the step deviations. Following are the steps:

1. Take two series X and Y.
2. Find the mean of both the series X and Y, denoted by  $\bar{X}$  and  $\bar{Y}$ .
3. Take deviations of series X from its mean and it is denoted by  $_{xx'}$ .
4. Take deviations of series Y from its mean and it is denoted by  $_{yy'}$ .
5. Find the product of x and y and it is denoted by xy.
6. Find the sum of  $_{xy}$  it is denoted by  $\sum xy$
7. Calculate the standard deviation of both series X and Y.
8. Apply the following formula for calculating the correlation.

$$r = \frac{\sum xy}{N\sigma_X\sigma_Y}$$

**Example 5. Given**

**No. of pairs of observations = 10**

$$\sum xy = 625$$

**X Series Standard Deviation = 9**

**Y Series Standard Deviation = 8**

**Find „r“.**

Solution: We are given that

$$N = 10, \quad \sigma_X = 9 \quad \sigma_Y = 8 \quad \text{and} \quad \sum xy = 625$$

$$\begin{aligned} \text{Now } r &= \frac{\sum xy}{N\sigma_X\sigma_Y} \\ &= \frac{625}{10 \times 9 \times 8} = \frac{625}{720} = 0.868 \\ \Rightarrow r &= +.868 \end{aligned}$$

**Example 6. A computer while calculating the coefficient of correlation between the variables X**

**and Y obtained the values as**

$$\begin{aligned} N &= 6, & \sum X &= 50, & \sum X^2 &= 448 \\ \sum Y &= 106, & \sum Y^2 &= 1896, & \sum XY &= 879 \end{aligned}$$

**But later on, it was found that the computer had copied down two pairs of observations as**

X	Y
5	15
10	18

**While the correct values were**

X	Y
6	18
10	19

**Find the correct value of correlation coefficient.**

Solution: Incorrect value of  $\sum X = 50$

$$\begin{aligned} \therefore \text{Correct value of } \sum X &= 50 - 5 - 10 + 6 + 10 \\ &= 51 \end{aligned}$$

Incorrect value of  $\sum Y = 106$

$$\begin{aligned} \therefore \text{Correct value of } \sum Y &= 106 - 15 - 18 + 18 + 19 \\ &= 110 \end{aligned}$$

Incorrect value of  $\sum X^2 = 448$

$$\begin{aligned} \therefore \text{Correct value of } \sum X^2 &= 448 - 5^2 - (10)^2 + 6^2 + (10)^2 \\ &= 459 \end{aligned}$$

Incorrect value of  $\sum Y^2 = 1896$

$$\begin{aligned} \therefore \text{Correct value of } \sum Y^2 &= 1896 - 15^2 - (18)^2 + (18)^2 + 19^2 \\ &= 2032 \end{aligned}$$

Incorrect value of  $\sum XY = 879$

$$\therefore \text{Correct value of } \sum XY = 879 - (5 \times 15) - (10 \times 18) + (6 \times 18) + (10 \times 19) = 952$$

Thus, the corrected value of coefficient of correlation

$$\begin{aligned} &= \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}} \\ &= \frac{6 \times 952 - 51 \times 110}{\sqrt{6 \times 459 - (51)^2} \sqrt{6 \times 2032 - (110)^2}} \\ &= \frac{5712 - 5610}{\sqrt{2754 - 2601} \sqrt{12192 - 12100}} \\ &= \frac{102}{\sqrt{153} \sqrt{92}} = \frac{102}{12.369 \times 9.59} \\ &= \frac{102}{118.618} = 0.8599 \end{aligned}$$

$$\Rightarrow r = +0.8599$$

### 3.9.6 Limitations of Karl Pearson's Coefficient of Correlation

1. It is comparatively difficult to calculate.
2. It is time consuming method.
3. It is based on unrealistic assumptions.
4. It is affected by extreme values.
5. It cannot be applied on qualitative data.

### TEST YOUR UNDERSTANDING (A)

1. From the following data of prices of product X and Y draw scatter diagram.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>
Price of X	60	65	65	70	75	75	80	85	80	100
Price of Y	120	125	120	110	105	100	100	90	80	60

2. Calculate Karl Pearson's coefficient of correlation

X	21	22	23	24	25	26	27	28	29	30
Y	46	42	38	34	30	26	22	18	14	10

3. Calculate Karl Pearson's coefficient between X and Y

X	42	44	58	55	89	98	66
Y	56	49	53	58	65	76	58

4. Find correlation between marks of subject A Subject B

Subject A	24	26	32	33	35	30
Subject B	15	20	22	24	27	24

5. What is the Karl Pearson's coefficient of correlation if  $\sum xy = 40$ ,  $n = 100$ ,  $\sum x^2 = 80$  and  $\sum y^2 = 20$ .

6. Calculate the number of items for which  $r = 0.8$ ,  $\sum xy = 200$ . Standard deviation of  $y = 5$  and  $\sum x^2 = 100$  where  $x$  and  $y$  denote the deviations of items from actual means.

7. Following values were obtained during calculation of correlation:

$$N = 30; \quad \sum X = 120 \quad \sum X^2 = 600 \quad \sum Y = 90 \quad \sum Y^2 = 250 \quad \sum XY = 335$$

Later found that two pairs were taken wrong which are as follows:

pairs of observations as:	(X, Y):	(8, 10)	(12, 7)
While the correct values were:	(X, Y):	(8, 12)	(10, 8)

Find correct correlation.

**Answer**

2) -1	4) .92	5) 1
3) .9042	6) 25	7) -.4311

### 3.10 SPEARMAN'S RANK CORRELATION

Karl Pearson's Coefficient of Correlation is very useful if data is quantitative, but in the case of qualitative data it is a failure. Spearman's Rank correlation is a method that can calculate correlation both from quantitative and qualitative data if the data is ranked like in singing contest we rank the participants as one number, two number or three number, etc. This method was given by Charles Edward Spearman in 1904. In this method we give Rank to the data and with the help of such ranks, correlation is calculated.

#### 3.10.1 Features of Spearman's Rank Correlation

1. The coefficient of correlation may be positive or negative.
2. The value of coefficient of correlation always lies between -1 and + 1. -1 refers to 100% negative correlation, plus one refers to 100% positive correlation, and zero refers to no correlation between the items.
3. This method is based on ranks of the data.
4. Sum of difference between ranks in this method is always zero i.e.,  $\sum D = 0$ .
5. There is no assumption of normal distribution in this method.
6. In case all the ranks of the two series are same the value of  $\sum D^2 = 0$ , it shows that there is perfect positive correlation between the data.

#### 3.10.2 Spearman's Rank Correlation when ranks are given

1. Calculate the difference between ranks of both the series denoted by  $\sum D$ .
2. Take square of deviations and calculate the value of  $D^2$ .
3. Calculate sum of square of deviations denoted by  $\sum D^2$ .
4. Apply following formula.



**Example 9. Following are given the ranks of 8 pairs. Find „r“**

Rank X	6	4	8	2	7	5	3	1
Rank Y	4	8	7	3	6	5	1	2

Solution:

Rank X	Rank Y	Difference of Ranks D	D <sup>2</sup>
6	4	+2	4
4	8	-4	16
8	7	-1	1
2	3	-1	1
7	6	+1	1
5	5	0	0
3	1	+2	4
1	2	-1	1
N = 8			$\sum D^2 = 28$

$$\begin{aligned}
 \text{Coefficient of Rank Correlation, } r &= 1 - \frac{6 \sum D^2}{N(N^2-1)} \\
 &= 1 - \frac{6 \times 28}{8(8^2-1)} \\
 &= 1 - \frac{168}{8(64-1)} = 1 - \frac{168}{8(63)} \\
 &= 1 - \frac{168}{504} = 1 - 0.33 = 0.67
 \end{aligned}$$

⇒ Rank Correlation Coefficient = 0.67

**Example 10. In a beauty contest, three judges gave the following ranks to 10 contestants. Find out which pair of judges agree or disagree the most.**

<b>Judge 1</b>	5	1	6	3	8	7	10	9	2	4
<b>Judge 2</b>	9	7	10	5	8	4	3	6	1	2
<b>Judge 3</b>	6	4	7	10	5	3	1	9	2	8

Solution:

Ranks by			D <sub>1</sub> = R <sub>1</sub> - R <sub>2</sub>	D <sub>1</sub> <sup>2</sup>	D <sub>2</sub> = R <sub>2</sub> - R <sub>3</sub>	D <sub>2</sub> <sup>2</sup>	D <sub>3</sub> = R <sub>1</sub> - R <sub>3</sub>	D <sub>3</sub> <sup>2</sup>
Judge 1 R <sub>1</sub>	Judge 2 R <sub>2</sub>	Judge 3 R <sub>3</sub>						
5	9	6	-4	16	3	9	-1	1
1	7	4	-6	36	3	9	-3	9
6	10	7	-4	16	3	9	-1	1
3	5	10	-2	4	-5	25	-7	49
8	8	5	0	0	3	9	3	9
7	4	3	+3	9	1	1	4	16
10	3	1	+7	49	2	4	9	81
9	6	9	+3	9	-3	9	0	0

2	1	2	+1	1	-1	1	0	0
4	2	8	+2	4	-6	36	-4	16
				$\sum D_1^2$ = 144		$\sum D_2^2$ = 112		$\sum D_3^2$ = 182

Now 
$$r_{12} = 1 - \frac{6\sum D_1^2}{N(N^2-1)}$$

$$= 1 - \frac{6 \times 144}{10(10^2-1)}$$

$$= 1 - \frac{864}{10(100-1)} = 1 - \frac{864}{10(99)}$$

$$= 1 - \frac{864}{990} = 1 - 0.873 = 0.127$$

$\therefore r_{12} = +0.127 \Rightarrow$  Low degree +ve correlation

$$r_{23} = 1 - \frac{6\sum D_2^2}{N(N^2-1)}$$

$$= 1 - \frac{6 \times 112}{10(10^2-1)} = 1 - \frac{672}{10(100-1)}$$

$$= 1 - \frac{672}{10(99)} = 1 - \frac{672}{990}$$

$$= 1 - 0.679 = 0.321$$

$\therefore r_{23} = +0.321 \Rightarrow$  Moderate degree +ve correlation

Similarly, 
$$r_{31} = 1 - \frac{6\sum D_3^2}{N(N^2-1)}$$

$$= 1 - \frac{6 \times 182}{10(10^2-1)} = 1 - \frac{1092}{10(100-1)}$$

$$= 1 - \frac{1092}{10(99)} = 1 - \frac{1092}{990}$$

$$= 1 - 1.103 = -0.103$$

$\therefore r_{31} = -0.103 \Rightarrow$  Low degree -ve correlation

$\Rightarrow$  Since  $r_{23}$  is highest, so 2nd and 3rd judges agree the most.

Also,  $r_{31}$  being lowest, 3rd and 1st judges disagree the most.

### 3.10.3 Spearman's Rank Correlation when ranks are not given

1. Assign the ranks in descending order to series X by giving first rank to highest value and second rank to value lower than higher value and so on.
2. Similarly assign the ranks to series Y.
3. Calculate the difference between ranks of both the series denoted by  $\sum D$ .
4. Take square of deviations and calculate the value of  $D^2$ .
5. Calculate sum of square of deviations denoted by  $\sum D^2$ .
6. Apply following formula.

**Example 11.** Following are the marks obtained by 8 students in Maths and Statistics.  
Find the Rank Correlation Coefficient.

<b>Marks in Math's</b>	60	70	53	59	68	72	50	54
<b>Marks in stats</b>	44	74	54	64	84	79	53	66

Solution:

X	Ranks R <sub>1</sub>	Y	Ranks R <sub>2</sub>	Difference of Ranks D = R <sub>1</sub> – R <sub>2</sub>	D <sup>2</sup>
60	4	44	8	–4	16
70	2	74	3	–1	1
53	7	54	6	+1	1
59	5	64	5	0	0
68	3	84	1	+2	4
72	1	79	2	–1	1
50	8	53	7	+1	1
54	6	66	4	+2	4
					$\sum D^2 = 28$

Here N = 8

$$\begin{aligned}
 \Rightarrow \text{Rank Coefficient of Correlation, } r &= 1 - \frac{6 \sum D^2}{N(N^2-1)} \\
 &= 1 - \frac{6 \times 28}{8(8^2-1)} \\
 &= 1 - \frac{168}{8(64-1)} \\
 &= 1 - \frac{168}{8(63)} \\
 &= 1 - \frac{168}{504} \\
 &= 1 - 0.33 = 0.67
 \end{aligned}$$

$\Rightarrow$  Rank Correlation Coefficient = 0.67

### 3.10.4 Spearman's Rank Correlation when there is repetition in ranks

1. Assign the ranks in descending order to series X by giving first rank to highest value and the second rank to value lower than higher value and so on. If two items have same value, assign the average rank to both item. For example, two equal values have ranked at 5<sup>th</sup> place then rank to be given is 5.5 to both i.e., mean of 5<sup>th</sup> and 6<sup>th</sup> rank. ( $\frac{5+6}{2}$ ).
2. Similarly assign the ranks to series Y.
3. Calculate the difference between ranks of both the series denoted by  $\sum D$ .
4. Take square of deviations and calculate the value of  $D^2$ .
5. Calculate sum of square of deviations denoted by  $\sum D^2$ .
6. Apply following formula.

$$r = 1 - \frac{6\{\sum D^2 + \frac{1}{12}(m_1^3 - m_1) + \frac{1}{12}(m_2^3 - m_2)\}}{N(N^2-1)}$$

Where m = no. of times a particular item is repeated.

**Example 12. Find the Spearman's Correlation Coefficient for the data given below**

X	110	104	107	82	93	93	115	95	93	113
Y	80	78	90	75	81	70	87	78	73	85

**Solution:** Here, in X series the value 93 occurs thrice ( $m_1 = 3$ ), i. e. at 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> rank. So, all the three values are given the same average rank, i. e.  $\frac{7+8+9}{3} = 8^{\text{th}}$  rank.

Similarly, in Y series the value 78 occurs twice ( $m_2 = 2$ ), i. e. at 6<sup>th</sup> and 7<sup>th</sup> rank. So, both the values are given the same average rank, i. e.  $\frac{6+7}{2} = 6.5^{\text{th}}$  rank.

X	Ranking of X $R_1$	Y	Ranking of Y $R_2$	Difference of Ranks $D = R_1 - R_2$	$D^2$
110	3	80	5	-2	4
104	5	78	6.5	-1.5	2.25
107	4	90	1	+3	9
82	10	75	8	+2	4
93	8	81	4	+4	16
93	8	70	10	-2	4
115	1	87	2	-2	1
95	6	78	6.5	-0.5	0.25
93	8	73	9	-1	1
113	2	85	3	-1	1
					$\Sigma D^2 = 42.5$

Here  $N = 10$

Spearman's Rank Correlation Coefficient,  $r = 1 - \frac{6\{\Sigma D^2 + \frac{1}{12}(m_1^3 - m_1) + \frac{1}{12}(m_2^3 - m_2)\}}{N(N^2 - 1)}$

$$\begin{aligned}
 \text{i. e.} \quad r &= 1 - \frac{6\{42.50 + \frac{1}{12}(3^3 - 3) + \frac{1}{12}(2^3 - 2)\}}{10(10^2 - 1)} \\
 &= 1 - \frac{6\{42.50 + \frac{24}{12} + \frac{6}{12}\}}{10(100 - 1)} = 1 - \frac{6\{42.50 + 2 + \frac{1}{2}\}}{10 \times 99} \\
 &= 1 - \frac{6\{42.5 + 2.5\}}{990} = 1 - \frac{6 \times 45}{990} \\
 &= 1 - 0.2727 = 0.7273
 \end{aligned}$$

$\Rightarrow$  Rank Correlation Coefficient = 0.7273

**Example 13. The rank correlation coefficient between the marks obtained by ten students in Mathematics and Statistics was found to be 0.5. But later on, it was found that the difference in ranks in the two subjects obtained by one student was wrongly taken as 6 instead of 9. Find the correct rank correlation.**

**Solution:** Given  $N = 10$ , Incorrect  $r = 0.5$

We know that

$$\text{Rank Correlation Coefficient, } r = 1 - \frac{6 \Sigma D^2}{N(N^2 - 1)}$$

$$\Rightarrow 0.5 = 1 - \frac{6 \sum D^2}{10(10^2-1)} = 1 - \frac{6 \sum D^2}{10 \times 99}$$

$$\Rightarrow \text{Incorrect } \sum D^2 = \frac{990}{6} \times 0.5 = 82.5$$

$$\therefore \text{The corrected value of } \sum D^2 = 82.5 - 6^2 + 9^2$$

$$= 82.5 - 36 + 81 = 127.5$$

$$\therefore \text{Correct Rank Correlation Coefficient, } r = 1 - \frac{6 \times 127.5}{10(10^2-1)}$$

$$= 1 - \frac{765}{10(100-99)}$$

$$= 1 - \frac{765}{10 \times 99}$$

$$= 1 - \frac{765}{990}$$

$$= 1 - 0.7727$$

$$= 0.2273$$

### 3.10.5 Limitations of Spearman's Rank Correlation

1. It cannot deal with grouped data.
2. If large data is there, it is difficult to apply this method.
3. It cannot be applied further algebraic treatment.
4. Combined correlation cannot be calculated.
5. It gives only approximate correlation; it is not based on actual values.

### TEST YOUR UNDERSTANDING (B)

1. Find Rank correlation on base of following data.

X	78	36	98	25	75	82	90	62	65	39
Y	84	51	91	60	68	62	86	58	53	47

In Dance competition following ranks were given by 3 judges to participants. Determine which two judges have same preference for music:

1st Judge	1	6	5	10	3	2	4	9	7	8
2nd Judge	3	5	8	4	7	10	2	1	6	9
3rd Judge	6	4	9	8	1	2	3	10	5	7

3. Find Rank correlation on base of following data.

X	25	30	38	22	50	70	30	90
Y	50	40	60	40	30	20	40	70

### Answers

1) .82	2) I and II -.2121, II and III -.297, I and III .6364, so judge I and III	3) 0
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### 3.11 SUM UP

- Correlation shows the relation between two or more variables.

- The value of the coefficient of correlation always lies between -1 and +1.
- Correlation may be positive or negative.
- Karl Person's coefficient of correlation is the most popular method of correlation.
- It can deal only with quantitative data.
- Spearman's Rank correlation calculated correlation on the basis of ranks given to data.
- It can deal with qualitative data also.

### 3.12 KEY TERMS

- **Correlation:** Correlation is a statistical technique that studies the relation between two or more variables. It studies how two variables are related to each other.
- **Positive correlation:** It is a situation in which two variables move in the same direction. In this case if the value of one variable increases the value of other variable also increase. Similarly, if the value of one variable decreases, the value of other variables also decreases.
- **Negative or Inverse Correlation:** When two variables move in opposite directions from each other, it is known as negative or inverse correlation. In other words, we can say that when the value of one variable increases value of other variable decreases, it is called a negative correlation.
- **Linear Correlation:** When the change in the value of one variable results into a constant ratio of change in the value of other variables, it is called linear correlation. In such case, if we draw the values of two variables on the graph paper, all the points on the graph paper will fall on a straight line.
- **Non - Linear Correlation:** When the change in value of one variable does not result in constant ratio of change in the value of other variables, it is called non-linear correlation. In such case, if we draw the value of two variables on the graph paper all the points will not fall in the straight line on the graph.
- **Simple Correlation:** When we study the relation between two variables only, it is known as simple correlation. For example, the relation between income and expenditure, Price and Demand, are situations of simple correlation.
- **Multiple Correlation:** Multiple correlation is a situation in which more than two variables are involved. Here relations between more than two variables are studied together, for example, if we are studying the relation between the income of the consumer, price of the product and demand of the product, it is a situation of multiple correlation.

### 3.13 QUESTIONS FOR PRACTICE

### **Short Answer Type**

- Q1. What is Correlation?
- Q2. What are the uses of measuring correlation?
- Q3. What do you mean by scatter diagram?
- Q4. Give Karl Persons's method of calculating correlation.
- Q5. What is positive and negative correlation?
- Q6. What is Spearman's Rank correlation?

### **Long Answer Type**

- Q1. Explain the properties of the Correlation Coefficient.
- Q2. Give different types of correlation.
- Q3. What are the various degrees of correlation coefficient?
- Q4. Give Karl Pearson's coefficient of correlation in the case of actual and assumed mean.
- Q5. What are the limitations of Karl Pearson's method?
- Q6. In the case of repeated ranks, how would you determine Spearman's Rank correlation?
- Q7. What are the limitations of Spearman's Rank correlation?

### **3.14 SUGGESTED READINGS**

- J. K. Sharma, Business Statistics, Pearson Education.
- S.C. Gupta, Fundamentals of Statistics, Himalaya Publishing House.
- S.P. Gupta and Archana Gupta, Elementary Statistics, Sultan Chand and Sons, New Delhi.
- M.R. Spiegel, Theory and Problems of Statistics, Schaum's Outlines Series, McGraw Hill Publishing Co.

**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 4: SIMPLE REGRESSION ANALYSIS**

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**STRUCTURE**

- 4.0 Objectives**
- 4.1 Introduction**
- 4.3 Meaning of Regression Analysis**
- 4.4 Benefits of Regression Analysis**
- 4.5 Limitations of Regression Analysis**
- 4.6 Different Types of Regression**
- 4.7 Relationship between correlation and regression**
- 4.8 Regression lines**
- 4.9 Least Square Method of fitting Regression lines**
- 4.10 Direct Method of Estimating Regression Equations**
- 4.11 Other Methods of Estimating Regression Equations**
- 4.12 Properties of Regression Coefficients**
- 4.13 Sum Up**
- 4.14 Key Terms**
- 4.15 Questions for Practice**
- 4.16 Further Readings**

**4.0 OBJECTIVES**

After studying the Unit, students will be able to

- Describe what is regression.
- Distinguish between different types of Regression.
- Understand the benefits of Regression.
- Find Regression using various methods.
- Show how correlation and regression are related.
- Understand the properties of regression coefficients.



