



MCM-504

ADVANCED BUSINESS ECONOMICS



**COMMERCE DEPARTMENT
SCHOOL OF MANAGEMENT STUDIES
AND COMMERCE
UTTARAKHAND OPEN UNIVERSITY, HALDWANI**

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UTTARAKHAND OPEN UNIVERSITY

**University Road, Teenpani By-pass, Behind Transport Nagar,
Haldwani-263139**

Toll Free No... 18001804025

Fax No.: (05946)-264232, e-mail: info@uou.ac.in

som@uou.ac.in

<http://www.uou.ac.in>

www.blogsomcuou.wordpress.com

Board of Studies

Professor Nageshwar Rao
Vice-Chancellor,
Uttarakhand Open University
Haldwani

Professor R.C Mishra (Convenor)
Director, School of Management Studies and
Commerce, Uttarakhand Open University, Haldwani

Professor Bal Krishna Bali (Retd.)
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HPU, Shimla, H.P.

Professor Krishna Kumar Agarwal
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MG Kashi Vidyapeeth, Varanasi

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Department of Commerce,
DDU Gorakhpur University, Gorakhpur

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Department of Commerce,
Shri Ram College of Commerce, New Delhi

Prof. Gagan Singh
Department of Commerce,
Uttarakhand Open University, Haldwani
Dr. Sumit Prasad
Department of Management Studies,
Uttarakhand Open University, Haldwani

Prof. Manjari Agarwal
Department of Management Studies,
Uttarakhand Open University, Haldwani

Programme Coordinator

Prof. Gagan Singh, Department of Commerce, Uttarakhand Open University, Haldwani

Units Written By	Unit No.
Dr. Ravi Inder Singh, University Business School, Panjab University Regional Centre, Ludhiana	1-4
Dr. Anil Kumar, Haryana School of Business, GJ University of Science and Technology, Hisar	5-11
Dr. Umesh Maiya, Department of Management and Commerce, First Grade College, Udupi, Karnataka	12-15
Dr. Surender Singh Kundu, Department of Commerce, Chaudhary Devi Lal University, Sirsa, Haryana	16-19
Dr. Kulbhushan Chandel, Department of Commerce, Himachal Pradesh University, Shimla	20-23

Editing

Professor T.P.N. Srivastava (Retired)
Department of Commerce,
DDU Gorakhpur University, Gorakhpur
Dr. Geetanjali Bhatt Sharma
Department of Commerce,
Uttarakhand Open University, Haldwani

Dr. Gagan Singh
Department of Commerce,
Uttarakhand Open University, Haldwani

Translation

Dr. Anoop Kumar , Department of Economics, Allahabad University, Allahabad	1-12, 18-23
Dr. Subodh Kumar , SRT Campus, HNB Garhwal, Tehri Garhwal	13
Dr. Shrish Kumar Tiwari , Allahabad Degree College, Allahabad	14
Dr. Aruna Srivastava , Rajiv Gandhi College, Bhopal, M.P.	15-16
Dr. Ashish Shukla , Nehru Gram Bharati University, Allahabad	17

ISBN : 978-93-90845-48-4
Copyright : Uttarakhand Open University
Publication Year : 2020

Published by : Uttarakhand Open University– 263139

Printed at : (.....)

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UNIT 1: FUNDAMENTAL CONCEPTS OF BUSINESS ECONOMICS

Structure

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OBJECTIVES

After studying the contents of this unit, you should be able to understand:

- The meaning and characteristics of business economics
- The scope of business economics
- The need of business economics

- The fundamental aspects associated with business economics
- The role and responsibilities of business economists
- Link of managerial economics with other streams of learning
- The various fundamental concepts of business economics

1.1 INTRODUCTION

Business Economics also known as managerial economics is that branch of economics which deals with the economic issues related to business. It combines managerial practice with economic theory to analyze the practical problems faced by the business firms. It uses the economic concepts, principles and theories to help the managers in taking rational business decisions. As a special branch of economics, it bridges the gap between abstract theory and business practice. It is also known as applied economics or economics of the firm and micro economics etc.

1.2 MEANING OF BUSINESS ECONOMICS

Business organizations are required to make a number of decisions which may range from routine business decisions to strategic decisions. Development of technology and integration of the world into one small village due to liberalization, globalization and privatization has brought paradigm shift in the way businesses used to be conducted. The success of business depends upon the quality of these decisions. With every passing day decision making in a business is becoming increasingly difficult because of complexities emerging in business arena. Business Economics embodies that special branch of economics which helps business managers in taking rational business decisions through application of principles and techniques of economics. Decision making is concerned with selection of the best alternative out of the available options. Statistical and operations research techniques like linear programming, Game Theory, derivatives, Sequencing and project control provide a systematic procedure for evaluating risk, uncertainty and other critical issues and help the management in selecting the best course of action. Business economics provides a solid foundation to the business managers for understanding the business problems and in taking relevant, and accurate decisions.

1.3 CHARACTERISTICS OF BUSINESS ECONOMICS

The following characteristics of business economics indicate its nature:

1. **Micro economics:** Business economics is micro economics in character since it studies the problems of an individual business unit. It does not study the problems of the entire economy. Of course it takes help of macro economics i.e. analysis of the economic environment while resolving the problems of the business unit. It helps the management in forecasting and evaluating the trends of the market.
2. **Normative science:** Business economics helps the management in taking a variety of decisions under different circumstances. It helps not only in selecting goals but also in choosing ways for the achievement of those goals. Future planning, optimal utilization of resources etc all come within the purview of managerial economics.

3. **Pragmatic:** Business economics is practical in approach unlike pure economics which is based on certain unrealistic assumptions. Managerial economics is concerned with making economic theory more application oriented. It tries to solve the managerial problems.
4. **Prescriptive:** Business economics is prescriptive. As pointed out earlier, business economics not only helps management in setting goals but prescribes a way also for achieving those goals.
5. **Takes help of macro economics:** Business does not work in isolation. It is strongly connected with the external economic environment and gets affected because of changes in economic environment. Business economics takes the help of macro-economics to understand the external conditions such as business cycle, national income, economic policies of Government etc. to help management in ensuring societal relevance and financial feasibility of the business.
6. **Management oriented:** The main focus of business economics is to aid the management in taking rational economic decisions. It assists the management in diagnosing the causes of business problems, helps management in setting business goals and making business policies and future planning. Managerial economics plays the same role for the business as played by the doctor for patient.
7. **Multi-disciplinary:** Business economics is multidisciplinary in approach. It makes use of tools of operation research, statistics, management and mathematics in analyzing and solving business problems.
8. **Science and Art:** As science is a body of proven principles, business economics is also based on certain principles. Like science, business economics establishes the cause-and-effect relationship by collecting, classifying and analyzing the facts. Further, as art, it also requires the use of skills in application of principles of business economics. Therefore, business economics is both science and art.

1.4 SCOPE OF BUSINESS ECONOMICS

The scope of business economics is very wide and covers the following areas:

1. Theory of Demand analysis

The main task of any business organization is to produce a product or render service to the society. To carry on its functions successfully, a business firm is required to assess the type of the product needed by the consumers, quantum of demand, factors affecting the demand of the product or service being rendered by the firm, effect of change in the income of the consumers over the demand of the product or service. Business Economics helps the firm in conducting detailed analysis of the aforesaid issues.

2. Theory of Production and cost analysis

Production and cost analysis is axle around which the entire economic decisions of the firm revolve. Firms have to achieve a certain level of production to earn reasonable

profits, and for that they have to conduct a detailed analysis of fixed and variable costs to find out the optimum level of production at which the average cost of production is the minimum. Production theory aids the management in determining the size of the firm as well as the level of production and in assessing the effect of change in production on average and marginal costs. It also helps management in identifying the optimum level of production through an analysis conducted in the form of 'If then analysis' i.e. effect on cost of production due to changes in one or more factors of production individually or jointly.

3. Theory of Exchange

Theory of Exchange or Price theory deals with determination of price under different types of market conditions. Product Pricing is a crucial managerial issue affecting the success of an enterprise. Product price affects the demand of the product which in turn affects the business profits.

4. Theory of Profit

The ultimate aim of any business organization is to maximize the profits. Profit is the difference between total revenue and total economic cost. Profitability of an organization is greatly influenced by the demand of the product, prices of the factors of production, nature and degree of competition in the market etc. Theory of profit helps management in profit planning and in improving efficiency of profit earning of the firm.