## **4.1 INTRODUCTION**

Statistics has many applications in our life whether it's business life or our routine life. Many techniques in statistics can help us in prediction. Regression is one such technique. In the literary meaning the term 'Regression' is 'going back', or 'stepping down'. So, regression analysis is a tool in statistics that can help in the prediction of one variable when the value of other variable is known if there exists any close relation between two or more variables, though such relation may be positive or negative. The technique of Regression can be widely used as a powerful tool in almost all fields whether science, social science, business, etc. However, particularly, in the fields of business and management this technique is very useful for studying the relationship between different variables such as Price and Demand, Price and Supply, Production and Consumption, Income and Consumption, Income and Savings, etc.

## **4.3 MEANING OF REGRESSION ANALYSIS**

When we find a regression between two or more variables, we try to understand the behavior of one variable with the help movement of the other variable in a particular direction. For example, if the correlation coefficient between the value of sales and amount spent on advertisement is +0.9, it means that if advertisement expenditure is increased, Sales are also likely to increase, as there is a very high positive relation between the two variables. However, correlation only tells the relation between two variables, but it does not tell the extent to which a change in one variable will affect the change in other variables. For this purpose, we have to calculate the co-efficient of Regression. The regression Coefficient is a statistical measure that tries to find out the value of one variable known as a dependent variable when the value of another variable known as an independent variable is known. Thus, in the case of two variables, like Advertisement expenditure and amount of Sales, we can estimate the likely amount of Sales if the value of Advertisement expenditure is given. Similarly, we can predict the value of Advertisement expenditure required, to achieve a particular amount of Sales. This can be done using the two regression coefficients

Some of these definitions are given below:

1. According to Sir Francis Galton, the term regression analysis is defined as "the law of regression that tells heavily against the full hereditary transmission of any gift, the more bountifully the parent is gifted by nature, the rarer will be his good fortune if he begets a son who is richly endowed as himself, and still more so if he has a son who is endowed yet more largely."
2. In the words of Ya Lun Chou, "Regression analysis attempts to establish the nature of the relationship between variables that is to study the functional relationship between the variables and thereby provide a mechanism for prediction or forecasting".

#### 4.4 BENEFITS / USES OF REGRESSION ANALYSIS

The benefits of Regression analysis are outlined as under:

1. **Forecasting or Prediction:** Regression provides a relationship between two or more variables that are related to each other. So, with the help of this technique, we can easily forecast the values of one variable that is unknown from the values of another variable that is known.
2. **Cause and Effect Relationship:** This analysis helps in finding the cause-and-effect relationship between two or more variables. It is a powerful tool for measuring the cause-and-effect relationship among economic variables. In the field of economics, it is very beneficial in the estimation of Demand, Production, Supply etc.
3. **Measuring Error in Estimation:** Regression helps in measuring errors in estimates made through the regression lines. In case the point of Regression line is less scattered around the relevant regression line, it means there are less chances of error but if there are more scattered around line of regression, it means there are more chances of error.
4. **Finding Correlation Coefficient between two variables:** Regression provides a measure of coefficient of correlation between the two variables. We can calculate correlation by taking the square root of the product of the two regression coefficients.
5. **Usefulness in Business and Commerce:** Regression is a very powerful tool of statistical analysis in the field of business and commerce as it can help businessmen in the prediction of various values such as demand, production etc.
6. **Useful in day-to-day life:** This technique is very useful in our daily life as it can predict various factors such as birth rate, death rate, etc.
7. **Testing Hypothesis:** The technique of regression can be used in testing the validity of economic theory or testing any hypothesis.

#### 4.5 LIMITATIONS OF REGRESSION ANALYSIS

Though Regression is a wonderful statistical tool, still it suffers from some limitations. The following are the limitations of Regression analysis:

1. Regression analysis assumes that there exists a cause-and-effect relationship between the variables and such a relation is not changeable. This assumption may not always hold good and thus could give misleading results.
2. Regression analysis is based on some limited data available. However, as the values are based on limited data it may give misleading results.

3. Regression analysis involves very lengthy and complicated steps of calculations and analysis. A layman may not be in a position to use this technique.
4. Regression analysis can be used in the case of quantitative data only. It cannot be used where data is qualitative such as hard work, beauty etc.

#### 4.6 DIFFERENT TYPES OF REGRESSION ANALYSIS

##### 1. Simple and Multiple Regression

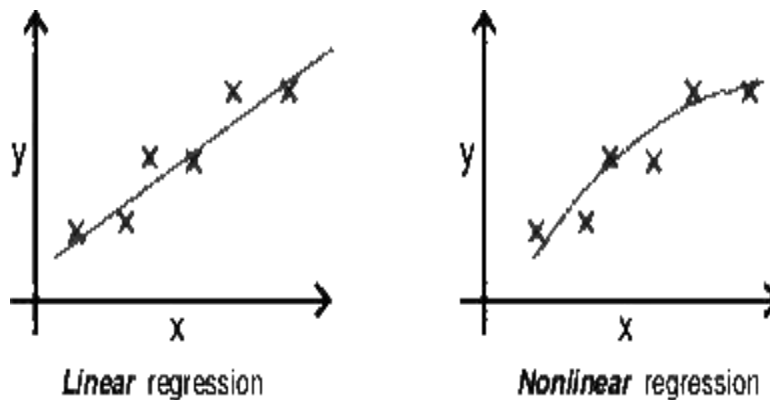
- **Simple Regression:** When there are only two variables under study it is known as a simple regression. For example, we are studying the relation between Sales and Advertising expenditure. If we consider sales as Variable X and advertising as variable Y, then the  $X = a + bY$  is known as the regression equation of X on Y where X is the dependent variable and Y is the independent variable. In other words, we can find the value of variable X (Sales) if the value of Variable Y (Advertising) is given.
- **Multiple Regression:** The study of more than two variables at a time is known as multiple regression. Under this, only one variable is taken as a dependent variable and all the other variables are taken as independent variables. For example, If we consider sales as Variable X, advertising as variable Y and Income as Variable Z, then using the functional relation  $X = f(Y, Z)$ , we can find the value of variable X (Sales) if the value of Variable Y (Advertising) and the value of variable Z (Income) is given.

##### 2. Total and Partial Regression

- a. **Total Regression:** Total regression analysis is one in which we study the effect of all the variables simultaneously. For example, when we want to study the effect of advertising expenditure of a business represented by variable Y, income of the consumer represented by variable Z, on the amount of sales represented by variable X, we can study impact of advertising and income simultaneously on sales. This is a case of total regression analysis. In such cases, the regression equation is represented as follows:  $X = f(Y, Z)$ ,
- a. **Partial Regression:** In the case of Partial Regression one or two variables are taken into consideration and the others are excluded. For example, when we want to study the effect of the advertising expenditure of a business represented by variable Y, income of the consumer represented by variable Z, on the amount of sales represented by variable X, we will not study the impact of both income and advertising simultaneously, rather we will first study the effect of income on sales keeping advertising constant and then effect of advertising on sales keeping income constant. Partial regression can be written as  $X = f(Y \text{ not } Z)$ .

### 3. Linear and Non-Linear Regression

- a. Linear Regression:** When the functional relationship between  $X$  and  $Y$  is expressed as the first-degree equations, it is known as linear regression. In other words, when the points plotted on a scatter diagram concentrate around a straight line it is the case of linear regression.
- b. Non-linear Regression:** On the other hand, if the line of regression (in the scatter diagram) is not a straight line, the regression is termed as curved or non-linear regression. The regression equations of non-linear regression are represented by equations of higher degree. The following diagrams show the linear and non-linear regressions:



### 8.7 RELATIONSHIP BETWEEN CORRELATION AND REGRESSION

1. Correlation is a quantitative tool that measures the degree of relationship that is present between two variables. It shows the degree and direction of the relation between two variables. Regression helps us to find the value of a dependent variable when the value of an independent variable is given.
2. Correlation between two variables is the same. For example, if we calculate the correlation between sales and advertising or advertising and sales, the value of correlation will remain same. But this is not true for Regression. The regression equation of Advertising on sales will be different from regression equation of Sales on advertising.
3. If there is a positive correlation, the distance between the two lines will be less. That means the two regression lines will be closer to each other- Similarly, if there is a low correlation, the lines will be farther from each other. A positive correlation implies that the lines will be upward-sloping whereas a negative correlation implies that the regression lines will be downward sloping.
4. Correlation between two variables can be calculated by taking the square root of the product of the two regression coefficients.

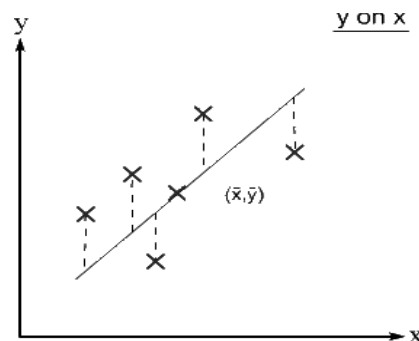
Following are some of the differences between Correlation and Regression:

No.	Correlation	Regression
1.	Correlation measures the degree and direction of a relationship between two variables.	Regression measures the change in the value of a dependent variable given the change in value of an independent variable.
2.	Correlation does not depict a cause-and-effect relationship.	Regression depicts the causal relationship between two variables.
3.	Correlation is a relative measure of the linear relationship that exists between two variables.	Regression is an absolute measure that measures the change in value of a variable.
4.	Correlation between two variables is the same. In other words, Correlation between two variables is the same. $r_{xy} = r_{yx}$ .	Regression is not symmetrical in formation. So, the regression coefficients of X on Y and of Y on X are different.
5.	Correlation is independent of Change in origin or scale.	Regression is independent of Change in origin but not of scale.
6.	Correlation is not capable of any further mathematical treatment.	Regression can be further treated mathematically.
7.	Coefficient of correlation always lies between -1 and +1.	Regression coefficient can have any value.

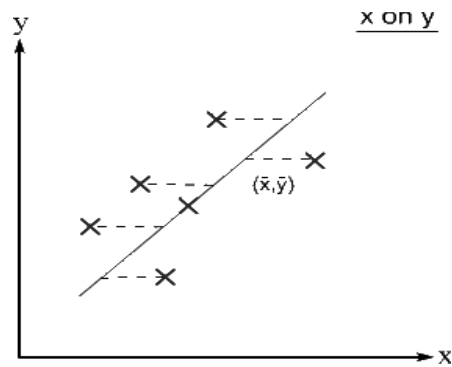
#### 4.8 REGRESSION LINES

The lines that are used in Regression for estimation are called as regression line. In other words, the lines that are used to study the dependence of one variable on the other variable are called as regression line. If we have two variables X and Y then there.

**a. Regression Line of Y on X:** Regression Line Y on X measures the dependence of Y on X and we can estimate the value of Y for the given values of X. In this line Y is dependent variable and X is independent variable.



**b. Regression Line of X on Y:** Regression Line X on Y measures the dependence of X on Y and we can estimate the value of X for the given values of Y. In this line, X is dependent variable and Y is independent variable.



The direction of two regression equation depends upon the degree of correlation between two variables. Following can be the cases of correlation between two variables:

**1. Perfect positive correlation:** If there is a positive correlation between two variables (i.e.  $r = +1$ ) the lines will coincide with each other and will have positive slope. Both the lines X on Y and Y on X will be the same in this case. In other words, in only one regression line can be drawn as shown in diagram. The slope of the line will be upward.

Both the line will coincide with positive slope

perfect  
+1), both  
have  
Y on X  
that case,  
the

**2. Perfect negative correlation:** If there is a negative correlation between two variables (i.e.  $r = -1$ ) both the lines will coincide with each other and such case these lines will be having a negative slope. Both the lines X on Y and Y on X will be the same downward sloping. In other words, in that case, regression line can be drawn as shown in the diagram. The slope of the line will be downward.

Both the line will coincide with negative slope

perfect  
= -1),  
will in  
slope.  
but  
only one  
diagram.

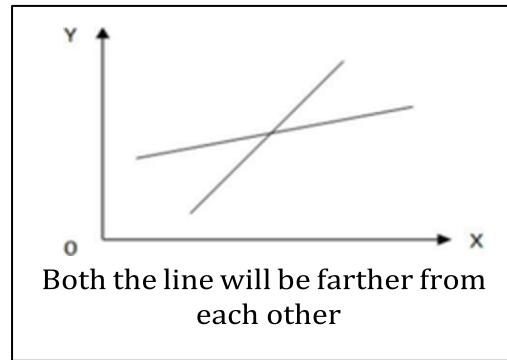
**3. High degree of correlation:** If there is a high degree of correlation between two variables, both the lines will be near to each other. In other words, these lines will be closer to each other but the lines will not coincide with each other. Both the lines will be separate. Further direction of lines depends upon the positive or negative correlation.

Both the line will be close to each other

degree  
lines will  
be  
with  
the  
negative

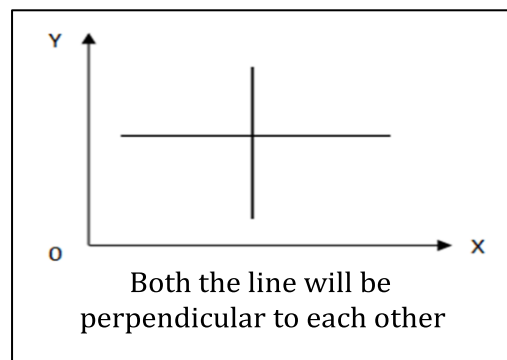
correlation.

**4. Low degree of correlation:** If there is a low of correlation between two variable, both the lines have more distance from each other. In other these lines will be farther to each other, that is the between the two lines will be more. Both the lines separate. Further, the direction of lines depends positive or negative correlation.



degree  
will be  
words,  
gap  
will be  
upon the

**5. No correlation:** If there is no correlation two variables (i.e.  $r = 0$ ), both the lines will be perpendicular to each other. In other words, these cut each other at  $90^\circ$ . This diagram depicts the perpendicular relation between the two regression when there is absolutely zero correlation between variables under the study.



between  
lines will  
lines  
the two

#### 4.9 LEAST SQUARE METHOD OF FITTING REGRESSION LINES

Under this method, the lines of best fit are drawn as the lines of regression. These lines of regression are known as the lines of the best fit because, with the help of these lines we can estimate the values of one variable depending on the value of other variables. According to the Least Square method, the regression line should be plotted in such a way that sum of squares of the difference between the actual value and an estimated value of the dependent variable should be the least or minimum possible. Under this method, we draw two regression lines that are

- a. Regression line Y on X:** it measures the value of Y when value of X is given. In other words, it assumes that X is an independent variable whereas the other variable Y is a dependent variable. Mathematically this line is represented by

$$Y = a + bX$$

Where Y – Dependent Variable

X – Independent Variable

a & b – Constants

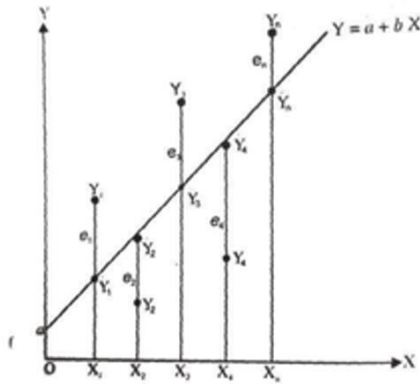
- b. Regression line X on Y** – it measures the value of X when value of Y is given. In other words, it assumes that Y is an independent variable whereas the other variable X is a dependent variable. Mathematically this line is represented by

$$X = a + bY$$

Where X – Dependent Variable

Y – Independent Variable

a & b – Constants



Equation Y on X

Equation X on Y

In the above two regression lines, there are two constants represented by  $a$  and  $b$ . The constant  $b$  is also known as regression coefficient, which is denoted as  $b_{yx}$  and  $b_{xy}$ . Where  $b_{yx}$  represent regression coefficient of equation Y on X and  $b_{xy}$  represent regression coefficient of equation X on Y. When the value of these two variables  $a$  and  $b$  is determined we can find out the regression line.

#### 4.10 DIRECT METHODS TO ESTIMATE REGRESSION EQUATION

The regression equations can be obtained by 'Normal Equation Method' as follows:

- 1. Regression Equation of Y on X:** The regression equation Y on X is in the format of  $Y = a + bx$ , where Y is a Dependent Variable and X is an Independent Variable. To estimate this regression equation, the following normal equations are used:

$$\sum Y = na + b_{yx} \sum X$$

$$\sum XY = a \sum X + b_{yx} \sum X^2$$

With the help of these two equations the values of  $a$  and  $b$  are obtained and by putting the values of  $a$  and  $b$  in the equation  $Y = a + bX$  we can predict or estimate value of Y for any value of X.

- 2. Regression Equation of X on Y:** The regression equation X on Y is in the format of  $X = a + bY$ , where X is a Dependent Variable and Y is an Independent Variable. To estimate this regression equation, following normal equations are used:

$$\sum X = na + b_{xy} \sum Y$$

$$\sum XY = a \sum Y + b_{xy} \sum Y^2$$

With the help of these two equations the values of  $a$  and  $b$  are obtained and by putting the values of  $a$  and  $b$  in the equation  $X = a + bY$  we can predict or estimate value of Y for any value of X.



**Example 1.** Find out the two regression lines for the data given below using the method of least square.

Variable X:	5	10	15	20	25
Variable Y:	20	40	30	60	50

Determination of the regression lines by the method of least square. Also find out

a. Value of Y when value of X is 40

b. Value of X when value of Y is 80.

**Solution:**

X	Y	X <sup>2</sup>	Y <sup>2</sup>	XY
5	20	25	400	100
10	40	100	1600	400
15	30	225	900	450
20	60	400	3600	1200
25	50	625	2500	1250
XX = 75	XY = 200	XX <sup>2</sup> =1375	XY <sup>2</sup> =9,000	XXY =3400

**(i) Regression line of Y on X**

This is given by  $Y = a + bX$

where  $a$  and  $b$  are the two constants which are found by solving simultaneously the two normal equations as follows:

$$\Sigma Y = na + b_{yx} \Sigma X$$

$$\Sigma XY = a \Sigma X + b_{yx} \Sigma X^2$$

Substituting the given values in the above equations we get,

$$200 = 5a + 75b \dots\dots\dots(i)$$

$$3400 = 75a + 1375b \dots\dots\dots(ii)$$

Multiplying the eqn. (i) by 15 we get

$$3000 = 75a + 1125b \dots\dots\dots(iii)$$

Subtracting the equation (iii) from equation (ii) we get,

$$3400 = 75a + 1375b$$

$$\underline{-3000 = -75a - 1125b}$$

$$400 = 250b$$

$$\text{or } b = 1.6$$

Putting the above value of  $b$  in the eqn. (i) we get,

$$200 = 5a + 75(1.6) \text{ or}$$

$$5a = 200 - 120 \text{ or}$$

$$a = 16$$

Thus,  $a = 16$ , and  $b = 1.6$

Putting these values in the equation  $Y = a + bX$  we get

$$Y = 16 + 1.6X$$

So, when  $X$  is 40, the value of  $Y$  will be

$$Y = 16 + 1.6(40) = 80$$

### (ii) Regression line of $X$ on $Y$

This is given by  $X = a + bY$

where  $a$  and  $b$  are the two constants which are found by solving simultaneously the two normal equations as follows:

$$\Sigma X = na + b_{xy} \Sigma Y$$

$$\Sigma XY = a \Sigma Y + b_{xy} \Sigma Y^2$$

Substituting the given values in the above equations we get,

$$75 = 5a + 200b \dots\dots\dots (i)$$

$$3400 = 200a + 9000b \dots\dots\dots (ii)$$

Multiplying the eqn. (i) by 40 we get

$$3000 = 200a + 8000b \dots\dots\dots (iii)$$

Subtracting the equation (iii) from equation (ii) we get,

$$3400 = 200a + 9000b$$

$$\underline{-3000 = -200a + -8000b}$$

$$400 = 1000b$$

$$\text{or } b = .4$$

Putting the above value of  $b$  in the eqn. (i) we get,

$$75 = 5a + 200(.4) \text{ or}$$

$$5a = -5 \text{ or}$$

$$a = -1$$

Thus,  $a = -1$ , and  $b = .4$

Putting these values in the equation  $X = a + bY$  we get

$$X = -1 + .4Y$$

So, when  $Y$  is 80, the value of  $X$  will be

$$X = -1 + .4(80) = 31$$

## 4.11 OTHER METHODS OF ESTIMATING REGRESSION EQUATION

This method discussed above is known as the direct method. This is one of the popular methods of finding the regression equation. But sometimes this method of finding regression equations becomes cumbersome and lengthy especially when the values of  $X$  and  $Y$  are very large. In this case, we can

simplify the calculation by taking the deviations of X and Y than dealing with actual values of X and Y.