5. Theory of Capital and Investment

Important capital and Investment issues regarding selection of a viable investment proposal, efficient allocation of scarce business capital, reducing the possibility of under capitalization or overcapitalization are the other important managerial issues covered dealt in business economics.

6. Business Environment

Socio-political environmental factors like Business cycles, type of economic system of the country, Industrial, trade, taxation, fiscal and labour policy, General economic trends related to production, employment, income, prices, saving and investment etc affect the business planning and success.

These factors are uncontrollable and therefore policies, program and planning of the firm's activities should be made after figuring in the due effects of the above stated socio-political factors.

7. Inventory management

Inventory management is again one of the critical areas of management. Whereas maintenance of excess inventory can adversely affect the profitability of the business, shortage of inventory can lead to stoppage of production process. A firm should always keep an optimum quantity of stock with it. Business economics through techniques of inventory management like ABC analysis, VED analysis, reorder level, re-order quantity helps business management in minimizing the inventory cost.

1.5 OBJECTIVES OF BUSINESS ECONOMICS

Managerial economics assists the management in decision making process. It helps the management in getting answers to the questions like:

- Where to invest ?
- How much to invest ?
- Which machine/equipment to be purchased ?
- What should be the product mix ?
- What should be the input mix so that the cost of production is the least ?
- How much quantity should be produced ?
- What should be the selling price ?

Business economics aids management in getting answers to above stated questions by collecting and analyzing the relevant data through relevant tools. However the following is the detailed list of objectives of business economics:

1. To provide a bridge between economic theory with business practice.
2. To minimize the risk and uncertainty.
3. To help management in application of economic concepts, principles and tools to solve business problems.
4. To assist the management in optimum allocation of the scarce resources.
5. To assist management in demand forecasting.
6. To assist management in production planning and cost analysis.
7. To assist management in project control.
8. To help the firm in emerging industry leader.
9. To assist management in devising strategies for expansion of the market share etc.
10. To make overall development of a firm.
11. To help in profit maximization.

1.6 ROLE OF A BUSINESS ECONOMIST

A business economist plays the role of an advisor for the business. He uses his skills and knowledge to assist the management of a business enterprise in taking important managerial decisions. The role of business economist these days has increased manifold on account of the increase in scale of operations of business, stiff competition and globalized operational environment. To start with, companies only in the developed countries of the world like UK, USA, Germany, Australia and France used to employ experts from the discipline of business economics. Now a days leading Indian companies like Reliance, Hindustan Lever etc. have also employed business economists. The following details would give you an idea of the multi marginal roles played by a business economist.

1. Study of the Business Environment.

By now you must have gathered that since business economics is a normative science, the role of a business economist is to derive relevant theories from traditional economics and apply them for making business decisions in the light of fast changing local and global business environment. Business environment may be defined as the totality of the factors

which are external to and beyond the control of a business organization and which have an intense bearing on managerial decisions of an organization. Thus every firm has to analyze external economic environmental factors like growth rate of population, per capita income, literacy rate, growth of national income, volume of trade, change in preferences of the consumers, government policies regarding trade, industry, exports and imports, and the general price trends for helping the management in taking appropriate business decisions. The analysis of external economic factors helps the organization in formulating important business policies and future planning. It helps the business in selecting the line of business, the capacity at which it needs to operate at different points of time, whether there is a need for the firm to go global or not and if yes which countries can be potential source of business etc.

Business economist does the entire task of scanning the national and international business environment on behalf of management of the firm and helps it in arriving at rational business decision.

2. Business Plan and Forecasting.

All businesses do planning for the future and after developing comprehensive plans they get on to the job for the realization of plans. Managerial economist, as discussed earlier helps the management in forecasting and developing business plans. Management economist collects and analyzes data about past business trends, government policies, national and international business environment and demographic features which are used for business planning and forecasting.

3. Advises Regarding Internal Business Operations

Economist uses analytical and forecasting techniques to give advice to the management regarding internal working of the organization e.g. percentage of capacity utilization required at different points of time. He also helps the management in getting answers to the questions like what is the suitable production schedule? What should be the policy regarding management of inventory? What will be the reasonable sales? From where firm should meet its financial requirements? He makes use of the various relevant statistical techniques like regression, correlation, trend analysis etc. and on the basis of this study remedies advice to the management of business organization regarding its internal business operation.

4. Study of Economic Intelligence

Business Economist keeps on providing general information pertaining to the economy to the management. This information can be of great use to the management as it improves the general level of intelligence of the managerial people and can greatly enhance their analytical faculties. Further this information can be used by the management in preparing the annual reports of the company and for making presentations during conferences and seminars.

5. Specific functions

With increase in business complexities, the task of business economists has become for more complicated. In order to maintain the quality of services, few business economists have chosen few particular areas as their areas of expertise and rendering specific advisory services pertaining to those areas only. Their particular areas of service include

demand forecasting, industrial market research, pricing problems of industry, production programs, investment analysis and forecasts. They also offer advice on trade and public relations, primary commodities and foreign capital projects in agriculture, industry, transport and tourism and also of the export environment.

1.7 RESPONSIBILITIES OF A BUSINESS ECONOMIST

A business organization's main objective is to earn as much profits as possible. The main responsibility of the business economist is to help the firms in achieving their objective of profit maximization and all other responsibilities of the business economist draw from his main responsibility of helping the business enterprises in earning maximum profits. The responsibilities of the business economist are explained in detail below:

1. Making Exact Forecasts

In today's highly competitive world, success of a business enterprise depends upon how proactive the firm is and this pro-activeness is dependent upon how accurately it makes forecast about the future events. Since future is highly uncertain it is difficult to make correct estimates. The uncertainty concerning future business events cannot be eliminated altogether but business economist can help in reducing it to a great extent through the use of scientific techniques of economics meant for future forecasting. A business economist who is well versed with forecasting techniques and is able to make successful forecasts about business trends commands great value in the market. It is the responsibility of the business economist to make as much exact as possible of forecast of the business trends and keep on revising the information in the light of changed circumstances and keep on sending alerts to the management.

2. Maintaining Relationships

Managerial economist is required to collect data from a wide variety of sources for discharging his duties effectively and efficiently. The collection of data from wide variety of sources is not possible with establishing strong relationship with the data sources. Therefore, it is the duty of the managerial economist to maintain good relationship with sources of data. In order to maintain his relationship with different data sources he must join professional associations and subscribe to the journals giving him fresh and latest information.

3. Command full Status on the Management team

A business economist must command full respect and respectable status in the management team as his areas of activities relate to giving advice to the management which may change the whole course of business operations. His advice will not command any value in the management team in case business economist does not command any respect in the management team. In order to command respect in the management team, business economist will have to prove his mettle there. He should have the ability to not only to explain his ideas but also convince people. He must be prepared to take up assignments on special project also.

In nutshell we can say that it is the duty of managerial economist to command good respect in the management team and the managerial economist can earn this place in the

managerial team only if the understands and undertakes his responsibilities and has the ability to explain his ideas clearly.

1.8 BUSINESS ECONOMICS AND OTHER SCIENCES

Introduction

Business economics does not function in isolation. It is not something which is related to economics only, but there are other areas of study also to which managerial economic is related. Other related subjects of managerial economics include Economics, Mathematics, Statistics, Accounting, Operation Research, Computers and Management. To properly understand the nature and scope of business economics it is necessary to investigate its relationship with other sciences. Relationship of business economics with other important fields of study such as statistics, mathematics, operations research, and accounting has been explained below:

Economic and Business economics

Economics is the foundation stone on which rests the structure of managerial economics. Economics contributes a great deal towards the performance of managerial duties and responsibilities. Economics plays the same role to managerial economics as the biology plays to the medical profession and physics to engineering. The basic function of the manager of a business is to help the management of a business in achieving the organizational goal of maximization of profits through optimum allocation of limited resources placed at their disposal. Economics contribute a lot to the managerial economics.

Business Economics and Statistics

Business economics is concerned with collection and analysis of data. Statistical techniques are used in collecting, marshalling and analyzing business data and for empirical testing of the economic generalizations before they are applied for decision making. The statistical tools e.g. theory of probability, forecasting techniques, and regression analysis help the decision makers in predicting the future course of economic events and probable outcome of their business decision.