In such case

Regression equation Y on X

$$Y = a + bX$$

will be converted to  $(Y - \bar{Y}) = b_{yx} (X - \bar{X})$

Similarly, Regression equation X on Y:

$$X = a + bY$$

will be converted into  $(X - \bar{X}) = b_{xy} (Y - \bar{Y})$

Now when we are using these regression equations, the calculations will become very simple as now we have to calculate value of only one constant that is the value of  $-b$  which is our regression coefficient. As there are two regression equations, so we need to calculate two regression coefficients that is Regression Coefficient X on Y, which is symbolically denoted as  $-b_{xy}$  and similarly Regression Coefficient Y on X, which is denoted as  $-b_{yx}$ . However, these coefficients can also be calculated using different methods. As we take deviations under this method, we can take deviations using actual mean, assumed mean or we can calculate it by not taking the deviations. Following formulas are used in such cases:

Method	Regression Coefficient X on Y	Regression Coefficient Y on X
When deviations are taken from actual Mean	$b_{xy} = \frac{\sum xy}{\sum y^2}$	$b_{yx} = \frac{\sum xy}{\sum x^2}$
When deviations are taken from assumed mean	$b_{xy} = \frac{N\sum dxdy - \sum dx\sum dy}{N\sum dy^2 - (\sum dy)^2}$	$b_{yx} = \frac{N\sum dxdy - \sum dx\sum dy}{N\sum dx^2 - (\sum dx)^2}$
Direct Method: Using sum of X and Y	$b_{xy} = \frac{N\sum XY - \sum X\sum Y}{N\sum Y^2 - (\sum Y)^2}$	$b_{yx} = \frac{N\sum XY - \sum X\sum Y}{N\sum X^2 - (\sum X)^2}$
Using the correlation coefficient (r) and standard deviation ( $\sigma$ )	$b_{xy} = r \cdot \frac{\sigma_x}{\sigma_y}$	$b_{yx} = r \cdot \frac{\sigma_y}{\sigma_x}$

**Example 2.** From the information give below obtain two regression lines X on Y and Yon X using

1. Actual Mean Method
2. Assumed Mean Method
3. Direct Method (Without taking Mean)

Number of hours machine-operated	7	8	6	9	11	9	10	12
Production (Units in 000):	4	5	2	6	9	5	7	10

**Solution: 1. Actual Mean**

**Method Calculation of**

**Regression Equation**

X	Y	x = X - $\bar{X}$	x <sup>2</sup>	y = Y - $\bar{Y}$	y <sup>2</sup>	xy
7	4	-2	4	-2	4	4
8	5	-1	1	-1	1	1
6	2	-3	9	-4	16	12
9	6	0	0	0	0	0
11	9	2	4	3	9	6
9	5	0	0	-1	1	0
10	7	1	1	1	1	1
12	10	3	9	4	16	12
$\sum X = 72$	$\sum Y = 48$		$\sum x^2 = 28$		$\sum y^2 = 48$	$\sum xy = 36$

$$\bar{X} = \frac{\sum X}{N} = \frac{72}{8} = 9, \quad \bar{Y} = \frac{\sum Y}{N} = \frac{48}{8} = 6$$

**Regression equation of X on Y:**

$$(X - \bar{X}) = b_{xy} (Y - \bar{Y})$$

$$\text{Where } b_{xy} = \frac{\sum xy}{y^2}$$

$$= \frac{36}{48} = .75$$

$$\text{So } (X - 9) = .75 (Y - 6)$$

$$X - 9 = .75Y - 4.5$$

$$\mathbf{X = 4.5 + .75Y}$$

**Regression equation of Y on X:**

$$(Y - \bar{Y}) = b_{yx} (X - \bar{X})$$

$$\text{Where } b_{yx} = \frac{\sum xy}{x^2}$$

$$= \frac{36}{28} = 1.286$$

$$\text{So } (Y - 6) = 1.286 (X - 9)$$

$$Y - 6 = 1.286X - 11.57$$

$$\mathbf{Y = - 5.57+ 1.286X}$$

**1. Assumed Mean Method**

**Calculation of Regression**

**Equation**

X	Y	dx = X - A (A = 8)	dx <sup>2</sup>	dy = Y - A (A = 5)	dy <sup>2</sup>	dx dy
7	4	-1	1	-1	1	1
8	5	0	0	0	0	0
6	2	-2	4	-3	9	6
9	6	1	1	1	1	1

11	9	3	9	4	16	12
9	5	1	1	0	0	0
10	7	2	4	2	4	4
12	10	4	16	5	25	20
$\sum X = 72$	$\sum Y = 48$	$\sum dx = 8$	$\sum dx^2 = 36$	$\sum dy = 8$	$\sum dy^2 = 56$	$\sum xy = 44$

$$\bar{X} = \frac{\sum X}{N} = \frac{72}{8} = 9, \quad \bar{Y} = \frac{\sum Y}{N} = \frac{48}{8} = 6$$

**Regression equation of X on Y:**

$$(X - \bar{X}) = b_{xy} (Y - \bar{Y})$$

$$\text{Where } b_{xy} = \frac{N\sum dxdy - \sum dx \sum dy}{N\sum dy^2 - (\sum dy)^2}$$

$$= \frac{8(44) - (8)(8)}{8(56) - (8)^2} = \frac{352 - 64}{448 - 64} = \frac{288}{384} = .75$$

$$\text{So } (X - 9) = .75 (Y - 6)$$

$$X - 9 = .75Y - 4.5$$

$$\mathbf{X = 4.5 + .75Y}$$

**Regression equation of Y on X:**

$$(Y - \bar{Y}) = b_{yx} (X - \bar{X})$$

$$\text{Where } b_{yx} = \frac{N\sum dxdy - \sum dx \sum dy}{N\sum dx^2 - (\sum dx)^2}$$

$$= \frac{8(44) - (8)(8)}{8(36) - (8)^2} = \frac{288}{224} = 1.286$$

$$\text{So } (Y - 6) = 1.286 (X - 9)$$

$$Y - 6 = 1.286X - 11.57$$

$$\mathbf{Y = - 5.57 + 1.286X}$$

## 2. Direct Method (Without taking

Mean) Calculation of Regression

**Equation**

<b>X</b>	<b>Y</b>	<b>X<sup>2</sup></b>	<b>Y<sup>2</sup></b>	<b>XY</b>
7	4	49	16	28
8	5	64	25	40
6	2	36	4	12
9	6	81	36	54
11	9	121	81	99
9	5	81	25	45
10	7	100	49	70
12	10	144	100	120
$\sum X = 72$	$\sum Y = 48$	$\sum X^2 = 676$	$\sum Y^2 = 336$	$\sum XY = 468$

$$\bar{X} = \frac{\sum X}{N} = \frac{72}{8} = 9, \quad \bar{Y} = \frac{\sum Y}{N} = \frac{48}{8} = 6$$

**Regression equation of X on Y:**

$$(X - \bar{X}) = b_{xy} (Y - \bar{Y})$$

$$\text{Where } b_{xy} = \frac{N\sum XY - \sum X \sum Y}{N\sum Y^2 - (\sum Y)^2}$$

$$= \frac{8(468) - (72)(48)}{8(336) - (48)^2}$$

$$= \frac{3744 - 3456}{2688 - 2304} = \frac{288}{384} = .75$$

$$\text{So } (X - 9) = .75 (Y - 6)$$

$$X - 9 = .75Y - 4.5$$

$$\mathbf{X = 4.5 + .75Y}$$

**Regression equation of Y on X:**

$$(Y - \bar{Y}) = b_{yx} (X - \bar{X})$$

$$\text{Where } b_{yx} = \frac{N\sum XY - \sum X \sum Y}{N\sum X^2 - (\sum X)^2}$$

$$= \frac{8(468) - (72)(48)}{8(676) - (72)^2}$$

$$= \frac{3744 - 3456}{5408 - 5184} = \frac{288}{224} = 1.286$$

$$\text{So } (Y - 6) = 1.286 (X - 9)$$

$$Y - 6 = 1.286X - 11.57$$

$$\mathbf{Y = - 5.57 + 1.286X}$$

**Example 3.** Find out two Regression equations on basis of the data given below:

	X	Y
Mean	60	80
Standard Deviation (S.D.)	16	20
Coefficient of Correlation	.9	

Also find value of X when Y = 150 and the value of Y when X = 100.

**Solution: Regression equation of X on Y:**

$$(X - \bar{X}) = b_{xy} (Y - \bar{Y})$$

$$\text{Where, } b_{xy} = r \frac{\sigma_x}{\sigma_y}$$

$$= .9 \frac{16}{20} = .72$$

$$\text{So } (X - 60) = .72 (Y - 80)$$

$$X - 60 = .72Y - 57.6$$

$$\mathbf{X = 2.4 + .72Y}$$

When Y = 150 then  $X = 2.4 + .72(150) = 110.4$

### Regression equation of Y on X:

$$(Y - \bar{Y}) = b_{xy} (X - \bar{X})$$

$$\text{Where } b_{yx} = r \frac{\sigma_y}{\sigma_x}$$
$$= .9 \frac{20}{16} = 1.125$$

$$\text{So } (Y - 80) = 1.125 (X - 60)$$

$$Y - 80 = 1.125X - 67.5$$

$$\mathbf{Y = 12.5 + 1.125 X}$$

$$\text{When } X = 100 \text{ then } Y = 12.5 + 1.125 (100) = 125$$

### 8.12 PROPERTIES OF REGRESSION COEFFICIENTS

The regression coefficients discussed above have a number of properties which are given as under:

1. The geometric Mean of the two regression coefficients gives the coefficients of correlation i.e.  $r = \sqrt{b_{xy} * b_{yx}}$
2. Both the regression coefficients must have the same sign i.e. in other words either both coefficients will have + signs or both coefficients will have - signs. This is due to the fact that in first property we have studied that geometric means of both coefficients will give us value of correlation. If one sign will be positive and other will be negative, the product of both signs will be negative. And it is not possible to find out correlation of negative value.
3. The signs of regression coefficients will give us signs of coefficient of correlation. This means if the regression coefficients are positive the correlation coefficient will be positive, and if the regression coefficients are negative then the correlation coefficient will be negative.
4. If one of the regression coefficients is greater than unity or 1, the other must be less than unity. This is because the value of coefficient of correlation must be in between  $\pm 1$ . If both the regression coefficients are more than 1, then their geometric mean will be more than 1 but the value of correlation cannot exceed 1.
5. The arithmetic mean of the regression coefficients is either equal to or more than the correlation coefficient  $\frac{b_{xy} + b_{yx}}{2} \geq \sqrt{b_{xy} * b_{yx}}$
6. If the regression coefficients are given, we can calculate the value of standard deviation by using the following formula.
  - a.  $b_{xy} = r \frac{\sigma_x}{\sigma_y}$  or  $b_{yx} = r \frac{\sigma_y}{\sigma_x}$
7. Regression coefficients are independent of change of origin but not of scale. This means that if the original values of the two variables are added or subtracted by some constant, the values of the

regression coefficients will remain the same. But if the original values of the two variables are multiplied, or divided by some constant (common factors) the values of the regression equation will not remain the same.

**Example 4.** From the following data find out two lines of regression and also find out value of correlation.

$$\sum X = 250; \quad \sum Y = 300; \quad \sum XY = 7900; \quad \sum X^2 = 6500; \quad \sum Y^2 = 10000; \quad n = 10$$

Solution:

$$\bar{X} = \frac{\sum X}{N} = \frac{250}{10} = 25, \quad \bar{Y} = \frac{\sum Y}{N} = \frac{300}{10} = 30$$

**Regression equation of Y on X:**

$$(Y - \bar{Y}) = b_{xy} (X - \bar{X})$$

$$\begin{aligned} \text{Where } b_{yx} &= \frac{N\sum XY - \sum X \sum Y}{N\sum X^2 - (\sum X)^2} \\ &= \frac{10(7900) - (250)(300)}{10(6500) - (250)^2} \\ &= \frac{79000 - 75000}{65000 - 62500} = \frac{4000}{2500} = 1.6 \end{aligned}$$

$$\text{So } (Y - 30) = 1.6 (X - 25)$$

$$Y - 30 = 1.6X - 40$$

$$\mathbf{Y = -10 + 1.6 X}$$

**Regression equation of X on Y:**

$$(X - \bar{X}) = b_{xy} (Y - \bar{Y})$$

$$\begin{aligned} \text{Where } b_{xy} &= \frac{N\sum XY - \sum X \sum Y}{N\sum Y^2 - (\sum Y)^2} \\ &= \frac{10(7900) - (250)(300)}{10(10000) - (300)^2} = \frac{79000 - 75000}{100000 - 90000} = \frac{4000}{10000} = .4 \end{aligned}$$

$$\text{So } (X - 25) = .4 (Y - 30)$$

$$X - 25 = .4Y - 12$$

$$\mathbf{X = 13 + .4Y}$$

Coefficients of Correlation

$$r = \sqrt{b_{xy} * b_{yx}}$$

$$r = \sqrt{1.6 * 0.4}$$

$$r = \sqrt{.64}$$

$$r = .8$$

**Example 5.** From the following data find out two lines of regression and also find out value of



correlation. Also find value of Y when X = 30

$$\begin{array}{lll} \sum X = 140; & \sum Y = 150; & \sum (X - 10) (Y - 15) = 6; \\ \sum (X - 10)^2 = 180; & \sum (Y - 15)^2 = 215; & n = 10 \end{array}$$

**Solution:**

Let's take assumed mean of Series X = 10 and Series Y = 15.

$$\sum dx = \sum (X - 10) = \sum X - 10n = 140 - 100 = 40$$

$$\sum dy = \sum (Y - 15) = \sum Y - 15n = 150 - 150 = 0$$

$$\sum dx^2 = \sum (X - 10)^2 = 180$$

$$\sum dy^2 = \sum (Y - 15)^2 = 215$$

$$\sum dx dy = \sum (X - 10) (Y - 15) = 6$$

So,

$$\bar{X} = A + \frac{\sum X}{N} = 10 + \frac{40}{10} = 14$$

$$\bar{Y} = A + \frac{\sum Y}{N} = 15 + \frac{0}{10} = 15$$

**Regression equation of Y on X:**

$$(Y - \bar{Y}) = b_{xy} (X - \bar{X})$$

$$\begin{aligned} \text{Where } b_{yx} &= \frac{N \sum dx dy - \sum dx \sum dy}{N \sum dx^2 - (\sum dx)^2} \\ &= \frac{10(6) - (40)(0)}{10(180) - (40)^2} = \frac{60}{200} = .3 \end{aligned}$$

$$\text{So } (Y - 15) = .3 (X - 14)$$

$$Y - 15 = .3X - 4.2$$

$$\mathbf{Y = 10.8 + .3X}$$

When X = 30 then Y = 10.8 + .3(30) = 19.8

**Regression equation of Y on X:**

$$(Y - \bar{Y}) = b_{xy} (X - \bar{X})$$

$$\begin{aligned} \text{Where } b_{yx} &= \frac{N \sum dx dy - \sum dx \sum dy}{N \sum dx^2 - (\sum dx)^2} \\ &= \frac{10(6) - (40)(0)}{10(25) - (0)^2} = \frac{60}{250} = .24 \end{aligned}$$

$$\text{So } (Y - 15) = .24 (X - 14)$$

$$Y - 15 = .24X - 3.36$$

$$\mathbf{Y = 11.64 + .24X}$$

Coefficients of Correlation

$$r = \sqrt{b_{xy} * b_{yx}} = \sqrt{.3 * .24}$$

$$r = \sqrt{.072}$$

$$r = .268$$

**Example 5.** From the following data find out which equation is equation X on Y and which equation is equation Y on X. Also find  $\bar{X}$ ,  $\bar{Y}$  and r.

$$3X + 2Y - 26 = 0$$

$$6X + Y - 31 = 0$$

**Solution:** To find  $\bar{X}$  and  $\bar{Y}$ , we will solve following simultaneous equations

$$3X + 2Y = 26 \dots\dots\dots(i)$$

$$6X + Y = 31 \dots\dots\dots(ii)$$

Multiply equation (i) with 2, we get

$$6X + 4Y = 52 \dots\dots\dots(iii)$$

Deduct equation (ii) from equation (iii)

$$6X + 4Y = 52$$

$$\underline{-6X - Y = -31}$$

$$3Y = 21$$

$$Y = 7$$

$$\text{Or } \bar{Y} = 7.$$

Put the value of Y in Equation (i), we get

$$3X + 2(7) = 26$$

$$3X + 14 = 26$$

$$3X = 12$$

$$X = 4$$

$$\text{or } \bar{X} = 4$$

Let  $3X + 2Y = 26$  be regression equation X on Y

$$3X = 26 - 2Y$$

$$X = \frac{26}{3} - \frac{2}{3} Y$$

$$\text{So } b_{xy} = -\frac{2}{3}$$

Let  $6X + Y = 31$  be regression equation Y on X

$$Y = 31 - 6X$$

$$\text{So } b_{yx} = -6$$

$$\text{As } r = \sqrt{b_{xy} * b_{yx}}$$

$$r = -\sqrt{\frac{2}{-\left(-\frac{1}{3}\right) \times (-.6)}}$$

$r = -2$ , but this is not possible as value of  $r$  always lies between  $-1$  and  $+1$ . So, our assumption is wrong and equation are reverse.

Let  $6X + Y = 31$  be regression equation X on Y

$$6X = 31 - Y$$

$$X = \frac{31}{6} - \frac{1}{6} Y$$

$$\text{So } b_{xy} = -\frac{1}{6}$$

Let  $3X + 2Y = 26$  be regression equation Y on X

$$2Y = 26 - 3X$$

$$Y = \frac{26}{2} - \frac{3}{2} X$$

$$\text{So } b_{yx} = -\frac{3}{2}$$

$$\text{As } r = \sqrt{b_{xy} * b_{yx}}$$

$$r = -\sqrt{-\left(-\frac{1}{6}\right) \times -\left(-\frac{3}{2}\right)}$$

$r = -.5$ , which is possible. So, our assumption is right.

$$\text{So, } \bar{Y} = 7;$$

$$\bar{X} = 4;$$

$$\text{X on Y is } X = \frac{31}{6} - \frac{1}{6} Y$$

$$\text{Y on X is } Y = \frac{26}{2} - \frac{3}{2} X$$

$$r = -.5$$

### TEST YOUR UNDERSTANDING (D)

1. Find both regression equations:

X	6	2	10	4	8
Y	9	11	5	8	7

2. From following estimate the value of Y when  $X = 30$  using regression equation.

X	25	22	28	26	35	20	22	40	20	18	19	25
Y	18	15	20	17	22	14	15	21	15	14	16	17

3. Fit two regression lines:

X	30	32	38	35	40
Y	10	14	16	20	15

Find X when Y = 25 and find Y when X = 36.

4. Find out two Regression equations on basis of the data given below:

	X	Y
Mean	65	67
Standard Deviation (S.D.)	2.5	3.5
Coefficient of Correlation	.8	

5. You are supplied with the following information. Variance of X = 36

$$12X - 51Y + 99 = 0$$

$$60X - 27Y = 321.$$

- Calculate
- The average values of X and Y
  - The standard deviation of Y and

7. The lines of regression of Y on X and X on Y are  $Y = X + 5$  and  $16X = 9Y + 4$  respectively.

Also,  $\sigma_y = 4$ , Find  $\bar{X}$ ,  $\bar{Y}$ ,  $\sigma_x$  and  $r$ .

8. Given:

$$\sum X = 56, \sum Y = 40, \sum X^2 = 524$$

$$\sum Y^2 = 256, \sum XY = 364, N = 8$$

**Find X on Y and r**

**Answers**

- $X = 16.4 - 1.3Y$ ,  $Y = 11.9 - .65X$
- 18.875
- $Y = .46X - 1.1$ ,  $X = .6Y + 26$ , Value of Y = 15.46, Value of X = 40.25
- $Y = 1.12X - 5.8$ ,  $X = .57Y + 26.81$
- Mean of X = 13, Mean of Y = 17, S.D of Y = 8
- Mean of X = 7, Mean of Y = 12, S.D of X = 3,  $r = .75$
- $X = 1.5Y - 0.5$ ,  $r = .977$

#### 4.13 SUM UP

- Regression is a useful tool of forecasting.
- With help of regression, we can predict the value of can find the value of X if value of Y is given or value of Y if value of X is given.

- It creates the mathematical linear relation between two variables X and Y, out of which one variable is dependent and other is independent.
- In this we find out two regression equations.
- Regression can be linear or nonlinear.
- It can be simple or multiple.
- Regression is based on the principle of Least Squares.
- We can also find out correlation coefficient with help of regression coefficients.

#### 4.14 KEY TERMS

- **Regression:** Regression creates the mathematical linear relation between two variables X and Y, out of which one variable is dependent and other is independent.
- **Simple Regression:** When there are only two variables under study it is known as a simple regression. For example, we are studying the relation between Sales and Advertising expenditure.
- **Multiple Regression:** The study of more than two variables at a time is known as multiple regression. Under this, only one variable is taken as a dependent variable and all the other variables are taken as independent variables.
- **Total Regression:** Total regression analysis is one in which we study the effect of all the variables simultaneously.
- **Partial Regression:** In the case of Partial Regression one or two variables are taken into consideration and the others are excluded.
- **Linear Regression:** When the functional relationship between X and Y is expressed as the first-degree equations, it is known as linear regression. In other words, when the points plotted on a scatter diagram concentrate around a straight line it is the case of linear regression.
- **Non-linear Regression:** On the other hand, if the line of regression (in scatter diagram) is not a straight line, the regression is termed as curved or non-linear regression.
- **Least Square method:** According to the Least Square method, regression line should be plotted in such a way that sum of square of the difference between actual value and estimated value of the dependent variable should be least or minimum possible.

#### 4.15 QUESTIONS FOR PRACTICE

- Q1. What is Regression? What are uses of Regression.
- Q2. What is relation between Regression and correlation?

- Q3. Explain different types of regressions.
- Q4. How two regression lines are determined under direct method?
- Q5. Explain various methods of finding regression equations.
- Q6. What are limitations of regression analysis?
- Q7. What are properties of regression coefficients?

#### **4.16 FURTHER READINGS**

- J. K. Sharma, *Business Statistics*, Pearson Education.
- S.C. Gupta, *Fundamentals of Statistics*, Himalaya Publishing House.
- S.P. Gupta and Archana Gupta, *Elementary Statistics*, Sultan Chand and Sons, New Delhi.
- Richard Levin and David S. Rubin, *Statistics for Management*, Prentice Hall of India, New Delhi.  
Hill Publishing Co.