Business Economics and Mathematics

Business economists deal primarily with concepts that are quantitative in nature e.g. demand, price, cost, capital, wages, inventories etc. Mathematics is the manager's most useful logical tool. The use of mathematical logic in the analysis of economic variables provides not only clarity of concepts but also a logical and systematic framework for understanding the problem and arriving at the solution.

Business Economics and Operations Research

Operations research and business economics are related to a certain extent. Linear programming and goal programming are two widely used operations research techniques in business decision making. The significant relationship between managerial economics and operations research can be highlighted with reference to certain important problems of managerial economics which are solved with the help of operations research techniques, like allocation problem, competitive problem, waiting line problem, and

inventory problem. Techniques of operations research are used to find out the optimum combination of various factors to achieve the objects of maximization of profit, minimizations of cost and time etc.

Business Economics and Accounting

Accounting is the main source of data regarding the operation and functioning of the firm. A business economist needs market information, production information and accounting information for decision-making. The information about financial performance and financial position provided by the accounting statements of profit and loss statement and balance sheet provides a basis for the manager in decision making and forward planning.

Computers and Business Economics

Present day age is age of Information technology and computers. Computers are assisting tools for the mankind in almost all walks of life be it product designing, project formulation, project implementation and production functions etc. business economists also make use of information for data processing, analysis and presentation.

Few fundamental concepts of Business Economics which need due consideration at the time of taking business decisions are explained below:

1.9 OPPORTUNITY COST

All economic resources have various alternative uses but because of their limited availability their use has to be restricted to best possible options and in the process their use for some of the other purposes has to be foregone. Opportunity cost of an economic resource is the return foregone by not using the resource for the next best alternative. Therefore, opportunity cost is measured by the sacrifices made in the decision. If there is no sacrifice involved in any particular decision, there will be no opportunity cost. Suppose you have only one computer in your shop and you receive two assignments. One assignment relates to typing and printing of a Project Report and the other assignment relates to typing and printing of a college prospectus. Project Report will fetch you an income of Rs. 1000 whereas prospectus will earn an income of Rs. 1200 for you. Both the assignments involve equal work. In case you decide to accept the job of typing of college prospectus you will have to leave the job of project report. In this case your opportunity cost is Rs. 1000 i.e. the return foregone by you by not accepting the assignment of project report. Opportunity cost is also called alternative cost or transfer cost.

The concept of opportunity cost is very important with respect to its role in managerial decision making. This concept helps in the optimum allocation of available resources. On the basis of this concept management can select the best possible alternative from amongst various alternatives available.

1.10 CONCEPT OF INCREMENTAL COST AND REVENUE

The concept of Incremental cost and revenue of Managerial Economics is very important and goes a long way in helping the management in taking important managerial decisions. Management of business enterprises is more often caught in situations wherein it is required to take decisions like Should it increase the production capacity or not? Should, it introduces a new product or not? And should it discontinue the production of an existing product? Should, it accepts an export order or not? This fundamental concept of incremental revenue and incremental cost is also known as managerial economics wherever the principle helps the management in resolving the aforesaid issues. Incremental cost is a change in total cost resulting from a decision. Incremental revenue means the change in total revenue resulting from a decision. Comparison of incremental cost of any particular decision with incremental revenue of that decision helps the management in assessing the profitability of that decision. Accordingly, a decision may be profitable if :

- (i) it increases revenue more than costs,
- (ii) it increases some revenues more than it decreases others,
- (iii) it decreases some costs at higher pace than it increases others ,
- (iv) it decreases costs more than revenues.

Note that it is not wise for a firm to refuse orders which do not cover full cost i.e. cost of labour, material cost and overhead cost plus a provision for profit. The incremental principle suggests that this notion would be inconsistent with proper maximization in the short run. By refusing to accept the deal below full cost may result into denying the possibility of adding more to revenue than to cost. Therefore, incremental cost is relevant cost and not the full cost. You may have better understanding of the concept with the help of the following example :

Suppose a firm expects to earn an additional amount of Rs. 100,000 by accepting a new order. The costs are estimated as follows :

Material	Rs. 40,000
Labour	Rs. 30,000
Overhead (allocated at 120% of labour cost)	Rs. 36,000
Selling and administrative expenses (allocated at 20% of labour and material cost)	Rs. 14,000
Full cost	Rs. 1,20,000

Obviously the order if executed would incur a loss of Rs. 20,000. Now it assumes that here is idle capacity which can be utilized to execute the order and which adds only Rs. 10000 of the overhead (i.e the cost of the added use of heat and power, cost of supervision and wear and tear of machinery etc.) only Rs. 20000 by way of labour cost, since some of the idle workers already on the payroll will be engaged without any addition to their wages and with no extra selling and administrative cost, the incremental cost can be calculated as under :

Materials	Rs. 40,000
Labour	Rs. 20,000
Overhead	Rs. 10,000
Total incremental cost	Rs. 70,000

Now this option would result into a profit of Rs. 30,000 (Rs. 10000- 70000).

Concept of incremental cost and revenue is the basis of marginal costing and differential cost techniques which are used for taking very important managerial decisions.

1.11 PRINCIPLE OF TIME PERSPECTIVE AND DIVISION OF COSTS

The concept of time perspective and division of costs into fixed and variable costs of managerial economics helps management in taking useful decisions related to output, acceptance or rejection of orders, fixation of prices in average, buoyant and recessionary market conditions. Distinction made between the short run and the long run helps in the determination of price in a given market form. In the long run a firm must cover its full cost whereas in the short-run it can afford to ignore some of its fixed costs but entire variable cost must be recovered. According to the principle of time perspective, a decision should take into account both the short run and the long run effects on revenues and costs and maintain the right balance between the long run and short run perspective.

1.12 DISCOUNTING PRINCIPLE

Discounting Principle or time value of money concept is based on the presumption that value of money keeps on changing with passage of time. Normally a rupee received today commands more value than a rupee received tomorrow. This is because of a number of reasons e.g. people prefer to satisfy their present wants to their future wants due to uncertainty about future receipts and also can capitalize the opportunity to invest at present to earn some extra money in the form of interest etc. This is also implied by the common saying that a bird in hand is worth more than two in the bush. This discounting principle of business economics helps to calculate the present value of any money to be received after some time in future and is made use by the management in resolving important issues like decisions pertaining to investment in long term projects, depositing money with banks for long periods and in selecting the sources of finance etc.

Present value factor which is used for calculating the present value of future receipts is:

$PVF = 1 / (1+r)^n$. Where r represents discount rate and n represents the time i.e. the number of years after which payment will be received.

Example

Suppose you will receive Rs. 1000 from your bank after one year. Rate of discount is 10%. Then the value of this Rs. 1000 in terms of value of today's currency is:

$$\text{Present Value} = 1000 \times 1 / (1+.10)^1$$

$$\text{Present Value} = 1000 \times 0.909 = \text{Rs. } 909$$

Similarly you can also calculate the present value of money the receipt of which is to get delayed by more than 1 year. In case the receipt of Rs. 1000 given above is to be received after three years instead of one year, then the present value can be calculated as follows:

$$\text{Present Value} = 1000 \times 1/(1+.10)^3$$

$$\text{Present Value} = 1000 \times 0.751 = \text{Rs. } 751$$

This principle has to be followed for evaluating those decisions wherein the decision is going to affect costs and revenues at future dates. In such cases it is necessary to discount those costs and revenues to obtain the present values of both. Thereafter a valid comparison of alternatives can be made.

1.13 EQUI-MARGINAL PRINCIPLE

Equi means equal and marginal means additional. This equi-marginal principle is one of the most widely used concepts in business economics, to ensure the optimum allocation of firm's scarce resources.

It requires that the input resources of the firm should be allocated in such a manner that the value added by the last unit of input is same in all the uses. In case the input resources of the firm are allocated in such a manner then it leads to maximum exploitation of all the inputs of a firm so as to maximize the profitability.

As the objective of principle of equi-marginal utility is to allocate resources it can be applied in different areas of management. The best use of this principle is made in budgeting to ensure the most productive use of these resources. The equi-marginal principle can also be applied in multiple product pricing, in identifying wasteful use of resources and then diverting the resources from wasteful activities towards productive assets.

1.14 OPTIMIZATION

Management has to take various strategic and operational decisions related to the affairs of the business. While taking these decisions it is not given a free space, therefore, it is always required to strike a balance between various aspects involved. For example, while taking investment decisions it has to weigh returns against risk as higher the risk, higher the return. Similarly while doing inventory management, it is required to balance the inventory carrying cost and inventory ordering cost. That is to say, management while taking business decisions is guided by the principle of optimization than maximization. Business economics often aims at optimizing a given objective. The important techniques for optimization include marginal analysis, calculus, linear programming etc.

1.15 SUMMARY

Business economics is a special branch of economics which helps management in resolving business issues through the use of principles, concepts and tools of economics. Due to increase in scale of business and stiff competition prevailing in the economies, the role of business economists has become important and business economists are commanding great value in the industry. Business economists like professionals from other streams are now also gaining expertise in specific areas of business economics. Business economics is a multifarious stream and has close link with sciences of economics, computers, mathematics and operations research etc.

1.16 GLOSSARY

- **Opportunity cost:** The opportunity cost of economics resources is the gain that is not foregone for the next best use of resource.
- **Managerial Economics:** It refers to the use of economic analysis to solve business problems faced by an enterprise.

1.17 CHECK YOUR PROGRESS

(A) Fill in the blank:

1. Business Economics is not based on----- assumptions.
2. Opportunity cost of any resource is the return ----- by not using it for the ---- ----- best option.
3. A firm can ignore some of its ----- costs.
4. Change in the taste of consumers is an factor.
5. The Concept of marginalism helps in.....
6.is the foundation stone of Managerial economics.
7.have made the task of data analysis easy.

(B) State whether the following statements are true or false :

1. Business economics is macro-economic in nature.
2. Business Economics has no relation with management sciences.
3. Business Economics is not an art.
4. Business economics is linked to statistics also.
5. A decision would not be profitable if it increases some revenue than it decreases others.
6. In the long run a firm can ignore some of its fixed cost.
7. People prefer to satisfy their present wants to their future wants.

1.18 ANSWERS TO CHECK YOUR PROGRESS

- A. 1. unrealistic 2. foregone, next 3. Fixed 4. external environmental 5. Allocation of resources 6. Economics 7. Computers
- B. 1. False 2. False 3. False 4. True 5. False 6. False 7. True

1.19 TERMINAL QUESTIONS

(A) Short Answer Type Questions

1. What do you understand by economics? What are its objectives?
2. Write a note on the role and responsibilities of a business economist.

3. Explain the Incremental concept.

(B) Long Answer Type Questions

1. Discuss the characteristics of business economics and explain its scope.
2. Explain the relationship of business economics with other sciences.

1.20 SUGGESTED READINGS

Gould, J. P. and C. E. Ferguson, Microeconomic Theory, 8th ed., Homewood III, Richard D. Irwin, (1980).

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UNIT 2: BASIC PROBLEMS OF THE ECONOMY

Structure

- 2.1 Introduction**
- 2.2 Infrastructure**
- 2.3 Transport System**
 - 2.3.1 Railways**
 - 2.3.2 Road Network**
 - 2.3.3 Air Transport**
 - 2.3.4 Power Sector**
 - 2.3.5 Growth in Core Sector and Infrastructure Services**
- 2.4 Unemployment**
- 2.5 Literacy level**
- 2.6 Poverty in India**
- 2.7 Regional Disparities**
- 2.8 Widening gap between the rich and poor**
- 2.9 Balance of Payments Disequilibrium**
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- 2.11 Summary**
- 2.12 Glossary**
- 2.13 Check Your Progress**
- 2.14 Answers to Check Your Progress**
- 2.15 Terminal Questions**
- 2.16 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to be aware of:

- The problem of infrastructure
- The problem of unemployment
- The problem of illiteracy
- The problem of increasing gap between the rich and poor

2.1 INTRODUCTION

Every economy, irrespective of the stage of development it is at, faces certain basic economic problems, though, the nature and the intensity of the problems vary from stage to stage. The nature and the types of the problems faced by the countries which have reached developed stage category are entirely different from the problems faced by countries which are underdeveloped. Indian economy which is passing through the developing stage as of now, though it has come a long way on the path of development after gaining independence, is facing peculiar kind of problems. Over a period of more than 60 years of Independence, India has attained self-sufficiency in food production, has established strong industrial base and has more importantly emerged as an attractive investment centre for the foreign investors. Strong fundamental economic base has made it possible for the country to absorb the shocks of big economic crisis like sub-prime crisis of USA, European crisis and Greece turmoil. But at the same time India is not free from diseases. It is suffering from some severe basic economic problems like poorly planned cities, lack of infrastructure for supporting industrial development, large unskilled and illiterate work force, excessive dependence on foreign money, weak political will for improvement and development, rampant red tapism, poorly designed and implemented social welfare schemes, widening gap between the rich and poor are the main problems faced by the Indian economy. Some of the most critical problems our country is facing presently, are being discussed in the following paragraph.

2.2 INFRASTRUCTURE

The importance of infrastructure in a country is similar to that the foundation in the structure of a building. Stronger the foundation, stronger is the building and greater the chances of its further elevation. Infrastructure includes transportation, agriculture, water management, telecommunications, industrial and commercial development, power, petroleum and natural gas, housing and other segments such as mining, disaster management services and technology-related infrastructure. Though huge resources and efforts have gone into the development of infrastructure in our country during the past, and there has been substantial improvement in infrastructure base of the economy but because of lack of proper planning and poor implementation of infrastructure development schemes, progress of infrastructure in the country is far from satisfactory. The detailed explanation regarding status of various kinds of infrastructure and the associated problems is given below:

2.3 TRANSPORT SYSTEM

Transportation is one of the most important requirements of the economy. The salient features that mark the development of the transport sector in India may be summarized as follows :

1. India which happened to be a rail dominated economy in the 1950's has been transformed into a road dominated economy now. The road transport today

accounts for over 60% of intercity freight traffic and over 80% of intercity passenger traffic, and

2. During the same period, Indian Railways shifted from being a freight dominant operation to a passenger dominant operation

The following paragraphs would provide you with a brief account of the modes of transport along with the problems attached to them.

2.3.1 Railways

Indian Railways is the main mode of transportation in the country and has the distinction of being the largest railway network in Asia and the second largest railway system in the world under single management. The Indian Railways system is fourth largest in the world in terms of route length, only U.S., Russia and China go ahead of India in this respect. Indian Railways with network coverage of 63273 kilometers operates more than 11,000 trains per day of which 7000 are passenger trains and serves 13 million people every day. The railways have played a critical role in catalyzing the pace of economic development and continue to be an integral part of the growth engine of the country. During the recent past rapid development has taken place in Indian railways like a large portion of the track which had outlived its life has been replaced with new electric tracks, steam and diesel engines have been replaced with electric engines, passenger amenities in the trains and platforms have been improved, Delhi metro is a shining feather in the cap of Indian railways system. Special emphasis has been given to the safety of passengers but railways still has a long way to cover to become at par with, best railways of the world. Serious Problems like old track, poor condition of rolling stock, travel without tickets, Railway Accidents, Attack on Railways in different parts of the country from naxalites, Lack of Modern Management, Outdated technology, Problem of Replacement, Problem of Laying Double Lines and overcrowding of trains etc. are amongst the few.

Problems in Railway Development

The basic problems in railway development can be discussed under the following heads :

- (i) **Inadequate Capacity network and infrastructure** :- During the period from 1950-51 to 2007-08 route kilometers has increased by just 18% and track kilometers by 11%, while freight and passenger output has gone up by more than 12 and 11 times respectively.
- (ii) **Declining Market Share** :- Indian railways is facing stiff competitive from road ways. According to the white paper of the railways the market share of rail transport has declined substantially from .89% in 1950-51 to a mere 30% in 2007-08, though it has maintained its dominance in the carriage of bulk commodities like core, iron bred fertilizers and cement or for bringing about improvement in this direction. The railways will have to adept a focused strategy to provide better services at a competitive tariff.
- (iii) **Cross Subsidization** :- In India, high freight rates cross subsidize the low passenger fares which are low that there are huge losses in passenger losses operation. The loss on coaching operations was as high as Rs. 13958 crore in 2008-09. To compensate this short working, the Indian railways raises its freight

rates resulting in high prices of transport goods. Creating inflationary pressure on the Indian economy.