**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 5: MEANING OF HYPOTHESIS, CHARACTERISTICS OF HYPOTHESIS, BASIC CONCEPTS**

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**STRUCTURE**

**5.0 Learning Objectives**

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**5.2 Characteristics of Hypothesis**

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**5.4 Types of Research Hypothesis**

**5.5 Sum Up**

**5.6 Questions for Practice**

**5.7 Suggested Readings**

**5.0 LEARNING OBJECTIVES**

After Reading this unit, Learners can able to know about the:

- Meaning of Testing of Hypothesis
- Types of hypotheses
- Types of tails used in testing
- Types of errors in the testing of hypothesis
- Level of significance
- Power of a test

## **5.1 INTRODUCTION/ MEANING OF HYPOTHESIS**

Testing of hypotheses is a fundamental concept in statistics and scientific research that plays a crucial role in decision-making and conclusions based on data. It involves a systematic and structured approach to evaluate and validate assumptions or claims about a population.

The terms "hypo" and "thesis" combine to form the word "hypothesis." Hypo implies a subject to verification, while the thesis is a statement on how to solve a problem. Therefore, the definition of the word hypothesis is an assumption regarding how a problem might be solved. A hypothesis presents a solution to the issue that must be tested empirically and is supported by some logic.

A hypothesis is an unproven assertion of the association between two or more variables. A hypothesis is a clear, verifiable forecast of what will occur in your investigation. The population, the variables, and the relationships between the variables are necessary for the hypothesis to be complete.

Remember, a hypothesis does not have to be correct. While the hypothesis forecasts what the researchers expect to see, the goal of research is to determine whether this guess is right or wrong. When experimenting, researchers might explore several different factors to determine which ones might contribute to the outcome. In many cases, researchers may find that the results of an experiment do not support the original hypothesis. When writing up these results, the researchers might suggest other options that should be explored in future studies.

## **5.2 CHARACTERISTICS OF HYPOTHESIS**

A good hypothesis must possess the following characteristics are as follows:

- can be tested experimentally, whether true or false.
- must not be contradictory.
- must identify the variables between which a relationship must be established.
- should describe a problem. A hypothesis can be formulated in descriptive or relational form.
- does not conflict with any law of nature considered to be true.



- ensure that available tools and techniques are used effectively for verification.
  - should be presented as specifically as possible in the simplest terms so that all concerned can easily understand it.
  - must explain the facts that give rise to the need for explanation.
  - It can be tested within a reasonable time frame. A ‘workable’ or ‘usable’ hypothesis would satisfy many of the following criteria.
- a. **conceptually clear:** The concepts used in the hypothesis should be clearly defined, not only formally but also, if possible, operationally. The formal definition of the concepts will clarify what a particular concept stands for, while the operational definition will leave no ambiguity about what would constitute the empirical evidence or indicator of the concept on the plane of reality.
  - b. **should be specific:** No vague or value-judgmental terms should be used in the formulation of a hypothesis. It should specifically state the posited relationship between the variables. It should include a clear statement of all the predictions and operations indicated therein and they should be precisely spelled out.
  - c. **should be empirically testable:** It should have empirical referents so that it will be possible to deduce certain logical deductions and inferences about it. Therefore, a researcher should take utmost care that his/her hypothesis embodies concepts or variables that have clear empirical correspondence and not concepts or variables that are loaded with moral judgments or values. Such statements as ‘criminals are no worse than businessmen’ and ‘capitalists exploit their workers’, in other words, a researcher should avoid using terms loaded with values or beliefs or words having moral or attitudinal connotations in his hypothesis.
  - d. **related to available techniques:** The researcher may be ignorant of the available techniques, which makes him/her weak in formulating a workable hypothesis. A hypothesis, therefore, needs to be formulated only after due thought has been given to the methods and techniques that can be used for measuring the concepts or variables incorporated in the hypothesis.
  - e. **related to a body of theory or some theoretical orientation:** A hypothesis, if tested, helps to qualify, support, correct or refute an existing theory, only if it is related to some theory or has some theoretical orientation. A hypothesis imaginatively formulated does not only elaborate and improve existing theory but may also suggest important links between it and some other theories. Thus, the exercise of deriving a hypothesis from a body of theory may also be an occasion for a scientific leap into newer areas of knowledge.

### 5.3 BASIC CONCEPTS OF HYPOTHESIS

The hypothesis is a fundamental concept in the scientific method and research process. It serves as a starting point for investigations and experiments, guiding researchers in their pursuit of knowledge. Here are some basic concepts related to hypotheses.

### 5.3.1 Null Hypothesis

The null hypothesis is a general statement that states that there is no relationship between two phenomena under consideration or that there is no association between two groups. This hypothesis is either rejected or not rejected based on the viability of the given population or sample.

In other words, the null hypothesis is a hypothesis in which the sample observations result from the chance. It is said to be a statement in which the evaluators want to examine the data. It is denoted by  $H_0$ . In statistics, the null hypothesis is usually denoted by the letter H with subscript '0' (zero), such that  $H_0$  (pronounced as H-null or H-zero or H-nought). At the same time, the alternative hypothesis expresses the observations determined by the non-random cause. It is represented by  $H_1$  or  $H_a$ . The main purpose of a null hypothesis is to verify/ disprove the proposed statistical assumptions.

An example of the hypothesis is as, If the hypothesis is that, —If random test scores are collected from men and women, does the score of one group differ from the other?|| a possible null hypothesis will be that the mean test score of men is the same as that of the women.

$H_0: \mu_1 = \mu_2$

$H_0$  = null hypothesis

$\mu_1$  = mean score of men

$\mu_2$  = mean score of women

Sometimes the null hypothesis is rejected too. If this hypothesis is rejected means, that research could be invalid. Many researchers will neglect this hypothesis as it is merely opposite to the alternate hypothesis. It is a better practice to create a hypothesis and test it. The goal of researchers is not to reject the hypothesis. However, a perfect statistical model is always associated with the failure to reject the null hypothesis.

### 5.3.2 Alternative Hypothesis

An alternative hypothesis is a statement that describes that there is a relationship between two selected variables in a study.

- An alternative hypothesis is usually used to state that a new theory is preferable to the old one (null hypothesis).
- This hypothesis can be simply termed as an alternative to the null hypothesis.

- The alternative hypothesis is the hypothesis that is to be proved that indicates that the results of a study are significant and that the sample observation does not result just from chance but from some non-random cause.
- If a study is to compare method A with method B about their relationship and we assume that method A is superior or method B is inferior, then such a statement is termed an alternative hypothesis.

The symbol of the alternative hypothesis is either  $H_1$  or  $H_a$  while using less than, greater than, or not equal signs.

The following are some examples of alternative hypothesis:

If a researcher is assuming that the bearing capacity of a bridge is more than 10 tons, then the hypothesis under this study will be:

Null hypothesis  $H_0: \mu = 10$  tons

Alternative hypothesis  $H_a: \mu > 10$  tons

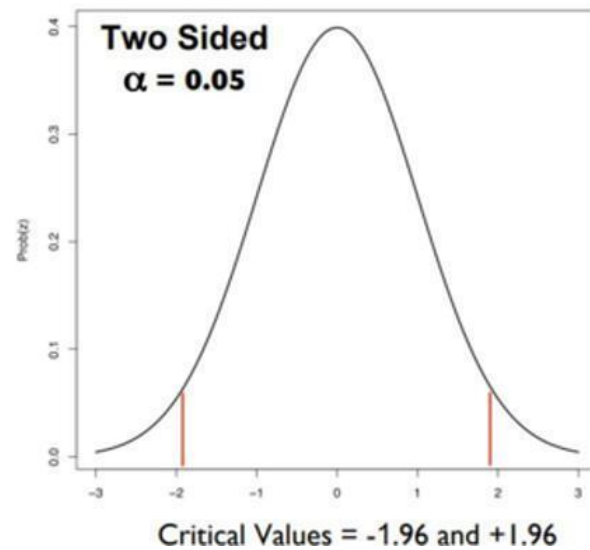
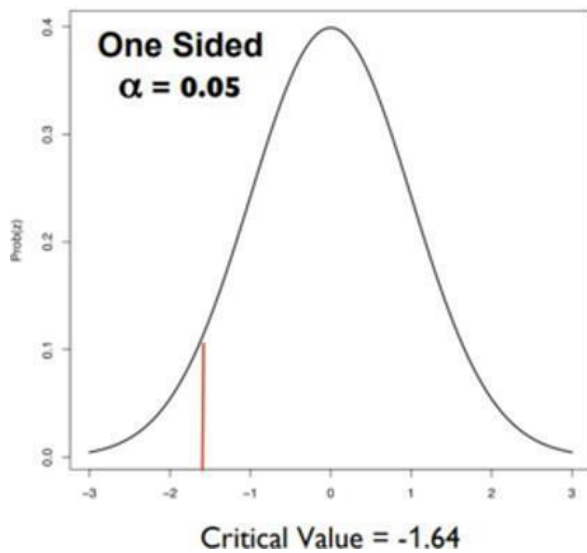
### 5.3.2.1 One-tailed & Two-tailed

A test of testing the null hypothesis is said to be a two-tailed test if the alternative hypothesis is two-tailed whereas if the alternative hypothesis is one-tailed then a test of testing the null hypothesis is said to be a one-tailed test. For example, if our null and alternative hypothesis is  $H_0: \mu = \mu_0$  and  $H_1: \mu \neq \mu_0$  then the test for testing the null hypothesis is two-tailed because the alternative hypothesis is two-tailed which means, the parameter  $\mu$  can take value greater than  $\mu_0$  or less than  $\mu_0$ . If the null and alternative hypotheses are  $H_0: \mu = \mu_0$   $H_1: \mu > \mu_0$  then the test for testing the null hypothesis is right-tailed because the alternative hypothesis is right-tailed. Similarly, if the null and alternative hypotheses are  $H_0: \mu = \mu_0$   $H_1: \mu < \mu_0$  then the test for testing the null hypothesis is left-tailed because the alternative hypothesis is left-tailed. The above discussion can be summarised in the Table below:

Table: Null and Alternative Hypothesis (Right and Left tailed test)

Null Hypothesis	Alternative Hypothesis	Types of Critical Region
$H_0: \mu = \mu_0$	$H_1: \mu \neq \mu_0$	Two-tailed test having critical regions under both tails
$H_0: \mu = \mu_0$	$H_1: \mu > \mu_0$	Right-tailed test having critical region under right tail only
$H_0: \mu = \mu_0$	$H_1: \mu < \mu_0$	Left-tailed test having critical region under left tail only

Let us do one example based on the type of tests.



Example 3: A company has replaced its original technology of producing electric bulbs with CFL technology. The company manager wants to compare the average life of bulbs manufactured by original technology and new technology CFL. Write appropriate null and alternate hypotheses. Also, say about one-tailed and two-tailed tests.

Solution: Suppose the average lives of original and CFL technology bulbs are denoted by:  $\mu_1$  and  $\mu_2$  respectively. If the company manager is interested just in knowing whether any significant difference exists in the average time of two types of bulbs then null and alternative hypotheses will be:

$H_0: \mu_1 = \mu_2$  [average lives of two types of bulbs are same]

$H_1: \mu_1 \neq \mu_2$  [average lives of two types of bulbs are different]

Since the alternative hypothesis is two-tailed therefore corresponding test will be two-tailed.

If company manager is interested just to know whether the average life of CFL is greater than original technology bulbs then our null and alternative hypotheses will be

$H_0: \mu_1 \geq \mu_2$

$H_1: \mu_1 < \mu_2$

Here, average life of CFL technology bulbs is greater than the average life of original technology,

Since alternative hypothesis is left-tailed therefore corresponding test will be a left-tailed test.

### **Difference between Null Hypothesis and Alternative Hypothesis**

Now, let us discuss the difference between the null hypothesis and the alternative hypothesis.

<b>Null Hypothesis</b>	<b>Alternative Hypothesis</b>
1. Denoted by $H_0$	Denoted by $H_1$
2. The null hypothesis is a statement. There exists no relation between the two variables	An alternative hypothesis is a statement, that there exists some relationship between two measured phenomena
3. It is the hypothesis that the researcher tries to disprove.	It is a hypothesis that the researcher tries to prove.
4. The mathematical formulation of the null hypothesis is an equal sign	The mathematical formulation alternative hypothesis is an inequality sign such as greater than, less than, etc.
5. The result of the null hypothesis indicates no changes in opinions or actions.	The result of an alternative hypothesis causes changes in opinions and actions.
6. The observations of this hypothesis are the result of chance	The observations of this hypothesis are the result of real effect
7. If the null hypothesis is accepted, the results of the study become insignificant.	If an alternative hypothesis is accepted, the results of the study become significant.
8. If the p-value is greater than the level of significance, the null hypothesis is accepted.	If the p-value is greater than the level of significance, the null hypothesis is accepted.

### 5.3.3 ERRORS IN HYPOTHESIS

If the value of test statistic falls in rejection (critical) region then we reject the null hypothesis and if it falls in the non-rejection region then we do not reject the null hypothesis. A test statistic is calculated based on observed sample observations. But a sample is a small part of the population about which decision is to be taken. A random sample may or may not be a good representative of the population. A faulty sample misleads the inference (or conclusion) relating to the null hypothesis. For example, an engineer infers that a packet of screws is sub-standard when it is not. It is an error caused by too poor or inappropriate (faulty) sample. Similarly, a packet of screws may infer good when it is sub-standard. So, we can commit two kinds of errors while testing a hypothesis which are summarised in Table 9.1 which is given below:

**Table: Types of Error**

<b>Decision</b>	<b><math>H_0</math> True</b>	<b><math>H_1</math> True</b>
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<b>Reject <math>H_0</math></b>	Type I Error ( $\alpha$ )	Correct decision
<b>Do not Reject <math>H_0</math></b>	Correct Decision	Type II Error (Power of test) $\beta$

Let us take a situation where a patient suffering from high fever reaches a doctor. Suppose the doctor formulates the null and alternative hypotheses as

$H_0$ : The patient has a Stomach Infection

$H_1$ : The patient has not a Stomach Infection

The following cases arise:

Case I: Suppose that hypothesis  $H_0$  is true, that is, the patient is a Stomach Infection and after observation, pathological and clinical examination, the doctor rejects  $H_0$ , that is, he/she declares him/her a non-Stomach Infection patient. It is not a correct decision and he/she commits an error in a decision known as a type-I error.

Case II: Suppose that hypothesis  $H_0$  is false, that is, the patient is a non-Stomach Infection patient and after observation, the doctor rejects  $H_0$ , that is, he/she declares him/her a non-Stomach Infection patient. It is a correct decision.

Case III: Suppose that hypothesis  $H_0$  is true, that is, the patient is a Stomach Infection patient and after observation, the doctor does not reject  $H_0$ , that is, he/she declares him/her a Stomach Infection patient. It is a correct decision.

Case IV: Suppose that hypothesis  $H_0$  is false, that is, the patient is a non-Stomach Infection patient and after observation, the doctor does not reject  $H_0$ , that is, he/she declares him/her a Stomach Infection patient. It is not a correct decision and he/she commits an error in a decision known as a type-II error.

### 5.3.4 LEVEL OF SIGNIFICANCE

The level of significance is the probability of rejecting a true null hypothesis that is the probability of —Type I error and is denoted by  $\alpha$ . The frequently used values of  $\alpha$  are 0.05 (i.e., 5 %); 0.01 (i.e., 1 %); 0.1 (i.e., 10 %), etc. When  $\alpha = 0.05$  it means that the level of significance is 5%.  $\alpha = 0.01$  which means 1% level of significance.  $\alpha = 0.1$  which means 10% level of significance. In fact,  $\alpha$  specifies the critical region. If the calculated value of the test statistic lies in the rejection (critical) region, then we reject the null hypothesis and if it lies in the non-rejection region, then we do not reject the null hypothesis. Also, we note that when  $H_0$  is rejected then automatically the alternative hypothesis  $H_1$  is

accepted. Now, one point of our discussion is how to decide critical value(s) or cut-off value(s) for a known test statistic. Suppose the distribution of test statistics could be expressed into some well-known distributions like Z,  $\chi^2$ , t, F test etc. Then our problem will be solved and using the probability distribution of test statistics, we can find the cut-off value(s) that provides us critical area equal to 5% (or 1%).

16 Testing of Hypothesis Another viewpoint about the level of significance relates to the trueness of the conclusion. If  $H_0$  does not reject at level, say,  $\alpha = 0.05$  (5% level) then a person will be confident that —concluding statement about  $H_0$  is true with 95% assurance. But even then, it may be false with 5% chance. There is no percent assurance about the trueness of the statement made for  $H_0$ . As an example, if among 100 scientists, each draws a random sample and uses the same test statistic to test the same hypothesis  $H_0$  conducting same experiment, then 95 of them will reach the same conclusion about  $H_0$ . But still, 5 of them may differ (i.e., against the earlier conclusion). A similar argument can be made for, say,  $\alpha = 0.01$  (=1%). It is like when  $H_0$  is rejected at  $\alpha = 0.01$  by a scientist, then out of 100 similar researchers who work together at the same time for the same problem, but with different random samples, 99 of them would reach the same conclusion however, one may differ.

### 5.3.5 Confidence Interval

Confidence interval is the interval marked by limits within which the population value lies by chance and the hypothesis is considered to be acceptable. If an observed value falls in the confidence interval  $H_0$  is accepted.

### 5.3.6 Degree of Freedom

Degree of freedom refers to the number of values that are free to vary after we have given the number of restrictions imposed upon the data. It is commonly abbreviated by df. In statistics, it is the number of values in a study that are free to vary. The statistical formula to find out how many degrees of freedom are there is quite simple. It implies that degrees of freedom are equivalent to the number of values in a data set minus 1, and appears like this:

$$df = N - 1$$

Where N represents the number of values in the data set (sample size).

That being said, let's have a look at the sample calculation.

If there is a data set of 6, ( $N=6$ ).

Call the data set X and make a list with the values for each data.

For this example, data, set X of the sample size includes: 10, 30, 15, 25, 45, and 55

This data set has a mean, or average of 30. Find out the mean by adding the values and dividing by N:

$$(10 + 30 + 15 + 25 + 45 + 55)/6 = 30$$

Using the formula, the degrees of freedom will be computed as  $df = N-1$ :

In this example, it appears,  $df = 6-1 = 5$

This further implies that, in this data set (sample size), five numbers contain the freedom to vary as long as the mean remains 30.

### **5.3.7 Power of Test**

Nowadays use of p-value is becoming more and more popular because of the following two reasons:

- most the statistical software provides a p-value rather than a critical value.
- p-value provides more information compared to critical value as far as rejection or not rejection of  $H_0$

Moving in this direction, we note that in scientific applications one is not only interested in rejecting or not rejecting the null hypothesis but he/she is also interested in assessing how strong the data has the evidence to reject  $H_0$ .

This smallest level of significance ( $\alpha$ ) is known as the —p-value. The p-value is the smallest value of the level of significance( $\alpha$ ) at which a null hypothesis can be rejected using the obtained value of the test statistic. The p-value is the probability of obtaining a test statistic equal to or more extreme (in the direction of sporting  $H_1$ ) than the actual value obtained when null hypothesis is true.

The p-value for various tests can be obtained with the help of the tables. But unless we are dealing with the standard normal distribution, the exact p-value is not obtained with the tables as mentioned above. But if we test our hypothesis with the help of computer packages or software such as SPSS, SAS, MINITAB, STATA, EXCEL, etc. These types of computer packages or software present the p-value as part of the output for each hypothesis testing procedure. Therefore, in this block, we will also describe the procedure to decide on the null hypothesis based on critical value as well as p-value concepts.

### **5.4 TYPES OF RESEARCH HYPOTHESIS**

Before researchers can begin working on a question that interests them, they need to formulate a research hypothesis. This is an important step in the scientific method because this determines the direction of the study. Scientists need to scrutinize previous work in the area and select an experimental design to use that helps them find data that either supports or rejects their hypothesis.

Research hypotheses are of different types: simple, complex, directional, nondirectional, associative, causal, inductive & deductive, null, and alternative research.



1. **Simple Hypothesis:** if a hypothesis specifies only one value or exact value of the population parameter then it is known as a simple hypothesis. This predicts the relationship between a single independent variable (IV) and a single dependent variable (DV). e.g., a motorcycle company claims that a certain model gives an average mileage of 100 km per Liter, this is a case of a simple hypothesis.
2. **Complex Hypothesis:** if a hypothesis specifies not just one value but a range of values that the population parameter may assume is called a composite hypothesis. This predicts the relationship between two or more independent variables and two or more dependent variables. The average age of students in a class is greater than 20. This statement is a composite hypothesis.
3. **Directional Hypothesis:** This may imply that the researcher is intellectually committed to a particular outcome. They specify the expected direction of the relationship between variables i.e., the researcher predicts not only the existence of a relationship but also its nature. Scientific journal articles generally use this form of hypothesis. The investigator bases this hypothesis on the trends apparent from previous research on this topic.
4. **Nondirectional Hypothesis:** This form of hypothesis is used in studies where there is no sufficient past research on which to base a prediction. Do not stipulate the direction of the relationship. Continuing with the same example, a nondirectional hypothesis would read, ‘The academic performance of high school students is related to their participation in extracurricular activities.’  
**Associative Hypothesis:** Associative hypotheses propose relationships between variables, when one variable changes, the other changes. Do not indicate cause and effect.
5. **Causal Hypothesis:** Causal hypotheses propose a cause-and-effect interaction between two or more variables. The independent variable is manipulated to cause an effect on the dependent variable. The dependent variable is measured to examine the effect created by the independent variable. Such hypotheses also need the researcher to rule out the possibility that the effect is a result of a cause other than what the study has examined.
6. **Inductive and deductive Hypotheses:** Inductive hypotheses are formed through inductive reasoning from many specific observations to tentative explanations. Deductive hypotheses are formed through deductively reasoning the implications of the theory.
7. **Null Hypothesis:** This is a hypothesis that proposes no relationship or difference between two variables. This is the conventional approach to making a prediction. It involves a statement that says there is no relationship between two groups that the researcher compares on a certain variable. The hypothesis may also state that there is no significant difference when different groups are compared concerning a particular variable. For example, ‘There is no difference in the academic performance

of high school students who participate in extracurricular activities and those who do not participate in such activities' is a null hypothesis. It is denoted as  $H_0$ .