- (iv) **The problem of funds and costs over run** :- The consistent pressure to undertake new projects mostly in the form of new lines requires huge funds, but, most of these projects are delayed due to shortage and availability of funds. Moreover, the cost escalations due to price rise during execution of the project also proves to be financially unmanageable.
- (v) **Old Technology**:- Indian Railways has been suffering from a considerably old technology both in electric and diesel locomotives. The Indian Railways needs to build its own technology base rather than depending on borrowed one to suit the needs of the Indian economy.

The most pressing problems facing Indian Railways are renewing over 19,000 kilometers of high-density tracks, connecting all major ports and four metros, which, out of a total track of about 64,000 kilometers, carry 80 per cent of total traffic. Further, 11,250 bridges out of about 128,000 rail bridges are to be strengthened to sustain higher pay load and speed on its tracks. Recently for the upgradation of railways two committees have stated a requirement of investment of Rs. 6,60,000 crore over a period of next five years. Anil Kakodkar's committee on railway safety has recommended a package of Rs.1,00,000 crore to be invested in the next five years and Sam Pitroda panel on modernization of railways recommended a whopping sum of Rs.5,60,000 crore during the same period. Railways in India are the life line of the nation and backbone of the whole transportation system.

2.3.2 Road Network

After railways, the second important mode of transportation in India is the roadways. They carry almost 90 percent of the country's passenger traffic and 65 percent of its freight. The density of India's highway network is 0.66 km of highway per square kilometer of land which is almost equal to that of the United States (0.65). Density of India's highway network is much greater than 0.16 of China and 0.20 of Brazil. Although road network is the most preferred system of transportation in India, it lacks capacity to meet the requirement of society. Since 1990 there has been great improvement so far as the length and quality of road network in India is concerned. But it still suffers from a wide variety of problems like most national highways are either single lane or two lanes which is much less than the required capacity. Almost a quarter of all India's road highways have recurrent congestion, reducing speed of vehicle to 30-40 km/hour. Congestion on Indian roads and high traffic contributes to reduced fuel efficiency of the vehicle, damage to the vehicles and severe impact on the environment. According to Ministry of Road transport and Highways about 22 per cent of the total length of National Highways (NHs) is single lane/ intermediate lane, about 53 per cent is two lane standard, and the balance 25 per cent is four lane standard or more. Further most of the roads are of poor quality and the maintenance of roads remains significantly under-funded with the result that only one-third of maintenance needs are met. This leads to the deterioration of roads and high transport costs for users. In India, road transport accounts for 8th highest road fatality rate. So far as network of roads in rural areas is concerned almost 70 percent of India's population reside in rural areas. Although the rural road network is extensive, around 40 percent of India's villages remain cut off during monsoon season due to the lack of good access of all-weather roads. This problem is severe in certain parts of India especially in the northern and northeastern states which are poorly linked to the

country's major economic centers. Further, whatever development of road networks is being done it is done on the basis of public private partnership models which allow the private partner to levy toll taxes. Huge amount of toll taxes is being collected by the private agencies. Some agencies start collecting the tax much before the start of work and continue collecting taxes even when their whole investment along with profits stand recovered.

2.3.3 Air Transport

Besides railways and road transport, civil aviation also plays a significant role in economic development particularly in today's globalized world. A lot of efforts have been put by the government in upgrading the airways system in the country particularly since 1991 reforms. Upgradation of Indira Gandhi International airport at New Delhi, upgradation of Kolkata and Chennai airports, including construction of new terminals, is at an advanced stage of completion. In another 18 non-metro airports, various upgradation works like expansion of terminal buildings, aprons, taxiways, and aerobridges have been taken up. For improving air navigation services, the Airport Authority of India (AAI) installed the new ATS automation system at Chennai. The Government approved a one-time grant-in-aid of Rs. 378.0 crore to the AAI for the Final Operation Phase of GPS Aided GEO Augmented Navigation (GAGAN) project. At IGI Airport, Delhi, upgradation of the existing cargo terminal and construction of a Greenfield cargo terminal have been undertaken. At Mumbai Airport, apart from the airport development project under way, upgradation of runway 09/27 was completed. In order to meet the requirements of increasing traffic, work relating to expansion of the terminal building and apron was undertaken at Bangalore International airport. Government also gave 'in-principle' approval for setting up of a green field airport at Karaikal in Puducherry and Shirdi in Maharashtra. Air traffic in India continues to register significantly higher rates of growth averaging 18.5 per cent in the last seven years. Domestic passenger traffic handled at Indian airports reached 108.1 million during January-November 2011 from a level of 90.5 million in the corresponding period in the previous year registering a growth of 19.4 per cent. International passenger traffic and cargo handled at Indian airports grew by 7.7 per cent during January-November 2011 and was placed at 33.6 million passengers and 1.4 MMT of cargo. Domestic cargo throughput during January- November 2011 stood at 0.75 MMT, the same level as in the previous year.

Table: Transport Sector Key Statistics

	Units	As of 2009
Length of Roads	Km.	3,516,452
Main Roads	Km.	666,452
Paved Roads	%	47.3
Access to All-Season-Roads	%	61
Road Density	km/1,000 sq. km.	1115
Rail Track Length	Km.	63, 327
<i>No. of Ports</i>		199
Turnaround time	Days	3
Airports		125
International		11

2.3.4 Power Sector

Power is the backbone for the economic development of any country. The growth of agriculture, manufacturing and even the growth of service sector is dependent upon the growth and strength of power industry of any country. India has the fifth largest power generation capacity in the world with an installed capacity of 152 GW as on 30 September 2009, which is about 4 percent of global power generation. The top four countries of the world i.e. US, Japan, China and Russia together consume almost around half of the total power generated globally. The average per capita consumption of electricity in India was estimated to be 704 kilowatts per hour during 2008-09. However, this is fairly low when compared to that of some of the developed and emerging nations such as US 15,000 kilowatts per hour and China 1,800 kilowatts per hour whereas the world average stands at 2,300 kilowatts per hour. Further, in India, power failures are a daily feature, even the most developed areas of Delhi, Mumbai, Chennai and Bangalore are not free from this. Any respectable business or factory in India has to maintain a diesel generator to ensure regular supply during power cuts. The outages aren't just spikes, but rather hour-long blackouts with multi-hour blackouts thrown in. Beyond keeping industrial machines and computers running, air conditioning is essential to office work in this unmercifully hot country, and even service providers must bear the burden of backup power.

In a good hotel, visitors first check the availability of generator, but this necessity adds to the cost of building and operating a facility in India. Effectively, the government is passing the buck on infrastructure to the investor, and generator costs add up fast. Some Industrial Parks or Research Parks will provide continuous power through shared generators – for small companies this is a huge perk, as a generator will require maintenance and logistics that the park can provide. Of course the park is charging a premium for that, and for large factories this may not be as good a deal. How to operate with a generator and its logistics is a key factor in designing a factory or office in India, and finding on-site consultants is recommended.

The Indian government desired to achieve the target of availability of 1000 units of per capita electricity by year 2012, it has been estimated that need-based capacity addition of more than 100,000 MW would be required. This has resulted in massive addition plans being proposed in the sub-sectors of Generation Transmission and Distribution.

India's government has committed itself to improving the nation's power grid. Government targets tend towards "Electricity for all by 2012" (a part of many politicians' election campaigns) rather than "Reliable power by 2012" or "A well-managed grid by 2012." One thing sure to expand is the nation's use of electricity per capita, as the middle-class becomes wealthy enough to afford air conditioners and run them around the clock. It is estimated that between increased consumer demand and new industrial projects, over a hundred gigawatts of new power capacity are needed by 2012, of which almost 29 gigawatts are now under construction. Ultimately, the

issue is not just total production but improved management, as currently both high-tech factories and residential areas suffer alike.

2.3.5 Growth in Core Industry and Infrastructure Services

Growth of Core industry and Infrastructure services industry in India has not been satisfactory till now. There are a number of problems which are acting as hurdle in the development of this sector e.g. Power industry is facing the problem of non availability of coal, other core industries are suffering from non-availability of sufficient power etc. Table 2.2 shown further gives data about growth rate of core and infrastructure services sector industry over a period of five years.

Table 2.2: Growth in core industries and infrastructure services (in per cent)

Sl. No.	Sector	2007-08	2008-09	2009-10	2010-11	2011-12 (April-Dec.)
1.	Power	6.3	2.5	6.8	5.7	9.3
2.	Coal	6.0	8.2	8.0	0.0	-2.7
3.	Finished steel	6.8	13.2	3.2	9.6	5.7
4.	Fertilizers	-8.6	-2.6	13.2	1.0	-0.5
5.	Cement	7.8	7.6	10.1	4.3	5.1
6.	Petroleum					
	a) Crude oil	0.4	-1.8	0.5	11.9	1.9
	b) Refinery	6.5	3.0	-0.4	3.0	4.1
	c) Natural gas	2.1	1.4	44.8	9.9	-8.8
7.	Railway revenue earning freight traffic	9.0	4.9	6.6	3.8	4.7
8.	Cargo handled at major ports	12.0	2.2	5.7	1.6	0.4
9.	Civil aviation					
	a) Export cargo handled	7.5	3.4	10.4	13.4	-1.1
	b) Import cargo handled	19.7	-5.7	7.9	20.6	1.4
	c) Passengers handled at international terminals	11.9	3.8	5.7	11.5	7.2
	d) Passengers handled at domestic terminals	20.6	-12.1	14.5	16.1	17.5
10.	Telecommunications					
	Cell phone connections	38.3	80.9	47.3	18.0	-51.0
11.	Roads					
	Up gradation of highways*					
	i) NHAI	164.6	30.9	214	-33.3	8.9
	ii) NH(O) & BRDB	12.5	17.3	4.0	-6.8	-36.5

Source : Ministry of Statistics and Program Implementation (MOSPI).

* Includes Widening to four lanes & two lanes and strengthening of existing weak pavement only. # Provisional.

Notes : NH(O) stands for National Highways Organization and BRDB for the Border Roads Development Board (BRDB).

2.4 UNEMPLOYMENT

Unemployment means the people who are eligible and interested for employment but are without any job. According to Keynes unemployment in developed economies arise because of ineffective demand whereas in India, a developing country, unemployment arises entirely due to different reasons. In developing countries unemployment and inflation go side by side. Data in percentage form of the Indian youth who remained unemployed over a period of last 9 years are given below:

Year	Percentage of Unemployed Youth
------	--------------------------------

2002	8.8
2003	9.5
2004	9.2
2005	8.9
2006	7.8
2007	7.2
2008	6.8
2009	10.7
2010	10.8

Source : CIA world fact book

The data given in the table are derived from the website of Central Intelligence Agency, US. These figures indicate that the problem of unemployment in India has always been critical with around 10% of the eligible youth remaining unemployed in the most parts of the years. In the years 2009 and 2010 problem of unemployment got further severe with unemployment percentage increasing 10% mark.

As per Labour Bureau Survey the total number of unemployed youth at the end of year 2010 was 40 million, the rate of unemployment amongst the males being 8% and in case of females 14.6%. Mahatma Gandhi National Rural Employment Guarantee Act has been enacted by the government which has a provision of providing 100 days of employment in a year to unemployed youth. This new act is contributing a lot in resolving the unemployment problem particularly in rural areas. Besides, it has also helped in checking migration of rural population to urban areas.

2.5 LITERACY LEVEL

One of the most significant parameters to measure the level of development of a society is the literacy rate. As per the definition given in census, a person of the age limit of seven years and above, who can both write and read with understanding in any of the language is considered as literate in India. Literacy level in India has been quite low and has been the main cause of unemployment in India.

Few years back government of India launched two schemes like Mid-day meal and Sarva Shiksha Abhiyan which are aimed at increasing literacy rate in the society. Besides the above stated two schemes, Government of India has taken several other measures to improve the literacy rate in villages and towns of India. State Governments have been directed to ensure and improve literacy rate in districts and villages where people are very poor.

As per the Population Census of India 2011, the Literacy rate of India has shown an improvement of almost 9 percent. It has gone up to 74.04% in 2011 from 65.38% in 2001, thus showing an increase of 9 percent in the last 10 years. It consists of male literacy rate 82.14% and female literacy rate of 65.46%. Kerala with 93.9% literacy rate is the top state in India. Lakshadweep and Mizoram are at second and third positions with 92.3% and 91.06% literacy rate respectively. Bihar with 63.08% literacy rate is the last in terms of literacy rate in India.

There has been a substantial improvement in literacy rate of India in last 10 years but there is still a long way to go. Following table shows the ranking of states in India on the basis of literacy rate:

Ranking of States in India by Literacy Rate				
Sl. No.	State	Literacy Rate (2011 Census)	Male Literacy Rate (2011 Census)	Female Literacy Rate (2011 Census)
1	Andaman & Nicobar Islands	86.3%	90.1%	81.8%
2	Andhra Pradesh	67.7%	75.6%	59.7%
3	Arunachal Pradesh	67.0%	73.7%	59.6%
4	Assam	73.2%	78.8%	67.3%
5	Bihar	63.8%	73.5%	53.3%
6	Chandigarh	86.4%	90.5%	81.4%
7	Chattisgarh	71.0%	81.5%	60.6%
8	Dadra & Nagar Haveli	77.7%	86.5%	65.9%
9	Daman & Diu	87.1%	91.5%	79.6%
10	Delhi	86.3%	91.0%	80.9%
11	Goa	87.4%	92.8%	81.8%
12	Gujarat	79.3%	87.2%	70.7%
13	Haryana	76.6%	85.4%	66.8%
14	Himachal Pradesh	83.8%	90.8%	76.6%
15	Jammu and Kashmir	68.7%	78.3%	58.0%
16	Jharkhand	67.6%	78.5%	56.2%
17	Karnataka	75.6%	82.8%	68.1%
18	Kerala	93.9%	96.0%	92.0%
19	Lakshadweep	92.3%	96.1%	88.2%
20	Madhya Pradesh	70.6%	80.5%	60.0%
21	Maharashtra	82.9%	89.8%	75.5%
22	Manipur	79.8%	86.5%	73.2%
23	Meghalaya	75.5%	77.2%	73.8%
24	Mizoram	91.6%	93.7%	89.4%
25	Nagaland	80.1%	83.3%	76.7%
26	Orissa	73.5%	82.4%	64.4%

27	Puducherry	86.5%	92.1%	81.2%
28	Punjab	76.7%	81.5%	71.3%
29	Rajasthan	67.1%	80.5%	52.7%
30	Sikkim	82.2%	87.3%	76.4%
31	Tamil Nadu	80.3%	86.8%	73.9%
32	Tripura	87.8%	92.2%	83.1%
33	Uttar Pradesh	69.7%	79.2%	59.3%
34	Uttarakhand	79.6%	88.3%	70.7%
35	West Bengal	77.1%	82.7%	71.2%
-	INDIA	74.04%	82.14%	65.46%

Source: Census of India, 2011

2.6 POVERTY IN INDIA

Poverty is a social phenomenon in which a part of the society does not get sufficient resources to fulfill even its basic needs. Although poverty exists in developed countries of the world also but in case of underdeveloped and developing economies the problem is more severe. Different authorities have defined the term poverty differently. According to 'Task Force on Minimum Needs and Effective Consumption Demand' poverty is defined in terms of per capita intake of calories. According to this task force a person who fails to get 2400 calories in urban areas and 2100 calories in rural areas is put below poverty line. As per planning commission of India, a person who earns an income of Rs. 28.65 in urban areas and Rs. 22.42 in rural areas is not poor. According to planning commission of India definition, number of people living below poverty line during 2009-10 was 34.47 crore which was 29.8 % of total population.

It's not only 'high proportion of population living below poverty line' which is a cause of concern, but there are some critical dimensions attached to it. One of the most astonishing revelations is that poverty has actually gone up in the north-eastern states of Assam, Meghalaya, Manipur, Mizoram and Nagaland.

Even big states like Bihar, Chhattisgarh and Uttar Pradesh could register only a marginal decline in poverty ratio, particularly in the rural areas. States such as Himachal Pradesh, Madhya Pradesh, Maharashtra, Orissa, Sikkim, Tamil Nadu, Karnataka and Uttarakhand registered a decline of 10 per cent in poverty over the past years.

States like Bihar with a poverty rate of 53.5 per cent, Chhattisgarh 48.7 per cent, Manipur 47.1 per cent, Jharkhand 39.1, Assam 37.9 per cent and Uttar Pradesh 37.7 per cent are the worst hit.