## 5.5 SUM UP

Hypothesis testing is a fundamental statistical method used to make inferences about population parameters based on sample data. Here is a summary of the key concepts and steps involved in hypothesis testing are as:

- **Formulate Hypotheses:** Null Hypothesis ( $H_0$ ): This is the default hypothesis that there is no effect or no difference in the population. It represents the status quo.
- **Alternative Hypothesis ( $H_a$  or  $H_1$ ):** This is the hypothesis you want to test, suggesting there is an effect or difference in the population.
- **Select Significance Level ( $\alpha$ ):** The significance level, often denoted as  $\alpha$ , represents the probability of making a Type I error (rejecting a true null hypothesis). Common values for  $\alpha$  include 0.05 or 0.01.
- **Determine the P-value:** The p-value is the probability of obtaining a test statistic as extreme as, or more extreme than, the one calculated from the sample data, assuming the null hypothesis is true. A smaller p-value indicates stronger evidence against the null hypothesis.
- **Make a Decision:** If the p-value is less than  $\alpha$ , you reject the null hypothesis and If the p-value is greater than  $\alpha$ , you fail to reject the null hypothesis.
- **Draw a Conclusion:** If you reject the null hypothesis, you conclude that there is evidence to support the alternative hypothesis.
- **If you fail to reject the null hypothesis,** you do not have enough evidence to support the alternative hypothesis.

## 5.6 QUESTIONS FOR PRACTICE

**Define the below-mentioned terms:**

- a) Null Hypothesis
- b) Alternative Hypothesis and its Types
- c) Type I Error
- d) Type II Error
- e) Level of Significance
- f) Degree of Freedom
- g) Power of a Test

## 5.7 SUGGESTED READINGS

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**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 6: SMALL SAMPLE TEST**

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**STRUCTURE**

**6.0 Objectives**

**6.1 Introduction**

**6.3 Procedure of t-test for Testing a Hypothesis**

**6.4 Testing of hypothesis for Population Mean Using t-Test**

**6.5 Testing of Hypothesis for Difference of Two Population Means Using t-test**

**6.6 Paired t-test**

**6.7 Testing of Hypothesis for Population Correlation Coefficient Using t-test**

**6.8 Sum Up**

**6.9 Questions for Practice**

**6.10 Suggested Readings**

**6.0 OBJECTIVES**

After studying this unit, the learner should be able to:

- know the procedure of t-test for testing a hypothesis
- describe testing of the hypothesis for the population mean for using a t-test
- explain the testing of the hypothesis for the difference between two population means
- when samples are independent using a t-test
- describe the procedure for paired t-test for testing of hypothesis
- difference of two populations means when samples are dependent or paired
- testing of the hypothesis for the population correlation coefficient using a t-test.

**6.1 INTRODUCTION**

**t-test** was developed in 1908 by —Willian Sealy Gosset‡ he was working with —Guinness Son & Company- A Dublin Brewery, in Ireland‡ and company did not permit employees to publish their research findings under their names, so he published his findings under the pen name —Student‡. So, it is also called as —Student‡ t-test. It is a statistical hypothesis testing tool that is used to determine whether there is a significant difference between the means of two groups or samples. t-test is

commonly used when the sample size is small or  $n < 30$  ( $n$ , means number of observations) and population standard deviation is unknown. It is based on t-distribution which is similar to the normal distribution but less peaked than normal distribution and has a higher tail than normal distribution.

The shape of the t-distribution varies with the change in the degree of freedom, it is less peaked than the normal distribution at centre and more peaked in the tails. The value of t-distribution ranges from  $-\infty$  to  $+\infty$  ( $-\infty < t < +\infty$ ).

The following are the standard t-tests:

- One-sample: Compares a sample mean to a reference value.
- Two-sample: Compares two sample means.
- Paired: Compares the means of matched pairs, such as before and after scores.

To choose the correct t-test, you must know whether you are assessing one or two group means. If you're working with two groups means, do the groups have the same or different items/people? Use the table below to choose the proper analysis.

Number of Group Means	Group Type	t-test
One	-----	One sample t-test
Two	Different items in each group	Two sample t-test
Two	The same items in both groups	Paired t-test

### 6.3 PROCEDURE OF T-TEST FOR TESTING A HYPOTHESIS

Let us give you similar details here. For this purpose, let  $X_1, X_2, \dots, X_n$  be a random sample of small size  $n$  ( $< 30$ ) selected from a normal population having parameter of interest, say,  $\theta$  which is unknown but its hypothetical value, say,  $\theta_0$  estimated from some previous study or some other way is to be tested. t-test involves the following steps for testing this hypothetical value:

**Step I:** First of all, we have to set up null hypothesis  $H_0$  and alternative hypothesis  $H_1$ .

Suppose, we want to test the hypothetical / Testing of the Hypothesis assumed value  $\mu_0$  of parameter  $\mu$ .

So, we can take the null and alternative hypotheses as  $H_0: \mu = \mu_0$

$H_1: \mu \neq \mu_0$  (for the two-tailed test)

While one- tail test as:

$H_0: \mu = \mu_0$  and  $H_1: \mu > \mu_0$  (Right-tailed)

$H_0: \mu = \mu_0$  and  $H_1: \mu < \mu_0$  (Left-tailed)

In case of comparing the same parameter of two populations of interest, say,  $\mu_1$  and  $\mu_2$ , then our null and alternative hypotheses would be

$H_0: \mu_1 = \mu_2$  and  $H_1: \mu_1 \neq \mu_2$  (for two-tailed test)

While one- tail test as:

$H_0: \mu_1 \leq \mu_2$  and  $H_1: \mu_1 > \mu_2$  (Right-tailed)

$H_0: \mu_1 \geq \mu_2$  and  $H_1: \mu_1 < \mu_2$  (Left-tailed)

**Step II:** After setting the null and alternative hypotheses, we establish a criterion for rejection or non-rejection of null hypothesis, that is, decide the level of significance ( $\alpha$ ), at which we want to test our hypothesis. The most common value of  $\alpha$  is 0.05 or 5%. Other popular choices are 0.01 (1%) and 0.1 (10%).

**Step III:** The third step is to choose an appropriate test statistics form like t-test of any application.

**Step IV:** Obtain the critical value(s) in the sampling distribution of the test statistic and construct the rejection (critical) region of size  $\alpha$ . Generally, critical values for various levels of significance are put in the form of a table for various standard sampling distributions of test statistics such as t-table of respective d.f ,etc.

**Step V:** After that, compare the calculated value of test statistic obtained from Step IV, with the critical value(s) obtained in Step V and locate the position of the calculated test statistic, that is, it lies in the rejection region or non-rejection region.

**Step VI:** ultimately testing the hypothesis, we have to conclude.

It is done as explained below:

- (i) If the calculated test statistic value lies in the rejection region at the significance level, then we reject the null hypothesis. It means that the sample data provide us sufficient evidence against the null hypothesis and there is a significant difference between hypothesized value and observed value of the parameter.
- (ii) If the calculated test statistic value lies in the non-rejection region at the significance level, then we do not reject the null hypothesis. It means that the sample data fails to provide sufficient evidence against the null hypothesis and the difference between hypothesized value and observed value of the parameter due to sample fluctuation.

Note: The decision about the null hypothesis is taken with the help of the p-value. The concept of p-value is very important because computer packages and statistical software such as SPSS, STATA, MINITAB, EXCEL, etc., all provide p-value.

## 6.4 TESTING OF HYPOTHESIS FOR POPULATION MEAN USING T-TEST

### ASSUMPTIONS

When the standard deviation of a population is not known and the sample size is small so in this situation, we use a t-test provided the population under study is normal. Virtually every test has some assumptions which must be met before the application of the test. This t-test needs the following assumptions to work:

- (i) The characteristic under study follows a normal distribution. In other words, populations from which a random sample is drawn should be normal for the characteristic of interest
- (ii) Sample observations are random and independent.
- (iii) Population variance  $\sigma^2$  is unknown.

For describing this test, let  $X_1, X_2, \dots, X_n$  be a random sample of small size  $n$  ( $< 30$ ) selected from a normal population with mean  $\mu$  and unknown variance  $\sigma^2$ . Now, follow the same procedure as we have discussed, that is, first of all, we set up the null and alternative hypotheses. Here, we want to test the claim about the specified value  $\mu_0$  of population means  $\mu$  so we can take the null and alternative hypotheses as

take the null and alternative hypotheses as  $H_0: \mu = \mu_0$

$H_1: \mu \neq \mu_0$  (for the two-tailed test)

While one- tail test as:

$H_0: \mu = \mu_0$  and  $H_1: \mu > \mu_0$  (Right-tailed)

$H_0: \mu = \mu_0$  and  $H_1: \mu < \mu_0$  (Left-tailed)

For testing the null hypothesis, the test statistic  $t$  is given by

$$t = \frac{\bar{X} - \mu_0}{s / \sqrt{n}}$$

where  $\bar{X} = \frac{\sum X}{n}$  is the sample mean

$\bar{X}$  can be solved by  $A + \frac{1}{n} \sum d$

$$\sum d = \sum (X - A)$$

$A$  = assumed mean

$s^2 = \frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2$  is the sample variance

$s^2$  can be solved by  $\frac{1}{n-1} (\sum d^2 - \frac{(\sum d)^2}{n})$

Here, t-distribution with  $(n - 1)$  degrees of freedom.

After substituting values of  $X$ ,  $S$  and  $n$ , we get the calculated value of test statistic  $t$ . Then we look for

the critical value of test statistic  $t$  from the  $t$ -table. On comparing the calculated value and critical value(s), we decide on the null hypothesis.

**Example 1:** An electric tube producer claims that the average life of a particular category of electric tubes is 18000 km when used under normal driving conditions. A random sample of 16 electric tubes was tested. The mean and SD of life of the electric tubes in the sample were 20000 km and 6000 km respectively. Assuming that the life of the electric tubes is normally distributed, test the claim of the producer at a 1% level of significance.

Solution: Here, we are given that

$$n = 16, \mu_0 = 18000, \bar{X} = 20000, s = 6000$$

Here, we want to test that the producer's claim is true that the average life ( $\mu$ ) of electric tubes is 18000 km.

**Step 1:** Set up the null and alternative hypotheses as

$$H_0: \mu_0 = 18000 \text{ (average life of electric tubes is 18000 km)}$$

$$H_1: \mu_0 \neq 18000 \text{ two-tailed (average life of electric tubes is not 18000 km)}$$

**Step 2:** level of significance: As this is a one-tailed test,

$$\alpha = 5\%. \text{ This can be used to determine the critical value.}$$

$$1 - \alpha = 1 - 0.05 = 0.95, df = N - 1 = 6 - 1 = 5$$

**Step 3:** It is a small sample test; therefore  $t$ -test is to be determined as

$$t = \frac{\bar{X} - \mu_0}{s / \sqrt{n}}$$

**Step 4:** Determine the critical value

The critical value of test statistic  $t$  for two-tailed test corresponding  $(n-1) = 15$  df at 1% level of significance are  $\pm t_{(15), 1\%} = \pm 2.947$ . Here,  $t$ -distribution with  $(n-1)$  degrees of freedom.

**Step 5:** Test Statistics

$$t = \frac{20000 - 18000}{6000 / \sqrt{16}}$$

$$t = \frac{2000}{1500} = 1.33$$

**Step 6: Conclusion**

Since the calculated value of test statistic  $t$  ( $=1.33$ ) is less than the critical (tabulated) value ( $= 2.947$ ) and greater than the critical value ( $= -2.947$ ), that means a calculated value of test statistic lies in the non-rejection region, thus we do not reject the null hypothesis i.e. we support the producer's claim at 1% level of significance. Therefore, we conclude that the sample fails to provide sufficient evidence against the claim so we may assume that the producer's claim is true.



**Example 2: (left-tail)** The average score of a class is 90. However, a teacher believes that the average score might be lower. The scores of 6 students were randomly measured. The mean was 82 with a standard deviation of 18. With a 0.05 significance level use hypothesis testing to check if this claim is true.

**Solution: Step 1:** Set up the null and alternative hypotheses as

$$H_0: \mu = 90,$$

Alternative hypothesis

$$H_1: \mu < 90 \text{ (Left-tailed)}$$

$$n = 6, s = 18$$

**Step 2:** level of significance:

As this is a one-tailed test,

$\alpha = 5\%$ . This can be used to determine the critical value.

$$1 - \alpha = 1 - 0.05 = 0.95, df = N - 1 = 6 - 1 = 5$$

**Step 3:** It is a small sample test; therefore t-test is to be determined as

$$t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}}$$

**Step 4:** Determine the critical value

The critical value from the t table is -2.015

**Step 5:** Test Statistics

$$t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}}$$

$$t = \frac{82 - 90}{\frac{18}{\sqrt{6}}}$$

$$t = -1.088$$

**Step 6: Conclusion**

As  $\text{Cal } t > \text{Tab } t$  ( $-1.088 > -2.015$ ), therefore, fail to reject the null hypothesis. There is not enough evidence to support the claim.

## 6.5 TESTING OF HYPOTHESIS FOR DIFFERENCE OF TWO POPULATION MEANS USING T-TEST

When standard deviations of both populations are not known, in real-life problems t-test is more suitable compared to the Z-test.

### Assumptions

This test works under the following assumptions:

- It follows a normal distribution in both populations. Both populations from which random samples are drawn should be normal for the characteristics of interest.
- Samples and their observations both are independent of each other.
- Population variances  $\sigma_1^2$  and  $\sigma_2^2$  are both unknown but equal.

Let's we have to draw two independent random samples,  $X_1, X_2, \dots, X_n$  and  $Y_1, Y_2, \dots, Y_n$  of sizes  $n_1$  and  $n_2$  from these normal populations. Let  $\bar{X}$  and  $\bar{Y}$  be the means of first and second sample respectively. Further, suppose the variances of both the populations are unknown but are equal, i.e.,  $\sigma_1^2 = \sigma_2^2 = \sigma$ . In this case,  $\sigma^2$  is estimated by value of pooled sample variance  $S^2$

$$s_p^2 = \frac{1}{n_1 + n_2 - 2} [(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2]$$

$$s_1^2 = \frac{1}{n_1 - 1} \sum (X - \bar{X})^2 \text{ and } s_2^2 = \frac{1}{n_2 - 1} \sum (Y - \bar{Y})^2$$

$$s_p^2 = \frac{1}{n_1 + n_2 - 2} [\sum (X - \bar{X})^2 + \sum (Y - \bar{Y})^2]$$

$$\bar{X} = A + \frac{\sum d_1}{n_1}$$

$$\bar{Y} = A + \frac{\sum d_2}{n_2}$$

$$d_1 = (X - A_1)$$

$$d_2 = (Y - A_2)$$

$A_1$  is assumed mean from series X

$A_2$  is assumed mean from series Y

$$s_p^2 = \frac{1}{n_1 + n_2 - 2} [\sum d_1^2 - \frac{(\sum d_1)^2}{n_1} + \sum d_2^2 - \frac{(\sum d_2)^2}{n_2}]$$

Here, the hypotheses for a difference in two population means are similar to those for a difference in two population proportions. The null hypothesis,  $H_0$ , is again a statement of —no effect‖ or —no difference.‖

- $H_0: \mu_1 - \mu_2 = 0$ , which is the same as  $H_0: \mu_1 = \mu_2$

The alternative hypothesis,  $H_a$ , can be any one of the following.

- $H_a: \mu_1 - \mu_2 < 0$ , which is the same as  $H_a: \mu_1 < \mu_2$
- $H_a: \mu_1 - \mu_2 > 0$ , which is the same as  $H_a: \mu_1 > \mu_2$
- $H_a: \mu_1 - \mu_2 \neq 0$ , which is the same as  $H_a: \mu_1 \neq \mu_2$

For testing the null hypothesis, the test statistic  $t$  is given by

$$t = \frac{\bar{X} - \bar{F}}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

After substituting values of  $\bar{X}$ ,  $\bar{Y}$ ,  $S$ ,  $n_1$  and  $n_2$  we get the calculated value of test statistic  $t$ . Then we look for critical (or tabulated) value(s) of test statistic  $t$  from the  $t$ -table. On comparing calculated value and critical value(s), we decide the null hypothesis either to accept or reject.

**Example 3: Two different types of drugs A and B were tried on some patients for increasing their weights. Six persons were given drug A and other 7 persons were given drug B. The gain in weights (in pounds) is given below:**

<b>Drug A:</b>	<b>5</b>	<b>8</b>	<b>7</b>	<b>10</b>	<b>9</b>	<b>6</b>	<b>–</b>
<b>Drug B:</b>	<b>9</b>	<b>10</b>	<b>15</b>	<b>12</b>	<b>14</b>	<b>8</b>	<b>12</b>

**Assuming that increase in the weights due to both drugs follow normal distributions with equal variances, do the both drugs differ significantly with regard to their mean weights increment at 5% level of significance?**

**Solution:** If  $\mu_1$  and  $\mu_2$  denote the mean weight increment due to drug A and drug B respectively then our claim is  $\mu_1 = \mu_2$  and its complement is  $\mu_1 \neq \mu_2$ .

Since the claim contains the equality sign so we can take the claim as the null hypothesis and complement as the alternative hypothesis. Thus,

$H_0: \mu_1 = \mu_2$  [effect of both drugs is same]

$H_1: \mu_1 \neq \mu_2$  [effect of both drugs is not same]

Since the alternative hypothesis is two-tailed so the test is two-tailed test. Since it is given that increments in the weight due to both drugs follow normal distributions with equal and unknown variances and other assumptions of  $t$ -test for testing a hypothesis about difference of two population means also meet. So, we can go for this test. For testing the null hypothesis, the test statistic  $t$  is given by

$$t = \frac{\bar{X} - \bar{F}}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Assume,  $a = 8$ ,  $b = 12$  and use short-cut method to find  $\bar{X}$ ,  $\bar{Y}$  and  $S$

Drug A (X)			Drug B (Y)		
X	$d_1 = (X - A_X)$ $A_X = 8$		Y	$d_2 = (Y - A_Y)$ $A_Y = 12$	
5	-3	9	9	-3	9
8	0	0	10	-2	4

7	-1	1	15	3	9
10	2	4	12	0	0
9	1	1	14	2	4
6	-2	4	8	-4	16
			12	0	0
$\sum X = 45$	$\sum d_1 = -3$	$\sum d_1^2 = 19$	$\sum Y = 80$	$\sum d_2 = -4$	$\sum d_2^2 = 16$

$$\bar{X} = \frac{\sum X}{n} = \frac{45}{6} = 7.5$$

$$\bar{Y} = \frac{\sum Y}{n} = \frac{80}{7} = 11.43$$

$$S^2 = \frac{1}{n_1 + n_2 - 2} \left( \sum d_1^2 - \frac{(\sum d_1)^2}{n_1} \right) + \left( \sum d_2^2 - \frac{(\sum d_2)^2}{n_2} \right)$$

$$= \frac{1}{6+7-2} \left( 19 - \frac{(-3)^2}{6} \right) + \left( 16 - \frac{(-4)^2}{7} \right)$$

$$= \frac{1}{11} (17.5 - 3.71)$$

$$= \sqrt{5.20}$$

$$S = 2.28$$

$$t = \frac{\bar{X} - \bar{Y}}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$t = \frac{7.5 - 11.43}{2.28 \sqrt{\frac{1}{6} + \frac{1}{7}}}$$

$$= \frac{-3.93}{2.28 \times 0.56}$$

$$= \frac{-3.93}{1.28}$$

$$= -3.07$$

The critical values of test statistic t for two-tailed test corresponding  $(n_1 + n_2 - 2) = 11$  df at 5% level of significance are  $\pm t(11), 0.025 = \pm 2.201$ . Since calculated value of test statistic t ( $= -3.07$ ) is less than the critical values ( $= \pm 2.201$ ) that means calculated value of test statistic t lies in rejection region, so we reject the null hypothesis i.e. we reject the claim at 5% level of significance. Thus, we conclude that samples provide us sufficient evidence against the claim so drugs A and B differ significantly. Any one of them is better than other.

## 6.6 PAIRED t-TEST

Paired t-test gives a hypothesis examination of the difference between population means for a set of random samples whose variations are almost normally distributed. Subjects are often tested in a before-

after situation or with subjects as alike as possible. The paired t-test is a test that the differences between the two observations are zero. For instance, a pharmaceutical company might create a new blood pressure-lowering medication. Twenty individuals had their blood pressure taken both before and after the medicine is administered for a month. To determine whether there is a statistically significant difference between pressure readings taken before and after taking the medication, analysts utilize a paired t-test.

Let us assume two paired sets, such as  $X_i$  and  $Y_i$  for  $i = 1, 2, \dots, n$  such that their paired difference is independent which is identically and normally distributed. Then the paired t-test concludes whether they notably vary from each other. Here,

- Null hypothesis: The mean difference between pairs equals zero in the population ( $\mu_D = 0$ ).
- Alternative hypothesis: The mean difference between pairs does not equal zero in the population ( $\mu_D \neq 0$ ).

### Assumptions

This test works under following assumptions:

- The population of differences follows normal distribution.
- Samples are not independent.
- Size of both the samples is equal.
- Population variances are unknown but not necessarily equal.

Let  $(X_1, Y_1), (X_2, Y_2), \dots, (X_n, Y_n)$  be a paired random sample of size  $n$  and the difference between paired observations  $X_i$  &  $Y_i$  be denoted by  $D_i$ , that is,  $D_i = X_i - Y_i$  for  $i = 1, 2, \dots, n$ . Hence, we can assume that  $D_1, D_2, \dots, D_n$  be a random sample from normal population of differences with mean  $\mu_D$  and unknown variance  $\sigma_D^2$ . This is same as the case of testing of hypothesis for population mean when population variance is unknown.