Among social groups in the rural areas, Scheduled Tribes (47.4 per cent) suffer the highest level of poverty, followed by Scheduled Castes (42.3 per cent), Other Backward Castes (31.9 per cent) as against 33.8 per cent for all classes.

In rural Bihar and Chhattisgarh, nearly two-third of the SCs and the STs are poor where as in Manipur, Orissa and Uttar Pradesh more than 50 per cent are below poverty line.

In urban areas, 34.1 per cent of SCs, 30.4 percent of STs and 24.3 per cent of OBCs fall under this category against 20.9 per cent for all classes.

2.7 REGIONAL DISPARITIES

There exists regional dualism in India. There is always danger of some regions developing faster than the other, it poses threat to national integration and seen as a largest socio-political problem. This is called as regional disparity. Difference in the rate of growth of state income as well as per capita income is very wide. On one side there are richer states like Punjab and Maharashtra with per capita income of above Rs. 19,000 at current prices and on the other side there are states like Bihar and Orissa with meager per capita income of Rs. 4700 and Rs. 6800 respectively. Western and southern states like Gujarat, Maharashtra and Andhra Pradesh have more flows of Foreign Direct Investment (FDI) than the other states and they are technologically more advanced states than rest of India. Regional disparities exist in all walks e.g. three industrial advanced states of Maharashtra, Gujarat and Tamil Nadu contribute 44% of industrial output; developed states like Maharashtra and Tamil Nadu have urban population of 39 and 34% respectively while poor states like Assam has urban population of 9% only; Kerala has Infant mortality rate of 12 per thousand live births whereas Orissa has 96 per thousand live births.

2.8 WIDENING GAP BETWEEN THE RICH AND THE POOR

There exists huge and wide gap between rich and poor sections of the society. This is called inequality of income and distribution of wealth. According to experts, upper stratum of 10% people contributes 45% to the national product, whereas lower stratum of 10% people contributes 1.9% to the national product. Even the advantage of 5 year plans go to the richer section of the society with rapid industrialization and agriculture development, large farmers and capitalist have gained more than the small and marginal farmers. Even the benefit of subsidy goes to the large farmers because they have large farms, they can adopt modern technology, whereas 77% of small and medium farmers have only access to the land holding less than 1%. There exists even more widening gap between rich and poor in rural sectors or villages where upper sections of the society have 80% of the total property and lower sections of the society has just a meagre 2%.

2.9 BALANCE OF PAYMENTS DISEQUILIBRIUM

Balance of payment is an account of exports and imports made by a country. There has always been a deficit in balance of payments in case of India. Our share of exports is only 1% in the world trade whereas share of imports has been rising with each successive year. Disequilibrium in balance of payments is the root cause of many problems of our economy. There is a need to enhance exports to make the balance of payments favourable.

2.10 INFLATION

Inflation is the consistent rise in price of product and services. Indian economy has always been suffering from inflation, though at some points of time it has been less critical, but most of the time it has been highly critical. High rate of Inflation not only makes it difficult for the general public to meet their both ends but also put a cap on the rate of economic development of the country. Main causes of Inflation are increase in money supply vis-a-vis output due to technique of deficit financing and Balance of Payment disequilibrium. Recently, Indian economy has faced serious threats from constantly declining value of rupee in terms of dollar. Rise in crude oil prices is another factor which has led to sharp rise in the rate of inflation further.

If we look at the overall level of economic development of our country, India is ranked at number 127 (out of 177 countries) in Human Development Index report released by World bank. Indian Economy is developing economy in which people have backward and low agriculture productivity and low standard of living, weak industry sector, lack of infrastructure adversely affecting growth and social problems like poverty, inequality, corruption, inefficiency, deficiency in production, lack of water, lack of electricity, poor sanitation and hygiene condition etc., basically Indian economy is agrarian economy which is dependent on agriculture still 40% people of the country are dependent on agriculture whereas in countries like America, Canada, England only 3-4% of the work force is employed in agriculture. Agriculture is still dependent on natural factors without proper irrigation facility and indigenous techniques are used in agriculture. Lack of credit facility, poor storage capacity, and inefficient transport system are adversely affecting economic growth.

29 percent people are still living below poverty line, poor medical facilities infrastructure. Although in recent years the role of institutional credit has gone up in India, but rural India still finds it difficult to meet their credit needs from organized financial institutions. Rural India is still dependent on shahukars to meet their credit needs at exorbitant rates of interest.

2.11 SUMMARY

India is suffering from a number of severe economic problems. Planned efforts of more than 60 years have helped India build a strong economic base but it has still a

long way to go. Railways are overcrowded; safety is not upto mark, amenities for the passengers both within the train and on platforms haunts the public. Aviation industry is into doldrums e.g. Air India and Kingfisher are struggling for survival. Road transport is suffering because of lack of planning in road development. Narrow roads, inefficient traffic management leads to frequent traffic jams. Average speed of vehicles on national highways in India is around 30-40 Kilometers per hour. Besides these the problem of galloping Inflation, high rate of unemployment, poverty, widening gap between rich and poor, poor industrial base, lack of basic amenities etc. are the major hurdles in the economic development of the country.

India needs a strong political consensus to overcome all the above stated problems.

2.12 GLOSSARY

- **Infrastructure:** It refers to the basic physical and organizational structures and facilities necessary for the operation of a society or enterprise.
- **Unemployment:** It refers to people who are able and willing to work but are without employment.
- **Poverty:** It is a social phenomenon in which some people in the society do not have enough resources to meet their basic needs.
- **Balance of Payments:** It is a record of imports and exports made by a country.
- **Inflation:** A persistent increase in the price of goods and services.

2.13 CHECK YOUR PROGRESS

(A) Fill in the Blanks :

- (i) Indian railways run.....trains in a day.
- (ii) Indian government desired to achieve the target of availability of units of per capita electricity by year 2012.
- (iii) Only.....percent of roads in India are two lane.
- (iv) Air traffic in India is registering on an average growth rate ofover the last seven years.
- (v) Road transport in India accounts forhighest fatality rate in the world.

(B) State whether the following statements are true or false :

- (i) The Indian Railways is Second largest in the world railway network.
- (ii) Power back up in the industries through generators is a necessity.
- (iii) Public Private Partnership (PPP) is the only way to develop infrastructure in India.
- (iv) 29% people in India live below poverty line.
- (v) As per census 2011, literacy rate in India is 74.04%.
- (vi) As per labour bureau survey the total number of unemployed youths at the end of year 2010 was 60 million.
- (vii) Percentage of people living below poverty line in Bihar is 67%

2.14 ANSWER TO CHECK YOUR PROGRESS

- (i) 11,000 (ii) 1000 (iii) 53 (iv) 18.5% (v) 8th
(i) False (ii) True (iii) False (iv) True (v) True (vi) False (vii) False

2.15 TERMINAL QUESTIONS

- (i) Critically evaluate the status of infrastructure in India.
(ii) “Poverty and low literacy rate is the root cause of all the problems in India”.
Give your comments.
(iii) Write an essay on the various basic problems faced by the Indian society.
(iv) What do you understand by regional imbalance. Discuss its causes and suggest
measures to eradicate it.

2.16 SUGGESTED READINGS

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UNIT 3 - METHODOLOGY OF ECONOMICS

Structure

- 3.1 Introduction**
- 3.2 Concept of Methodology Of Economics**
- 3.3 Nature of Economic Theory**
- 3.4 Basis of Economic Theory**
 - 3.4.1 Deductive Method**
 - 3.4.2 Inductive Method**
- 3.5 Concept of Equilibrium**
- 3.6 Model Building in Economics**
- 3.7 Concepts of Static, Comparative static and Dynamic Relationship**
- 3.8 Micro and Macro Approaches**
- 3.9 Summary**
- 3.10 Glossary**
- 3.11 Check Your Progress**
- 3.12 Answers to Check Your Progress**
- 3.13 Terminal Questions**
- 3.14 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to understand;

- Concept of methodology of economics
- Nature of economic theory
- Derivations of economic theory
- Concept of equilibrium
- Model Building in Economics

- Economic statics and dynamics
- Micro and Macro approaches

3.1 INTRODUCTION

Economics is a science which derives hypothesis, principles, laws and theories, generalizations which explain the behavior of the contents it studies. Certain methodology has to be adopted for deriving these generalizations and theories. Economists use both inductive and deductive methods of reasoning, depending upon the approach they are using, micro or macro. The tools of econometrics are widely gaining importance these days. The role of value judgments in economic analysis to draw the connection between positive and normative economics cannot be negated. The micro approach is basically called as problem study of economics as it focuses on the problems of scarcity, choice and price determination, whereas macroeconomics is called as method approach, it is concerned with the solution of the problems of the economy rather than with just identification of the problem. In this unit, we will cover the study of the methodology of economics, nature of scientific theory, basis of theory, derivations of economic theory, concept of equilibrium, model building in economics, economic's static, dynamic, micro and macro approaches, their significance and comparison.