Here, we want to test that there is an effect of a diet, training, treatment, medicine, etc.

A paired samples t-test always uses the following null hypothesis:

- $H_0: \mu_1 = \mu_2$  or  $H_0: \mu_D = \mu_1 - \mu_2$  (the two-population means are equal)

The alternative hypothesis can be either two-tailed, left-tailed, or right-tailed:

- $H_1$  (two-tailed):  $\mu_1 \neq \mu_2$  or  $\mu_D \neq 0$  (the two-population means are not equal)
- $H_1$  (left-tailed):  $\mu_1 < \mu_2$  (population 1 mean is less than population 2 mean)
- $H_1$  (right-tailed):  $\mu_1 > \mu_2$  (population 1 mean is greater than population 2 mean)

For testing null hypothesis, paired t statistic is given as:

$$t = \frac{\bar{D}}{s_D / \sqrt{n}}$$

$$\bar{D} = \frac{1}{n} \sum_{i=1}^n D_i$$

$$S_D^2 = \frac{1}{n-1} \sum_{i=1}^n (D_i - \bar{D})^2 = \frac{1}{n-1} \left[ \sum D_i^2 - \frac{(\sum D_i)^2}{n} \right]$$

After substituting values of D, S and n D we get calculated value of test statistic t. Then we look for critical (or cut-off or tabulated) value(s) of test statistic t from the t-table. On comparing calculated value and critical value(s), we take the decision about the null hypothesis.

**Example 4: To verify whether the training programme improved performance of the laborers, a similar test was given to 10 laborers both before and after the programme.**

**The original marks out of 100 (before training) recorded in an alphabetical order of the participants are**

**before training: 42, 46, 50, 36, 44, 60, 62, 43, 70 53**

**After training: 45, 46, 60, 42, 60, 72, 63, 43, 80 65** Assuming

**that performance of the before training and after follows normal distribution. Test whether the training programme has improved the performance of the laborers at 5% level of significance?**

**Solution:** Here, we want to test whether the training programme has improved the performance of the laborer. Thus,

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 < \mu_2 \text{ (left-tailed)}$$

Since the alternative hypothesis is left-tailed so the test is left-tailed test.

It is a situation of before and after. Also, the marks of the students before and after the training programme follows normal distributions. Therefore, population of differences will also be normal. Also, all the assumptions of paired t-test meet. So, we can go for paired t-test. For testing the null hypothesis, the test statistic t is given by

$$t = \frac{\bar{D}}{S_D / \sqrt{n}}$$

Labours	X	Y	D = (X-Y)	D <sup>2</sup>
1	42	45	-3	9
2	46	46	0	0
3	50	60	-10	100
4	36	42	-6	36
5	44	60	-16	256
6	60	72	-12	144
7	62	63	-1	1
8	43	43	0	0

9	70	80	-10	100
10	53	65	-12	144
			$\sum D = -70$	$\sum D^2 = 790$

$$\begin{aligned}
 \bar{D} &= \frac{1}{n} \sum_{i=1}^n D_i \\
 &= \frac{1}{10} (-70) \\
 &= -7 \\
 S_D^2 &= \frac{1}{10-1} \left[ \sum D^2 - \frac{(\sum D)^2}{n} \right] \\
 &= \frac{1}{9} \left[ 790 - \frac{(-70)^2}{10} \right] \\
 &= \frac{1}{9} [300] \\
 &= 33.33 \\
 S_D &= \sqrt{33.33} \\
 S_D &= 5.77
 \end{aligned}$$

Putting the values in t-test, we have

$$\begin{aligned}
 t &= \frac{\bar{D}}{S_D / \sqrt{n}} \\
 t &= \frac{-7}{5.77 / \sqrt{10}} \\
 t &= -3.38
 \end{aligned}$$

The critical value of test statistic t for left-tailed test corresponding (n-1) = 9 df at 5% level of significance is  $-t(9), 0.05 = -1.833$ . Since calculated value of test statistic t (= -3.83) is less than the critical (tabulated) value (= -1.833), that means calculated value of test statistic t lies in rejection region, so we reject the null hypothesis and support the alternative hypothesis i.e. we support our claim at 5% level of significance. Thus, we conclude that samples fail to provide us sufficient evidence against the claim so we may assume that the participants have significant improvement after training programme.

## 6.7 TESTING OF HYPOTHESIS FOR POPULATION CORRELATION COEFFICIENT USING T-TEST

if two variables are related in such a way that change in the value of one variable affects the value of another variable then the variables are said to be correlated or there is a correlation between these two variables. Correlation can be positive, which means the variables move together in the same direction, or negative, which means they move in opposite directions. And correlation coefficient is used to

measure the intensity or degree of linear relationship between two variables. The value of correlation coefficient varies between  $-1$  and  $+1$ , where  $-1$  representing a perfect negative correlation,  $0$  Small Sample Tests representing no correlation, and  $+1$  representing a perfect positive correlation. Sometime, the sample data indicate for non-zero correlation but in population they are uncorrelated ( $\rho = 0$ ). For example, price of tomato in Delhi (X) and in London (Y) are not correlated in population ( $\rho = 0$ ). But paired sample data of 20 days of prices of tomato at both places may show correlation coefficient ( $r$ )  $\neq 0$ . In general, in sample data  $r \neq 0$  does not ensure in population  $\rho \neq 0$  holds. here, we will know how we test the hypothesis that population correlation coefficient is zero.

### Assumptions

This test works under following assumptions:

- (i) The characteristic under study follows normal distribution in both the populations. In other words, both populations from which random samples are drawn should be normal with respect to the characteristic of interest.
- (ii) Samples observations are random.

Let us consider a random sample  $(X_1, Y_1), (X_2, Y_2), \dots, (X_n, Y_n)$  of size  $n$  taken from a bivariate normal population. Let  $\rho$  and  $r$  be the correlation coefficients of population and sample data respectively. Here, we wish to test the hypothesis about population correlation coefficient ( $\rho$ ), that is, linear correlation between two variables X and Y in the population, so we can take the null hypothesis as

$H_0: \rho = 0$  and  $H_1: \rho \neq 0$  (two-tailed)

$H_0: \rho \leq 0$  and  $H_1: \rho > 0$  (right -tailed)

$H_0: \rho \geq 0$  and  $H_1: \rho < 0$  (left -tailed)

Here t statistic is as:  $t = \frac{r \sqrt{n-2}}{\sqrt{1-r^2}}$

here  $n-2$  degrees of freedom

After substituting values of  $r$  and  $n$ , we find out calculated value of t-test statistic. Then we look for critical (or cut-off or tabulated) value(s) of test statistic  $t$  from the t-table. On comparing calculated value and critical value(s), we take the decision about the null hypothesis. Let us do some examples of testing of hypothesis that population correlation coefficient is zero.

**Example 5: 20 families were selected randomly from Area A group to determine that correlation exists between family income and the amount of money spent per family member on food each month. The sample correlation coefficient ( $r$ ) was computed as  $r = 0.40$ . By follow the normal**



**distributions, test that there is a positive linear relationship between the family income and the amounts of money spent per family member on food each month in Area A group at 1% level of significance.**

**Solution:** here,  $n = 20$ ,  $r = 0.40$ , and to test that there is a positive linear relationship between the family income and the amounts of money spent per family member on food each month in area A group. If  $\rho$  denote the correlation coefficient between the family income and the amounts of money spent per family member then the claim is  $\rho > 0$  and its complement is  $\rho \leq 0$ . Since complement contains the equality sign so we can take the complement as the null hypothesis and the claim as the alternative hypothesis.

Thus,

$$H_0: \rho \leq 0$$

$$H_1: \rho > 0 \text{ (right-tailed)}$$

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

$$t = \frac{0.40\sqrt{20-2}}{\sqrt{1-(0.40)^2}}$$

$$t = \frac{0.40 \times 4.24}{0.92} = 1.84$$

The critical value of test statistic  $t$  for right-tailed test corresponding  $(n-2) = 18$  df at 1% level of significance is  $t_{(n-2), \alpha} = t_{(18), 0.01} = 2.552$ . Since calculated value of test statistic  $t (=1.84)$  is less than the critical value  $(= 2.552)$ , it calculated value of test statistic  $t$  lies in non-rejection region, so we do not reject the null hypothesis and reject the alternative hypothesis *i.e.* we reject our claim at 1% level of significance. Thus, we conclude that sample provide us sufficient evidence against the claim so there is no positive linear correlation between the family income and the amounts of money spent per family member on food each month in area A group.

## 6.8 SUM UP

Since in many of the problems it becomes necessary to take a small size sample, considerable attention has been paid in developing suitable tests for dealing with problems of small samples. The greatest contribution to the theory of small samples is that of Sir William Gosset and Prof. R.A. Fisher. Sir William Gosset published his discovery in 1905 under the pen name ‘Student’ and later on developed and extended by Prof. R.A. Fisher. He gave a test popularly known as ‘t-test’. The t-distribution has a number of applications in statistics, t-test for significance of single mean, t-test for significance of the difference between two sample means, independent samples, paired t-test.

## **6.9 QUESTIONS FOR PRACTICE**

Q1. Explain the need of small sample tests.

Q2. List out the assumptions of t-test.

Q3. List out the Procedure of testing a hypothesis for t-test.

Q4. Explain the testing of hypothesis for population mean using t-test.

Q5. Describe testing of hypothesis for difference of two population means when samples are independent using t-test.

Q6. Explain the procedure of paired t-test for testing of hypothesis for difference of two population means when samples are dependent or paired.

## **6.10 SUGGESTED READINGS**

- C.R. Kothari (1990) Research Methodology. Vishwa Prakasan. India.
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**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 7: LARGE SAMPLE TEST**

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**STRUCTURE**

**7.0 Objectives**

**7.1 Introduction**

**7.2 Steps in Testing of Hypothesis**

**7.3 Applications of Large Sample Test**

**7.4 Test for Single Proportion**

**7.5 Test for Significance of Difference of Proportions**

**7.6 Test of Significance for A Single Mean**

**7.7 Test of Significance for Difference of Means**

**7.8 Comparison of Z-test and t-test**

**7.9 Sum Up**

**7.10 Suggested Readings**

**7.0 OBJECTIVES**

After studying this unit, learners should be able to know:

- Meaning of large sample test
- Applying the Z-test to test the hypothesis about the population mean and the difference between the two population means
- proportion and difference of two population proportions
- Applying the Z-test to test the hypothesis about the population variance and two population variances.

**7.1 INTRODUCTION**

Sometimes in our studies in economics, psychology, medicine, etc., we take a sample of objects/units/participants/patients, etc. such as 70, 500, 1000, 10,000, etc. This situation comes under the category of large samples. As a thumb rule, a sample of size  $n$  is treated as a large sample only if it contains more than 30 units (or observations,  $n > 30$ ). We know that for large samples ( $n > 30$ ), one statistical fact is that almost all sampling distributions of the statistic(s) are closely approximated by the

normal distribution. Therefore, the test statistic, a function of sample observations based on  $n > 30$ , could be assumed to follow the normal distribution approximately (or exactly).

In other words, we have seen that for large values of  $n$ , the number of trials, almost all the distributions e.g., Binomial, Poisson, etc. are very closely approximated by Normal distribution and in this case, we apply Normal Deviate test (Z-test). In cases where the population variance ( $s$ ) is/are known, we use Z-test. The distribution of  $Z$  is always normal with mean zero and variance one. In statistics, a sample is said to be large if its size exceeds 30.

## ASSUMPTIONS FOR A SINGLE SAMPLE Z-TEST

Every statistical method has assumptions. Assumptions mean that your data must satisfy certain properties for statistical method results to be accurate.

The assumptions for the Single Sample Z-Test include:

1. Continuous
2. Normally Distributed
3. Random Sample
4. Enough Data
5. Known Population

## 7.2 STEPS OF T-TEST TESTING OF HYPOTHESIS

Suppose  $X_1, X_2, \dots, X_n$  is a random sample of size  $n$  ( $> 30$ ) selected from a population having unknown parameter  $\theta$  and we want to test the hypothesis about the hypothetical / claimed/assumed value  $\theta_0$  of parameter  $\theta$ . For this, a test procedure is required. We discuss it step by step as follows:

t-test involves the following steps for testing this hypothetical value:

**Step I:** First of all, we have to set up null hypothesis  $H_0$  and alternative hypothesis  $H_1$ .

Suppose, we want to test the hypothetical / Testing of the Hypothesis assumed value  $\mu_0$  of parameter  $\theta$ .

So, we can take the null and alternative hypotheses as  $H_0: \theta = \theta_0$

$H_1: \theta \neq \theta_0$  (for the two-tailed test)

While one- tail test as:

$H_0: \theta = \theta_0$  and  $H_1: \theta > \theta_0$  (Right-tailed)

$H_0: \theta = \theta_0$  and  $H_1: \theta < \theta_0$  (Left-tailed)

In case of comparing the same parameter of two populations of interest, say,  $\theta_1$  and  $\theta_2$ , then our null and alternative hypotheses would be

$H_0: \theta_1 = \theta_2$  and  $H_1: \theta_1 \neq \theta_2$  (for two-tailed test)

While one- tail test as:

$H_0: \theta_1 \leq \theta_2$  and  $H_1: \theta_1 > \theta_2$  (Right-tailed)

$H_0: \theta_1 \geq \theta_2$  and  $H_1: \theta_1 < \theta_2$  (Left-tailed)

**Step II:** After setting the null and alternative hypotheses, we establish a criterion for rejection or non-rejection of null hypothesis, that is, decide the level of significance ( $\alpha$ ), at which we want to test our hypothesis. The most common value of  $\alpha$  is 0.05 or 5%. Other popular choices are 0.01 (1%) and 0.1 (10%).

**Step III:** Third step is to determine an appropriate test statistic, say,  $Z$  in case of large samples. Suppose  $T_n$  is the sample statistic such as sample mean, sample proportion, sample variance, etc. for the parameter  $\theta$  then for testing the null hypothesis, test statistic is given by

$$Z = \frac{t - E(t)}{S.E.(t)}$$

**Step IV:** Obtain the critical value(s) in the sampling distribution of the test statistic and construct the rejection (critical) region of size  $\alpha$ . Generally, critical values for various levels of significance are put in the form of a table for various standard sampling distributions of test statistics such as Z-table.

**Step V:** After that, we obtain the critical (cut-off or tabulated) value(s) in the sampling distribution of the test statistic  $Z$  corresponding to  $\alpha$  assumed in Step II. These critical values are given in Table A (Z-table) this course corresponding to different levels of significance ( $\alpha$ ). For convenience, some useful critical values at  $\alpha = 0.1, 0.01$  and  $0.05$  for Z-test are given in Table A (mentioned below). After that, we construct a rejection (critical) region of size  $\alpha$  in the probability curve of the sampling distribution of test statistic  $Z$ .

**Step VI:** ultimately testing the hypothesis, we have to conclude.

(iii) **Case I:** When  $H_0: \theta \leq \theta_0$  and  $H_1: \theta > \theta_0$  (right-tailed test)

Now, if  $z$  (calculated value)  $\geq Z_\alpha$  (tabulated value), that means the calculated value of test statistic  $Z$  lies in the rejection region, then we reject the null hypothesis  $H_0$  at  $\alpha$  the level of significance. Therefore, we conclude that sample data provides us sufficient evidence against the null hypothesis and there is a significant difference between hypothesized or specified value and the observed value of the parameter. If  $Z < Z_\alpha$ , that means the calculated value of test statistic  $Z$  lies in non-rejection region, then we do not reject the null hypothesis  $H_0$  at  $\alpha$  level of significance. Therefore, we conclude that the sample data fails to provide us sufficient evidence against the null hypothesis and the difference between hypothesized value and observed value of the parameter due to the fluctuation of a sample. so, the population parameter  $\theta$  may be  $\theta_0$ .

**Case II:** When  $H_0: \theta \geq \theta_0$  and  $H_1: \theta < \theta_0$  (left-tailed test)

In this case, the rejection (critical) region falls under the left tail of the probability curve of the sampling distribution of test statistic  $Z$ . If  $Z \leq -Z_{\alpha}$ , that means the calculated value of test statistic  $Z$  lies in the rejection region, then we reject the null hypothesis  $H_0$  at  $\alpha$  level of significance. If  $Z > -Z_{\alpha}$ , that means the calculated value of test statistic  $Z$  lies in the non-rejection region, then we do not reject the null hypothesis  $H_0$  at  $\alpha$  level of significance.

**In case of two-tailed test:**  $H_0: \theta = \theta_0$  and  $H_1: \theta \neq \theta_0$

In this case, the rejection region falls under both tails of the probability curve of the sampling distribution of the test statistic  $Z$ . Half the area ( $\alpha$ ) i.e.  $\alpha/2$  will lie under the left tail and the other half under the right tail. If  $Z \geq Z_{\alpha/2}$  or  $Z \leq -Z_{\alpha/2}$ , that means the calculated value of test statistic  $Z$  lies in the rejection region, then we reject the null hypothesis  $H_0$  at  $\alpha$  level of significance. If  $-Z < Z < -Z_{\alpha/2}$ , that means the calculated value of test statistic  $Z$  lies in the non-rejection region, then we do not reject the null hypothesis  $H_0$  at  $\alpha$  level of significance.

**Table A: Critical Values of Z-test**

Level of Significance (%)	Two-tailed	Right-tailed	Left-tailed
1	2.58	2.33	-2.33
5	1.96	1.645	-1.645
10	1.645	1.28	-1.28

### 7.3 APPLICATIONS OF LARGE SAMPLE TEST

- Test for a single proportion.
- Test for significance of difference of proportions.
- Test of significance for a single mean.
- Test of significance for difference of means.

### 7.4 TEST FOR SINGLE PROPORTION

For this purpose, let  $X_1, X_2, \dots, X_n$  be a random sample of size  $n$  taken from a population with population proportion  $P$ . Also, let  $X$  denote the number of observations or elements that possess a certain attribute (number of successes) out of  $n$  observations of the sample then sample proportion  $p$  can be defined as

$$p = \frac{X}{n}$$

here mean and variance of the sampling distribution of sample proportion are  $E(p) = P$  and  $\text{Var}(p) = \frac{PQ}{n}$  where,  $Q = 1 - P$ .

Now, two cases arise: Large Sample Tests

**Case I:** When the sample size is not sufficiently large i.e. either of the condition's  $np > 5$  or  $nq > 5$  does not meet, then we use the exact binomial test. However, an exact binomial test is beyond the scope of this course.

**Case II:** When the sample size is sufficiently large, such that  $np > 5$  and  $nq > 5$  then by central limit theorem, the sampling distribution of sample proportion  $p$  is approximately normally distributed with mean and variance as

$$E(p) = P \text{ and } \text{Var}(p) = \frac{PQ}{n}$$

But we know that standard error = Variance

$$SE(p) = \sqrt{\frac{PQ}{n}}$$

Now, first of all, we set up null and alternative hypotheses. Here we want to test the hypothesis about the specified value  $P_0$  of the population proportion. So, we can take the null and alternative hypotheses as

For two-tailed

$$H_0: P = P_0$$

$$H_1: P \neq P_0$$

For one-tailed

$$H_0: P = P_0$$

$$H_1: P > P_0$$

Or

$$H_1: P < P_0$$

$$Z = \frac{p - P_0}{\sqrt{\frac{PQ}{n}}}$$

After that, we calculate the value of the test statistic and compare it with the critical value(s) given in below Table A at a prefixed level of significance  $\alpha$ .

**Table A: Critical Values of Z-test**

Level of Significance (%)	Two-tailed	Right-tailed	Left-tailed
1	2.58	2.33	-2.33
5	1.96	1.645	-1.645
10	1.645	1.28	-1.28

**Example 1:** A die is thrown 9000 times and a draw of 2 or 5 is observed 3100 times. Can we

**regard that die as unbiased at a 5% level of significance?**

**Solution:** Let getting a 2 or 5 be our success, and getting a number other than 2 or 5 be a failure then in usual notions, we have  $n = 9000$ ,  $X = \text{number of successes} = 3100$ ,  $p = 3100/9000 = 0.3444$

Here, we want to test that the die is unbiased and we know that if the die is Large Sample Tests unbiased then the proportion or probability of getting 2 or 5 is

$$\begin{aligned} P &= \text{Probability of getting a 2 or 5} \\ &= \text{Probability of getting 2} + \text{Probability of getting 5} \\ \frac{1}{6} + \frac{1}{3} + \frac{1}{3} &= 0.3333 \end{aligned}$$

So, our claim is  $P = 0.3333$  and its complement is  $P \neq 0.3333$ . Since the claim contains the equality sign. Thus, we can take the claim as the null hypothesis and complement as the alternative hypothesis. Thus,  $H_0: P = P_0 = 0.3333$  and

$$H_1: P \neq 0.3333$$

Since the alternative hypothesis is two-tailed so the test is two-tailed. Before proceeding further, first, we have to check whether the condition of normality meets or not.

$$\begin{aligned} np &= 9000 \times 0.3444 = 3099.6 > 5 \\ nq &= 9000 \times (1 - 0.3444) = 9000 \times 0.6556 = 5900.4 > 5 \end{aligned}$$

We see that the condition of normality meets, so we can go for Z-test. So, for testing the null hypothesis, the test statistic Z is given by

$$\begin{aligned} Z &= \frac{p - P_0}{\sqrt{\frac{P_0 Q}{n}}} \\ Z &= \frac{0.3444 - 0.3333}{\sqrt{\frac{0.3333 \times 0.6667}{9000}}} \\ &= \frac{0.0111}{0.005} = 2.22 \end{aligned}$$

Since the test is two-tailed so the critical values at 5% level of significance are  $\pm Z_{\alpha/2} = \pm Z_{0.025} = \pm 1.96$ . Since calculated value of Z (= 2.22) is greater than the critical value (= 1.96), that means it lies in the rejection region, so we reject the null hypothesis i.e. we reject our claim.

**Example 2: A shop claims that only, 1% of its products are imperfect. Out of sample of 500 units 10 are found to be imperfect. Check the claim of the shop.**

**Solution:** Let us set up the null hypothesis that the proportion of defective products is  $p$  against the alternative hypothesis that it is not equal to 1%. i.e.

$$H_0: P = 0.01$$

$$H_1: P \neq 0.01$$



$$Q = 1 - P = 1 - 0.01 = 0.99$$

Size of sample =  $n = 500$

Number of imperfect items found =  $X = 10$

Therefore, sample proportion of imperfect items =  $p = \frac{X}{n} = \frac{10}{500} = 0.02$

The test statistic is,

$$\begin{aligned} Z &= \frac{p - P_0}{\sqrt{\frac{PQ}{n}}} \\ &= \frac{0.02 - 0.01}{\sqrt{\frac{0.01 \times 0.99}{500}}} \\ &= \frac{0.01}{0.00445} \\ &= 2.25 \end{aligned}$$

The calculated value of  $Z$  is more than 1.96 (Critical value at 5% level), and  $H_0$  is rejected. Thus, the claim of the shop is rejected.

## 7.5 TEST FOR SIGNIFICANCE OF DIFFERENCE OF PROPORTIONS

If we have two populations and each item of a population belongs to either of the two classes  $C_1$  and  $C_2$ . A person is often interested to know whether the proportion of items in class  $C_1$  in both the populations is the same or not that is we want to test the hypothesis.

$$H_0: P_1 = P_2$$

$$H_1: P_1 \neq P_2 \text{ or } P_1 > P_2 \text{ or } P_1 < P_2$$

where  $P_1$  and  $P_2$  are the proportions of items in the two populations belonging to class  $C_1$ .

Let  $X_1$ ,  $X_2$  be the number of items belonging to class  $C_1$  in random samples of sizes  $n_1$  and  $n_2$  from the two populations respectively. Then the sample proportion

$$\begin{aligned} p_1 &= \frac{X_1}{n_1} \\ p_2 &= \frac{X_2}{n_2} \end{aligned}$$

If  $P_1$  and  $P_2$  are the proportions then

$$E(P_1) = P_1, E(P_2) = P_2$$

$$\text{Var}(p_1) = \frac{P_1 Q_1}{n_1}$$

$$\text{Var}(p_2) = \frac{P_2 Q_2}{n_2}$$

Since  $P_1 = P_2 = P$  and  $Q_1 = Q_2 = Q$ , therefore

$$Z = \frac{p_1 - p_2}{\sqrt{P \times Q \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

If the population proportion  $P_1$  and  $P_2$  are given to be distinctly different that is  $P_1 \neq P_2$ , then

$$Z = \frac{(p_1 - p_2) - (P_1 - P_2)}{\sqrt{\frac{P_1 Q_1}{n_1} + \frac{P_1 Q_2}{n_2}}}$$

In general  $P$ , the common population proportion (under  $H_0$ ) is not known, then an unbiased estimate of population proportion  $P$  based on both the samples is used and is given by

$$\hat{p} = \frac{X_1 + X_2}{n_1 + n_2} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

**Example 3. A machine turns out 16 imperfect items in a sample of 500. After overhauling it turns 3 imperfect articles in a batch of 100. Has the machine improved after overhauling?**

**Solution:** We are given  $n_1=500$  and  $n_2=100$

$p_1$  = Proportions of imperfect items before overhauling of machine =  $16/500=0.032$

$p_2$  = Proportions of imperfect items after overhauling of machine =  $3/100=0.03$

$H_0: P_1=P_2$  i.e. the machine has not improved after overhauling.

$H_1: P_1 > P_2$  or  $P_2 < P_1$

Here,

$$\hat{p} = \frac{X_1 + X_2}{n_1 + n_2} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

$$= \frac{16+3}{500+100} = 0.032$$

$$Z = \frac{p_1 - p_2}{\sqrt{P \times Q \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

$$Z = \frac{0.032 - 0.03}{\sqrt{0.032 \times 0.968 \left( \frac{1}{500} + \frac{1}{100} \right)}}$$

$$Z = \frac{0.002}{\sqrt{0.031 \left( \frac{1}{500} + \frac{1}{100} \right)}}$$

$$= \frac{0.002}{0.01878}$$

$$= 0.106$$

Since  $Z < 1.645$  (Right-tailed test), it is not significant at 5% level of significance. Hence, we accept the null hypothesis and conclude that the machine has not improved after overhauling.

## 7.6 TEST OF SIGNIFICANCE FOR A SINGLE MEAN

We have seen that if  $X_i$  ( $i=1, 2, \dots, n$ ) is a random sample of size  $n$  from a normal population with mean and variance  $\sigma^2$ , then the sample mean  $\bar{X}$  is distributed normally with mean  $\mu$  and variance  $\sigma^2/n$

i.e.,  $\bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$ . Thus for large samples normal variate corresponding to  $\bar{X}$  is

$$Z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$$

In test of significance for a single mean we deal the following situations

- 1) To test if the mean of the population has a specified value ( $\mu_0$ ) and null hypothesis in this case will be  $H_0: \mu = \mu_0$  i.e., the population has a specified mean value.
- 2) To test whether the sample mean differs significantly from the hypothetical value of population mean with null hypothesis as there is no difference between sample mean ( $\bar{X}$ ) and population mean ( $\mu$ ).
- 3) To test if the given random sample has been drawn from a population with specified mean  $\mu_0$  and variance  $\sigma^2$  with null hypothesis the sample has been drawn from a normal population with specified mean  $\mu_0$  and variance  $\sigma^2$

In all the above three situations the test statistic is given by

$$Z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$$

If  $|Z| < 1.96$ ,  $H_0$  is not rejected at 5% level of significance which implies that there is no significant difference between sample mean and population mean and whatever difference is there, it exists due to fluctuation of sampling.

$|Z| > 1.96$ ,  $H_0$  is rejected at 5% level of significance which implies that there is a significant difference between sample mean and population mean.

**Example 4.** A random sample of 100 workers gave a mean weight of 64 kg with a standard deviation of 16 kg. Test the hypothesis that the mean weight in the population is 60 kg.

**Solution:**  $H_0: \mu = 60$  kg., i.e. the mean weight in the population is 60 kg.

$H_1: \mu \neq 60$  kg., i.e. the mean weight in the population is not 60 kg.

here,  $n=100$ ,  $\mu=60$  kg.,  $\bar{X}=64$  kg.,

$$\begin{aligned} Z &= \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} \\ &= \frac{64 - 60}{16 / \sqrt{100}} \\ &= 2.5 \end{aligned}$$

Since calculated value of Z statistic is more than 1.96, it is significant at 5% level of significance. Therefore,  $H_0$  is rejected at all levels of significance which implies that mean weight of population is not 60 kg.

**Example 5:** A sample of 900 rods has a mean length 3.4 cm. Is the sample regarded to be taken from a large population of rods with mean length 3.25 cm and S.D 2.61 cm at 5% level of significance?

**Solution:** Here,  $n = 900$ ,  $\bar{X}=3.4$  cm,  $\mu = 3.25$  cm and  $\sigma = 2.61$  cm

Thus,  $H_0: \mu = \mu_0 = 3.25$

$H_1: \mu \neq 3.25$  (two-tailed)

Here, we want to test the hypothesis regarding population mean when Large Sample Tests population SD is unknown, so we should use t-test if the population of rods known to be normal. But it is not the case. Since the sample size is large ( $n > 30$ ) so we can go for Z-test instead of t-test as an approximate. So, test statistic is given by

$$\begin{aligned} Z &= \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} \\ &= \frac{3.40 - 3.25}{2.61 / \sqrt{900}} \\ &= \frac{0.15}{0.087} \\ &= 1.72 \end{aligned}$$

The critical (tabulated) values for two-tailed test at 5% level of significance are  $\pm Z_{\alpha/2} = \pm Z_{0.025} = \pm 1.96$ . Since calculated value of test statistic  $Z (=1.72)$  is less than the critical value ( $=1.96$ ) and greater than critical value ( $= -1.96$ ), that means it lies in non-rejection region, so we do not reject the null hypothesis i.e. we support the claim at 5% level of significance.

Thus, we conclude that sample does not provide us sufficient evidence against the claim so we may assume that the sample comes from the population of rods with mean 3.25cm.

## 7.7 TEST OF SIGNIFICANCE FOR DIFFERENCE OF MEANS

Let  $\bar{X}_1$  be the mean of a sample of size  $n_1$  drawn from a population with mean  $\mu_1$  and variance  $\sigma_1^2$  and let  $\bar{X}_2$  be the mean of an independent sample of size  $n_2$  drawn from another population with mean  $\mu_2$  and variance  $\sigma_2^2$ . Since sample sizes are large.

The co-variance terms vanish, since the sample means  $\bar{X}_1, \bar{X}_2$  are independent.

Thus, under  $H_0: \mu_1 = \mu_2$ , the Z statistic is given by

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Here  $\sigma_1^2$  and  $\sigma_2^2$  are assumed to be known. If they are unknown then their estimates provided by corresponding sample variances  $s_1^2$  and  $s_2^2$  respectively are used, i.e.,  $\hat{\sigma}_1^2 = s_1^2$  and  $\hat{\sigma}_2^2 = s_2^2$ , thus, in this case the test statistic becomes

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

**Remarks:** If we want to test whether the two independent samples have come from the same

population i.e., if  $\sigma_1^2 = \sigma_2^2 = \sigma^2$  (with common S.D.  $\sigma$ ), then under  $H_0 : \mu_1 = \mu_2$

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\sigma^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

If the common variance  $\sigma^2$  is not known, then we use its estimate based on both the samples which is given by

$$\hat{\sigma}^2 = \frac{n_1 s^2 + n_2 s^2}{n_1 + n_2}$$

**Example 6: A university conducts both face to face and regular classes for a particular course indented both to be identical. A sample of 50 students of face-to-face mode yields examination results mean and SD respectively as:  $\bar{X}_1 = 80.4$ ,  $S_1 = 12.8$  and other sample of 100 regular Students yields mean and SD of their examination results in the same course respectively as:  $\bar{X}_2 = 74.3$ ,  $S_2 = 20.5$ , Are both educational methods statistically equal at 5% level?**

**Solution:** Here, we are given that

$$n_1 = 50, \bar{X}_1 = 80.4, S_1 = 12.8$$

$$n_2 = 100, \bar{X}_2 = 74.3, S_2 = 20.5$$

We wish to test that both educational methods are statistically equal. If  $\mu_1$  and  $\mu_2$  denote the average marks of face to face and distance mode students respectively then our claim is  $\mu_1 = \mu_2$  and its complement is  $\mu_1 \neq \mu_2$ . Since the claim contains the equality sign so we can take the claim as the null hypothesis and complement as the alternative hypothesis. Thus,

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2 \text{ (two-tailed)}$$

We want to test the null hypothesis regarding two population means when  $\sigma$  standard deviations of both populations are unknown. So, we should go for t-test if population of difference is known to be normal. But it is not the case.

Since sample sizes are large ( $n_1$ , and  $n_2 > 30$ ) so we go for Z-test. For testing the null hypothesis, the test statistic Z is given by

$$\begin{aligned} Z &= \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \\ &= \frac{80.4 - 74.3}{\sqrt{\frac{12.8^2}{50} + \frac{20.5^2}{100}}} \\ &= \frac{6.1}{\sqrt{3.28 + 4.20}} \\ &= 2.23 \end{aligned}$$

The critical (tabulated) values for two-tailed test at 5% level of significance are  $\pm Z_{\alpha/2} = \pm Z_{0.025} = \pm 1.96$ . Since calculated value of Z (=2.23) is greater than the critical values ( $= \pm 1.96$ ), that means it lies in rejection region, so we reject the null hypothesis i.e. we reject the claim at 5% level of significance.

**Example 7: Two research laboratories have identically produced medicines that provide relief to thyroid patients. The first medicine was tested on a group of 50 thyroid patients and produced an average 8.3 hours of relief with a standard deviation of 1.2 hours. The second medicine was tested on 100 patients, producing an average of 8.0 hours of relief with a standard deviation of 1.5 hours. Do the first medicines provide a significant longer period of relief at a significant level of 5%?**

**Solution:**  $n_1=50, \bar{X}_1=8.3, S_1=1.2$   
 $n_2=100, \bar{X}_2=8.0, S_2=1.5$

Here, we want to test that the first medicines provide a significantly longer period of relief than the other. If  $\mu_1$  and  $\mu_2$  denote the mean relief time due to first and second medicines respectively then our claim is  $\mu_1 > \mu_2$  and its complement is  $\mu_1 \leq \mu_2$ . Since complement contains the equality sign so we can take the complement as the null hypothesis and the claim as the alternative hypothesis.

Thus,  $H_0: \mu_1 = \mu_2$

$H_1: \mu_1 > \mu_2$

Since the alternative hypothesis is right-tailed.

We want to test the null hypothesis regarding the equality of two population means. The standard deviations of both populations are unknown. So, we should go for t-test if the population of difference is known to be normal. But it is not the case. Since sample sizes are large ( $n_1$ , and  $n_2 > 30$ ) so we go for Z-test. So, for testing the null hypothesis, the test statistic Z is given by

$$\begin{aligned} Z &= \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \\ &= \frac{8.3 - 8.0}{\sqrt{\frac{1.2^2}{50} + \frac{1.5^2}{100}}} \\ &= \frac{0.3}{\sqrt{0.0288 + 0.0225}} \\ &= \frac{0.3}{0.2265} \\ Z &= 1.32 \end{aligned}$$

The critical (tabulated) value for a right-tailed test at a 5% level of significance is  $Z_{\alpha} = Z_{0.05} = 1.645$ .

Since the calculated value of test statistic Z (=1.32) is less than the critical value (=1.645), that means it

lies in the non-rejection region, so we do not reject the null hypothesis and reject the alternative hypothesis i.e. we reject the claim at 5% level of significance.

Thus, the samples provide sufficient evidence against the claim so the first medicines do not have longer periods of relief than the other.

### 7.8 COMPARISON OF Z-TEST (Large Sample Test) AND t-TEST (Small Sample Test)

Basis for comparison	t-test	Z-test
<b>Definition</b>	When the population's standard deviation is unknown, the t-test is a statistical test that is used to evaluate hypotheses about the mean of a small sample taken from the population.	A statistical technique called the z-test is used to compare or assess the significance of various statistical measures, most notably the mean in a sample taken from a population that is normally distributed or between two independent samples.
<b>Sample size</b>	$n \leq 30$	$n > 30$
<b>Assumptions</b>	A t-test is not based on the assumption that all key points on the sample are independent.	z-test is based on the assumption that all key points on the sample are independent.
<b>Population variance</b>	Unknown	known
<b>Variance or standard deviation</b>	Variance or standard deviation is not known in the t-test.	Variance or standard deviation is known in the z-test.
<b>Distribution</b>	The sample values are to be recorded or calculated by the researcher.	In a normal distribution, the average is considered 0 and the variance is 1.
<b>Population parameters</b>	In addition, to the mean, it compares partial or simple correlations among two samples.	In addition, to mean, it compares the population proportion.

### 7.9 SUM UP

Z-test is a statistical test that is used to determine whether the mean of a sample is significantly different from a known population mean when the population standard deviation is known. It is particularly useful when the sample size is large ( $>30$ ). Z-test can also be defined as a statistical method that is used to determine whether the distribution of the test statistics can be approximated using the

normal distribution or not. It is the method to determine whether two sample means are approximately the same or different when their variance is known and the sample size is large (should be  $\geq 30$ ). The Z-test compares the difference between the sample mean and the population means by considering the standard deviation of the sampling distribution.

#### **7.10 SUGGESTED READINGS**

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**M.A (ECONOMICS)**  
**SEMESTER II**  
**QUANTITATIVE METHODS II**

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**UNIT 8: INTERPOLATION AND EXTRAPOLATION**

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**STRUCTURE**

**8.0 Learning Objectives**

**8.1 Introduction**

**8.2 Meaning and Definition of Interpolation and Extrapolation**

**8.3 Assumptions of Interpolation and Extrapolation**

**8.4 Accuracy of Interpolation and Extrapolation**

**8.5 Need and Importance of Interpolation and Extrapolation**

**8.6 Interpolation**

**8.7 Common interpolation methods**

**8.8 Extrapolation**

**8.9 Extrapolation Methods**

**8.10 Advantages and Disadvantages of Interpolation**

**8.11 Advantages and Disadvantages of Extrapolation**

**8.12 Application of extrapolation and interpolation**

**8.13 Comparison between Interpolation and Extrapolation**

**8.14 Sum Up**

**8.15 Questions for Practice**

**8.16 Practical Questions with Solutions**

**8.0 LEARNING OBJECTIVES**

After Reading this Unit, Learner will be able to know:

- Meaning of interpolation and extrapolation

- Assumptions of validity
- About the methods of interpolation and extrapolation
- Advantages and Disadvantages

## **8.1 INTRODUCTION**

In real-life economic situations, decision-making must be judicious, operative, and capable. It is well known fact that decision-making activity is extremely intricate given the kind and nature of economic variables. Decision-making surroundings, necessities information to scrutinize, comprehend, and develop an appropriate model for effective and efficient management. Information is critical to the decision-making process. Sometimes information relating to the decision ecosystem is available and sometimes essential information is either absent or not available for several reasons. Interpolation and Extrapolation are both statistical methods that enable the estimation of unfamiliar values in a given series. Both extrapolation and interpolation are valuable approaches to calculating or estimating the hypothetical values for an unidentified variable based on the reflection of other data points. Nevertheless, it can be difficult to distinguish among these techniques and comprehend how they differ from each other.

In the regular management of any industry or for doing forecasting for decision-making, information is gathered regularly. But it may be difficult or not possible to collect information for every time point. In the real-life world and business, several times we come across situations where we have to make an estimation of a value that is either missing or not available in the given series of information or forecast a prospective value. To handle these types of situations instead of being subject to some guesswork, the techniques of interpolation and extrapolation are quite helpful. For instance, the census of the populace in India takes place every 10 years, i.e., we have the survey statistics for 1951, 1961, 1971, 1981, 1991, and 2001. Taking the support of this accessible information, if anyone desires to know the survey data for the years 1996 or 2007 then with the help of the technique of interpolation and extrapolation the same can be estimated and arrived at. The requirement for interpolating missing information or making predictions or estimates arises in some fields like economics, commerce, social sciences, actuarial work, population studies, etc. Therefore, the practice of interpolation and extrapolation are very supportive in assessing the missing values or forecasting future values. The present chapter is focused on Interpolation and Extrapolation.

## **8.2 MEANING AND DEFINITION OF INTERPOLATION AND EXTRAPOLATION**

In simple words, interpolation is done to estimate a value inside the specified range of the series while extrapolation on the other hand, it deals with obtaining the prediction or estimates of the required information in the earlier or future outside the specified range of the series. Interpolation, therefore, talks about the insertion of an in-between value in a sequence of items while extrapolation denotes anticipating a value for the future. Every time the technique of interpolation or extrapolation is used, it is based on the supposition that the variable whose value is to be projected is the function of the other variable. A variable is said to be the function of the other, if for any values of the independent variable (say  $x$ ) we can always find a certain value of the dependent variable (say  $y$ ).

**Explanation of the concept with an example:** Let us assume that there are two variables  $x$  and  $y$ ,  $x$  being the independent variable and  $y$  the dependent variable. Further, let the given values of  $x$  be  $X_0, X_1, X_2, \dots, X_n$ , and let the resultant values of  $y$  be  $Y_0, Y_1, Y_2, \dots, Y_n$ , respectively. If there is a requirement to guess the value of  $y$ , for any value of  $x$  between the limits,  $X_0$  and this can be done by using the method of Interpolation. For instance, imagine we have been given the sale values figures for the years ( $x$ ) 2010, 2012, 2013, 2015, and 2018 and we want to know the sale values for any year between 2010 and 2018, say, 2017, 2014, etc. This can be done by the technique of interpolation. On the other hand, if we have to estimate the sale values for the period outside the range 2010-2018, say, for 2008 or 2020, the method is known as extrapolation.

One of the easiest methods to distinguish these dissimilarities is to know the prefix of each term. Extra- denotes "in addition to," while inter- means "in between." Consequently, extrapolation points out a user is attempting to obtain a value in addition to available values, at the same time interpolation indicates that they want to ascertain a new value in between existing values. —Interpolation is the estimation of a most likely estimate in given conditions. The Technique of estimating a past figure is termed as interpolation, while that of estimating a **probable figure for the future is called extrapolation.**” by M. Harper

### 8.3 ASSUMPTIONS OF INTERPOLATION AND EXTRAPOLATION

As has been stated above, the interpolation or extrapolation technique is applied based on particular suppositions. The following are some of the assumptions that are taken into consideration while using the techniques of interpolation and extrapolation.

- i. **No sudden or violent fluctuations in the intervening period:** At the time of interpolating or extrapolating a value, it is at all times assumed that there are no sudden deviations in the given data. In other words, the values should communicate the periods of normal and steady economic state of

affairs. To put it differently, the given data on which the interpolation or extrapolation technique is to be applied should be free from all types of anomalies and all categories of unsystematic and uneven variations. If, for instance, we are interpolating the data of sales figures of a company for the year 2020 and we are given the figures of sales data for the year 2017, 2018, 2019, and 2021 we would assume that the sales of the company under consideration have grown up evenly and there are no aggressive ups and downs in these sales figures. There are a number of cases like earthquakes, wars, floods, labor strikes, lockouts, economic boom depression and political disturbances, etc., which may lead to violent ups and downs in the values, which should not be considered while applying the techniques of interpolation or extrapolation.

- ii. **The percentage of change of figures from one period to another is uniform:** The second supposition is that the degree of variation of the data is uniform. Therefore, in the example of sales data given above, if we want to interpolate or extrapolate the sales figure, it is assumed that the data from a period from 2017 to 2021 has witnessed evenly growth, i.e. free from all the types of abnormalities. Taking into account these assumptions, missing data can be interpolated with a reasonable degree of precision.

## **8.4 ACCURACY OF INTERPOLATION AND EXTRAPOLATION**

As the interpolation and extrapolation techniques are based on particular postulations which may sometimes pose some difficulties in practice, the values so estimated, may not at all times be precise or dependable, and it is difficult to ascertain the degree of error of the estimate. So, the accuracy of the interpolated or extrapolated values is affected due to:

- a) likely variations in the values of the trend under investigation, which is given by the existing information at our disposal.
- b) A known fact around the sequence of happenings that may disturb the value of the observable fact under consideration. If it is known that the expected value of the specified event at a specific period is influenced by random circumstances, like political disturbances, floods, etc., then the interpolation or extrapolation is disturbed and these known facts should be taken into account while reaching a certain conclusion for making any estimation for missing values.

## **8.5 NEED AND IMPORTANCE OF INTERPOLATION AND EXTRAPOLATION**

The methods of interpolation and extrapolation are of immense real-world use, because of:

- (i) **Non-availability of data:** Interpolation may also be necessary in case the data are inadequate because of gaps in the data or are ineptly gathered while collecting the information.
- (ii) **Loss of data:** Data from some of the periods may be deleted, damaged, or missing due to several causes like wrong management or random and natural causes like fire, floods, etc. Such types of data may be acquired with the help of the interpolation method. The interpolation technique is therefore supportive in filling up the data gaps in accessible data.
- (iii) **To estimate the intermediate values:** Owing to several financial and organisational teething troubles, information may not be accumulated on a survey basis and random sampling practices may be used to find the appropriate data. The in-between differences are then satisfied by interpolation methods.
- (iv) **To bring uniformity in the data:** From time to time, it so happens that the data relating to a particular event are assembled by diverse working groups working in different categories of groups and to draw any inferences from this data is difficult for evaluation. To achieve equality in the groups, the interpolation method is resorted to. If for instance, the information is gathered for two diverse dates, for doing a comparison in them, they have to be brought at one point in time. For instance, in a nation the population survey was done in 2020, and in India the survey was done in 2021. For doing a comparison between the populations of the two nations either India's population is to be interpolated for 2020 or the other nation's populace is to be projected by extrapolation for 2021.
- (v) **For doing forecasts: Projection** of future data is a fundamental necessity in any policy formation or economic planning. The extrapolation technique is used in making predictions. For instance, a company wants to project for the next financial year based on records. This can easily be done with the help of extrapolation technique.
- (vi) **To ascertain the positional averages in continuous frequency spreading:** The interpolation technique has been used to develop the formulae for the working out of the median, quartiles, quintiles, cortiles, deciles, percentiles, and mode in case of continuous frequency distribution.

## 8.6 INTERPOLATION

It is a technique of fitting the data points to denote the value of a function. It has some applications in engineering, commerce, industry, and science that are used to build new data points within the range of a discrete data set of known data points or can be used for finalizing a formula of the function that will pass from the given set of points (x, y). In this study material, we will be discussing the concept of

interpolation in Statistics, its formulas, and its uses in detail.

Interpolation is a technique of deriving a simple function from a particular discrete data set such that the function passes through the provided data points. This supports to conclusion of the data points in between the given data. This process is at all times required to figure out the value of a function for an in-between value of the independent function. To summarize, interpolation is a method to determine the unidentified values that lie in between the known data points. It is frequently used to forecast the unknown values for any ecologically connected data points such as noise level, rainfall, elevation, and so on.

Hirach —Interpolation is the art of understanding between the lines of the table.¶

### **Interpolation Formula**

The unknown value on the data points can be found using the linear interpolation and Lagrange's interpolation formula.

### **Interpolation explained with an example**

Interpolation means ascertaining a value from the existing values in a given data set. In other words, it is a process of putting in or interjecting a middle value between two other values.

In data science or mathematics, interpolation is something like calculating a function's value based on the value of other data points in a given sequence. This function may be represented as  $f(x)$ , and the known  $x$  values may range from  $X_0$  to  $X_n$ .

For instance, imagine we have a regression line  $y = 3x + 4$ . We know that, to produce this "best-fit" line, the value of  $x$  must be between 0 and 10. Supposing we choose  $x = 5$  Based on this best-fit line and equation, we can estimate the value of  $y$  as the following:

$$y = 3(5) + 4 = 19$$

Our x value (5) is within the range of adequate x values used to make the line of finest fit, so this is a valid y value, which we have computed by interpolation.

## **8.7 INTERPOLATION METHODS**

Three of the most common interpolation methods are the following:

- Linear Interpolation
- Polynomial Interpolation
- Spline Interpolation

### **1. Linear Interpolation**

Linear interpolation is amongst the simplest interpolation techniques. At this point, a straight line is drawn amid two points on a graph to control the other unidentified values. This simple technique frequently produces wrong estimates.

### **2. Polynomial Interpolation**

While using the polynomial interpolation method, polynomial roles are used on a graph to estimate the values in the set of data that has been misdirected. It is a somewhat more comprehensive, perfect method. The polynomial graph fills in the curve amongst identified points to find the missing data between those points.

There are multiple methods of polynomial interpolation:

- Lagrange interpolation
- Newton polynomial interpolation
- Spline interpolation

The Newton method is also identified as Newton's divided differences interpolation polynomial. The Lagrange and Newton interpolation techniques outcome in the smallest polynomial function, i.e., the polynomial of the lowermost potential point that goes across the data points in the data set. Both methods produce the same outcome but to arrive at the results both use different types of calculations.

**3. Spline Interpolation:** In spline interpolation, piecewise functions are employed to make an estimate of the missing values and fill the gaps in a data set. In its place of assessing one polynomial for the whole of the data set as takes place in the Lagrange and Newton methods, spline interpolation describes multiple simpler polynomials for subgroups of the data. For this purpose, it commonly delivers more

precise results and is believed to be a more trustworthy method.

- **Nearest Neighbour Method**– This technique introduces the value of an interpolated point to the value of the most nearby data point. Consequently, this technique does not create any new data points.
- **Cubic Spline Interpolation Method**– This process fits a diverse cubic polynomial between each pair of data points for curves or between sets of three points for surfaces.
- **Shape-Preservation Method**– This method is also known as Piecewise Cubic Hermite Interpolation (PCHIP). It maintains the monotonicity and the shape of the data. It is for curves only.
- **Thin-plate Spline Method**– This technique contains smooth surfaces that also extrapolate well. It is only for surfaces only
- **Biharmonic Interpolation Method**– This method is applied to the surfaces only.

## 8.8 EXTRAPOLATION

In Statistics, **Extrapolation** is a method of assessing the value outside the different range of the specified variable based on its connection with another variable. It is a very essential notion not only in Mathematics but also in other fields like Psychology, Sociology, Statistics, etc., with some definite data. Now, we will examine in detail regarding definition, formula, and examples of extrapolation. Another more significant concept is an **interpolation**, which has been discussed above as it is an estimation between the given data.

**Extrapolation** is described as an estimation of a value based on expanding the identified series or factors outside the range that is known. In other words, extrapolation is a method in which the data values are studied as points such as  $x_1, x_2, \dots, x_n$ . It normally occurs in statistical data very regularly, if that data is sampled intermittently and it approximates the next data point. One such instance is when a driver is driving a car, he ordinarily **extrapolates** about road conditions beyond his vision.

Extrapolation is a statistical method that is used in comprehending the unidentified data from the known data. It tries to forecast future data based on past data. For instance, estimating the size of the population of a country for policy making by the government after a few years based on the existing population size and its rate of growth. Another example is forecasting the sale of a particular product in the future based on the past sales record of a company.

## 8.9 EXTRAPOLATION METHODS

Extrapolation is categorized into three types, namely



- Linear extrapolation
- Conic extrapolation
- Polynomial Extrapolation

Let us briefly talk about these three kinds of extrapolation methods.

### 1. Linear Extrapolation

For any linear function, the linear extrapolation method delivers a good result when the point to be projected is not excessively far off from the given data. It is typically done by sketching the tangent line at the endpoint of the given graph and that will be extended beyond the limit.

### 2. Conic Extrapolation

A conic section can be formed with the assistance of five points closer to the end of the given i.e. known data. The conic segment will curve back on itself if it is a circle or ellipse. But for parabola or hyperbola, the curve will not back on itself as it is relative to the X-axis.

### 3. Polynomial Extrapolation

A polynomial curve can be shaped with the assistance of the whole of the identified data or near the endpoints. This technique is normally performed using Lagrange interpolation or Newton's system of finite series that arranges for the data. The final polynomial is used to extrapolate the data using the connected endpoints.

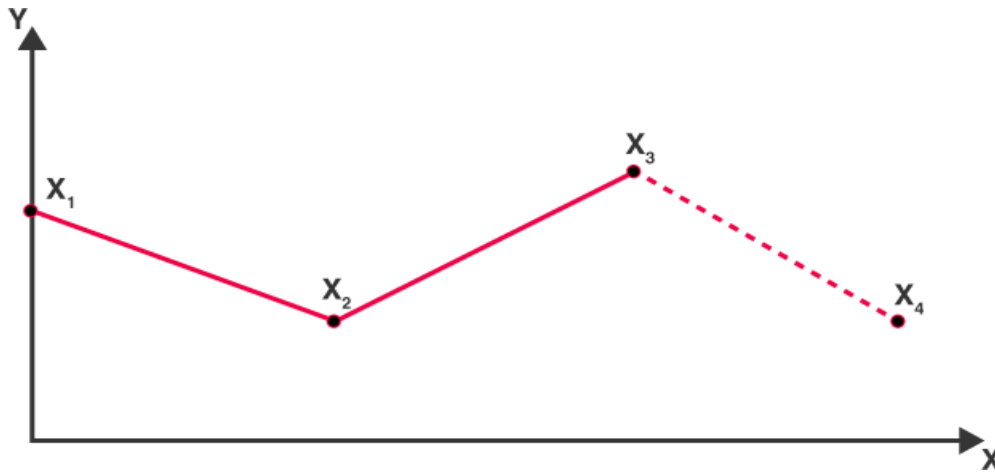
#### Extrapolation Formula

Let us consider the two endpoints in a linear graph  $(x_1, y_1)$  and  $(x_2, y_2)$  where the value of the point  $x$  is to be extrapolated, and then the extrapolation formula is given

$$y(x) = y_1 + \frac{x - x_1}{x_2 - x_1}(y_2 - y_1)$$

#### Extrapolation Graph

As it is known, extrapolation is a method of forecasting the data point about the exterior of a curve when normally a few points are given. In the model given below, the identified data are  $x_1, x_2, x_3$ . Locating the point  $x_4$  is acknowledged as an extrapolation point.



## 8.10 ADVANTAGES AND DISADVANTAGES OF INTERPOLATION

### Advantages of Interpolation

- Can assess extreme changes in terrain such as Cliffs and Fault Lines.
- Thick evenly spaced points are well interpolated (flat areas with cliffs).
- Can augment or decline the amount of sample points to influence cell values.

### Disadvantages of Interpolation

- Cannot make an estimation above maximum or below minimum values.
- Not very good for peaks or mountainous areas.

## 8.11 ADVANTAGES AND DISADVANTAGES OF EXTRAPOLATION

### Advantages of Extrapolation

- Extrapolation is the analysis of data based on past trends. As past data is easily available based on which forecasting can be done to make informed decisions.
- It is an uncomplicated technique of forecasting as the rough judgment of the data can be done based on the earlier data.
- Not much data information is required as past data of a very near period is relevant for extrapolating the data.
- It is prompt and low-priced as the cost involved in collecting the past data is not high.
- It can encourage staff if aims are high. With the help of extrapolation, the staff can be encouraged by educating them that the targets have been fixed on a scientific basis.

## Disadvantages of Extrapolation

- It can be uneven if there have been no changes in rise and fall with past data
- It undertakes that historical trends will always carry on into the future, which is doubtful in numerous business environments. The results will not be accurate, if there is a change in the policy of the government about a particular industry. There might be chances that the circumstances may change on a global basis like war or abnormal currency fluctuations etc.
- The technique of extrapolation overlooks the qualitative factors which cannot easily be quantifiable. If for instance, there is a change of fashion or liking of the consumers in the clothing industry, it will be difficult to extrapolate the data based on records. Extrapolation done based on the past data may not produce accurate results.
- It is a possibility that high-pitch targets can strain staff members. If targets are too high or too low based on the forecast of the previous data, it can promote dissatisfaction among the labour. As high targets will unnecessarily pressure them and low targets will result in suboptimal use of the resources.
- Extrapolating beyond a reasonable range is quite a difficult task. Sometimes a company wants to modernize the machinery to increase its productivity. It may be difficult to do a cost-benefit analysis based on future production.

## 8.12 APPLICATION OF EXTRAPOLATION AND INTERPOLATION

Interpolation time and again delivers a legitimate estimation of an unknown value, because of this, it's deliberated as a more dependable assessment method than extrapolation. Both approaches are advantageous for different purposes. Interpolation is particularly valuable to guess missing values or lost records to complete the records for deciding on doing any project or activity. Extrapolation is done to make forecasts about an event or occurrence based on a set of known or past values. In the real world, interpolation and extrapolation are applied in numerous fields, including the following:

- **Mathematics** to ascertain function values to reveal unidentified values to solve real-world problems;
- **Science** to make weather prediction models, forecast rainfall, or predict unknown chemical concentration values; and
- **Statistics** to forecast prospective data, such as population growth or the spread of a disease.

## 6.0 COMPARISON BETWEEN INTERPOLATION AND EXTRAPOLATION

<b>Interpolation</b>	<b>Extrapolation</b>
The interpretation of the values between two points in a data set. It is the prediction of a most likely assessment in the given circumstances.	Assessing a value that's outside the data set. Assessing a likely figure for the future is called extrapolation.
Predominantly used to ascertain missing past values. When data from some past periods are missing, information connecting to such projects may be assessed to finish the records by interpolation	Performs a most important role in predicting. It plays an important part in economic forecasting. For financial forecasting, prediction of future data is indispensable. This is done by extrapolation.
The expected information is more likely to be accurate. Interpolation has a preference because it has a better probability of finding an acceptable assessment.	The projected values are only possibilities, so they may not be completely accurate. In extrapolation, we normally assume that our perceived trend lasts for values of x outside the range. We worked to form our model. This may not be the case. So proper care should be taken while doing extrapolation.
It can be computed graphically. It is one of the easiest methods of interpolation.	The graphic method is not useful for extrapolation.
The technique of estimating a past figure is termed interpolation.	The technique of estimating a Future figure is termed as interpolation.

#### **8.14 SUM UP**

It is well known fact that decision-making activity is extremely intricate given the kind and nature of economic variables. Information is critical to the decision-making process. The number of times information relating to the decision ecosystem is available and sometimes essential information is either absent or not available for several reasons. Interpolation and Extrapolation are both statistical methods that enable the estimation of unfamiliar values in a given series. In simple words, interpolation is done to estimate a value inside the specified range of the series while extrapolation on the other hand deals with obtaining the prediction or estimates of the required information in the earlier or future outside the specified range of the series. At the time of interpolating or extrapolating a value, it is at all times assumed that there are no sudden deviations in the given data. The second supposition is that the degree of variation of the data is uniform. Interpolation and extrapolation are useful in the non-availability of

data and loss of data, for estimating the intermediate values, bringing uniformity in the data, **doing forecasts and ascertaining the positional averages** in continuous frequency spreading.

## **8.15 QUESTIONS FOR PRACTICE**

### **A. Short Answer Type Questions**

Q1. Write a short note on interpolation with an example.

Q2. Write a short note on extrapolation with an example.

Q3. What are the different methods of interpolation?

Q4. What are the main differences between interpolation and extrapolation?

### **B. Long Answer Type Questions**

Q1. What are the applications of interpolation and extrapolation in forecasting information for businesses?

Q2. What is the Need and Importance of Interpolation and Extrapolation?

Q3. What is extrapolation? Discuss its various methods.

Q4. What are the advantages and disadvantages of interpolation and extrapolation?

Q5. Discuss the important assumption of interpolation and extrapolation

## **8.16 PRACTICAL QUESTIONS WITH SOLUTION**

**Q1. If (20, 60) and (40, 100) are the two points on a straight line, find the value of y, when x = 60 using linear extrapolation.**

**Solution:** Given  $x_1=20$  and  $y_1=60$  similarly  $x_2= 40$  and  $y_2=100$ ,  $x=60$

**We know that**  $y(x) = y_1 + ((x - x_1) / (x_2 - x_1) (y_2 - y_1))$ .

Now putting the value from the above we get

$$y(60) = 60 + \frac{(60 - 20)}{(40 - 20)} \times (100 - 60)$$

On solving the equation, we get  $y(60) = 60 + 2 \times 40$

Thus, by solving we get  $y(60) = 140$

**Q2. If (60, 30) and (80, 90) are two points on a straight line, find the value of „y“ when x = 120 using linear extrapolation.**

**Solution:** Given  $x_1=60$  and  $y_1=30$  similarly  $x_2= 80$  and  $y_2=90$ ,  $x=120$

**We know that  $y(x) = y_1 + ((x - x_1) / (x_2 - x_1) (y_2 - y_1))$ .**

Now putting the value from the above we get

$$y(120) = 30 + \frac{(120-60)}{(80-60)} \times (90-30)$$

On solving the equation, we get  $y(120) = 30 + 3 \times 60$

Thus, by solving we get  $y(120) = 210$ .

Q3. Find the value of y when x=10 by Lagrange's interpolation method.

f(x)				

Solution:

Firstly, we will write Lagrange's interpolation method formula as given below.

$$\frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} \times f(x_0) + \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)} \times f(x_1) + \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)} \times f(x_2) +$$

$$\frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)} \times f(x_3)$$

The given value of x and y are depicted in the table

	5	6	9	11
f(x)				

Putting the values in the formula we get  $f(x) =$

$$\frac{(x-6)(x-9)(x-11)}{(5-6)(5-9)(5-11)} \times 12 + \frac{(x-5)(x-9)(x-11)}{(6-5)(6-9)(6-11)} \times 13 + \frac{(x-5)(x-6)(x-11)}{(9-5)(9-6)(9-11)} \times 14 +$$

$$\frac{(x-5)(x-6)(x-9)}{(11-5)(11-6)(11-9)} \times 16$$

$$\text{Now } f(10) = \frac{(10-6)(10-9)(10-11)}{(5-6)(5-9)(5-11)} \times 12 + \frac{(10-5)(10-9)(10-11)}{(6-5)(6-9)(6-11)} \times 13 + \frac{(10-5)(10-6)(10-11)}{(9-5)(9-6)(9-11)} \times 14$$

$$+ \frac{(10-5)(10-6)(10-9)}{(11-5)(11-6)(11-9)} \times 16$$

Solving the equation, we get

$$\frac{(4)(1)(-1)}{(-1)(-4)(-6)} \times 12 + \frac{(5)(1)(-1)}{(1)(-3)(-5)} \times 13 + \frac{(5)(4)(-1)}{(4)(3)(-2)} \times 14 + \frac{(5)(4)(1)}{(6)(5)(2)} \times 16$$

$$= 14.666.$$

Hence the value of  $y=f(x)$  will be 14.666 when  $x=10$ .

- Interpolate the value  $f(x)$  when  $x=4$  in the following table.

f(x)	0	0	0	

Solution:

	=3	=5	=7	=9
f(x)	0	0	0	

As the value of x lies between  $x_0$  and  $x_1$

First, we calculate the value of  $u$ , which is  $h=2$ .

Then  $u = \frac{x-x_0}{h}$ , where  $x=4$  and  $x_0 = 3$  hence  $u = \frac{4-3}{2} = \frac{1}{2} = .05$ .

Difference Table

x		$\Delta y$	y	y
	0			
	0	0		
	0	0		
	0	0		

The formula for interpolating the above problem is

$$y = y_0 + \frac{u}{1!} \Delta y_0 + \frac{u(u-1)}{2!} \Delta^2 y_0 + \frac{u(u-1)(u-2)}{3!} \Delta^3 y_0$$

$$y = 180 + \frac{(.05)}{1!} (-30) + \frac{(.05)(.05-1)}{2!} (0) + 0$$

$$y = 180 - 15 = 165$$

Hence  $y=165$  is the answer.

Q4. Estimate the turnover of business enterprises for the year 2021 from the under mentioned data.

Year	16	17	18	19	20	21
Turnover in Rs. lacs			0	0	0	

Solution:

Year	Turnover In Rs. lacs	
16		
17		
18	0	
19	0	
20	0	
21		

As the known values are 4

$$\therefore (y - 1)^4 = 0$$

$$y_4 - 4y_3 + 6y_2 - 4y_1 + y_0 = 0 \dots\dots (1)$$

The second equation can be calculated by increasing the suffixes of each term of 'y' by one and let the coefficients same.

then we get

$$y_5 - 4y_4 + 6y_3 - 4y_2 + y_1 = 0 \dots(2)$$

Substitute y values in equation (1) we get

$$y_4 - 4y_3 + 6y_2 - 4y_1 + y_0 = 0$$

$$260 - 4(150) + 6(100) - 4y_1 + 50 = 0$$

$$260 - 600 + 600 - 4y_1 + 50 = 0$$

$$-4y_1 + 310 = 0$$

$$y_1 = \frac{-310}{-4} = 77.50$$

Hence sales in 2017 are Rs.77.50 lacs.

Now substitute y values in equation (2) we get

$$y_5 - 4y_4 + 6y_3 - 4y_2 + y_1 = 0$$

$$y_5 - 4(260) + 6(150) - 4(100) + 77.50 = 0$$

$$y_5 - 1040 + 900 - 400 + 77.50 = 0$$

$$y_5 - 462.50 = 0$$

$$y_5 = 462.50$$

Hence sales in 2021 are Rs.462.50 lacs