3.2 CONCEPT OF METHODOLOGY OF ECONOMICS

You are aware that business economics applies economic theory and methodology to make business decisions. Quite like other sciences, Economics too has derived laws and theories. However, while in case of physical sciences like Physics, and chemistry, a scientist carries out experiments in limited periphery of a laboratory and results are fairly accurate, the subject matter of Economics is the study of human behavior which is fairly unpredictable and uncertain. For deriving laws and theories it has to adopt a certain methodology. These laws and theories describe explain and examine functional relationship between different variables relating to consumption, production, exchange, distribution of national income and employment.

The methodology of economics involves construction of an economic theory. Economic theory must be so stated as to be confirmed or contradicted of relevant facts at some time in future. Falsifiability it must be realistic and must contain explanatory power, fewer assumptions based on reality, logical positivism must be applied. Occam, an eminent philosopher of science of Europe gave the principle of Occam's Razor stated that if the true theories gave us the same results then the theory with lesser assumptions should be preferred. Once a theory is formed it must be verified. After framing the theory you have to proceed in arriving economic principles, for this two general methods can be employed i.e. Theoretical or Deductive Method and second is Empirical or Inductive Method. In

first method conclusions are reached by building logically right theoretical models and in second approach real world data are used to help arrive at conclusion.

The next step in methodology of economics is concerned with framing the economic model. A model is a theoretical construction which attempts to analyze and explain a phenomenon. In other words, economic models are simplification of reality. Generally there are two types of economic models i.e. Simple and complex, and there are two main purposes for which models are built – analysis and prediction. A model must have variables, parameters and must convey some relationship among the variables. To convey the functional relationship use of mathematics is gaining importance these days.

In nutshell, we can say that economic methodology, broadly conceived, is the study of how economics functions, how it could function, and how it should function and of the various presuppositions and conditions of all these.

3.3 NATURE OF ECONOMIC THEORY

Economists are concerned with examining the relationship between various economic factors like wages, employment, growth rate, quantities demanded, supplied and profits etc. Just like scientific theory economic theory provides us with the tools of economic analysis, explaining the cause and effect relationship among the above stated economic variables, explaining economic phenomena, judging the performance of the economy, in predicting economic events and in formulating economic policies. Economic theory and economic policy are closely related terms. Economic theory is an indispensable tool for understanding the policy measures of the government. It helps and guides consumers, producers, traders, workers and administrators and economists to plan rationally. Economic theory entails a clear cut understanding of the economic impact, costs and political feasibility of the programs and policies made by the government. There are many uses of the economic theory; it provides economic tools to economists. Mrs. Joan Robinson characterized economic theory as box of tools. Economic theory helps in judging the performance of various sectors of economy e.g. if the price of petrol is rising, a knowledge of the price mechanism is necessary to judge whether this hike in price is due to shortage of supply, our currency issues, BOP deficits or due to malfunctioning of the government policies.

3.4 BASIS OF ECONOMIC THEORY

The economic theory is based upon certain sets of assumptions, assumptions are taken with a view to simplify the analysis, and the assumptions taken may be related to technology or behavior. From these sets of assumptions, conclusions are arrived at through logical process and reasoning. Process of logical deduction is also called hypothesis. Scientific hypothesis states that the proposition about relationship between facts and variables in a form that is testable, propositions which are capable of being refuted.

Robert Russel and M. Wilkinson have commented that economic theory is concerned with “Deriving the implications of purposive behavior of consumers, producers, and other economic agents from the interactions of the taste and constraints facing them. So, theory brings out three essential elements which are explained below:

1. Economic units or agents seek to achieve certain goals such as maximization of profits
2. Economic units pursue the predetermined goals in a consistent manner
3. There are constraints upon the abilities of the economic units in form of scarcity of resources

These three elements form the basis of economy theory. Economic theory involves generalizations which are statements of general tendency among various elements of economic phenomena. In the view of Robbin’s, economic generalizations are statements of uniformity which describe human behavior in the allocation of scarce resources between alternative ends. Economic theory derives a generalization through a process of logical reasoning and these generalizations can be derived further in two ways, first is deductive method and second is inductive method.

3.4.1 Deductive Method

It is also called analytical, abstract and priori method. It represents an abstract approach to the derivation of economic generalizations and theories. The main steps in the process of arriving at economic generalizations through deductive method are as follows:

1. Identification of the Problem
2. drawing the assumptions
3. constructing hypotheses
4. verifying the hypotheses
5. drawing conclusion

This approach was widely used in economics by classical, neo-classicals such as Ricardo, Malthus, Marx, Pigou and Marshall. With the assistance of mathematical logic, economic theorems can be derived without the detailed collection of analysis and data. It consumes less time and low-cost method. It introduces accuracy, objectivity and has scientific character.

3.4.2 Inductive Method

It is also called empirical method which derives economic generalizations on the basis of experience and observations. Three principles form the basis of inductive method viz.:

1. Experimentation
2. Observation
3. Use of Statistical or econometric methods

In inductive method actual data are collected with regard to certain economic phenomena. Then data are observed, analyzed and finally conclusions are drawn. It is based on scientific procedure, more realistic approach and has practical orientation.

Integration of Two Methods

Modern view point is that both approaches are needed for the proper development of scientific theories. Rather they are complementary in nature and are not competitive. In the recent years economists first derived economic hypothesis through the deductive method and then empirically test them through econometric or statistical methods. Marshall has very correctly pointed out that induction and deduction both are needed for completing the concept of economic theory as the right and left both feet are needed for walking.

Another basis of economic theory is setting up of assumptions. So, proper assumptions need to be framed. Professor Friedman designated three different roles of assumptions:

1. They are economical mode of presenting a theory.
2. They facilitate an indirect test of hypothesis.
3. They are convenient means of specifying the conditions.

Assumptions are basically the restrictions or set of conditions on the basis of which a theory is meant to hold. They are four main criteria for choosing the assumptions:

1. They should have the explanatory powers.
2. They should be based on reality.
3. Number of assumptions should be as less as possible.
4. Falsifiability criteria should be adopted while forming assumptions.

3.5 CONCEPT OF EQUILIBRIUM

Concept of equilibrium has an important place in the methodology of economics and is used in almost every theory of economics. It is basically used in the problems related to price and growth. Equilibrium represents a state of balance and a state of rest. It is the system in which there is no change and it is called as stationary state. An economic system can be said to be in equilibrium when the important variables show no change, there are no forces which will cause any change in important variables, and hence a firm will be equilibrium when it has no tendency to change its output. Equilibrium is assumed to be the best position which economic system attains. In economics we use the term equilibrium to mean that state in which there is no tendency on the part of the consumer, firm, an industry or the economy to make any adjustment.

Equilibrium can be divided into two categories:

1. Particular or partial equilibrium
2. General Equilibrium

1. Particular or partial equilibrium

In this approach we focus our attention on individual units and it is widely used in micro economic analysis. This type of analysis takes into account few numbers of variables for intensive study. In this method we assume economic process is undisturbed by external influences, in this approach we are concerned with the variables we are studying and assume the ceteris paribus conditions for the rest of the variables. e.g. As per law of demand, demand is a function of price while other things are held constant.

$$D = f(P, \{Y, P_r, T, W, \dots\})$$

Dr. Erich Schneider pointed out “The surrounding world is regarded as fixed or frozen over the period for which it is studied.” It is also called ‘other things given approach’.

2. General Equilibrium

There is a second approach called total or general analysis. In this approach interrelationship among various variables is studied simultaneously. It deals with the interdependence between equilibrium adjustment of price and quantities of various goods and factors with each other. It is similar to multimarket equilibrium in which all the variables are studied simultaneously and they can have influence on each other. No variable is individualistic and is bound to make impact on the other variables.

So in this general equilibrium approach structure of the whole economy is studied and is widely used in macro economic analysis.

The concept of general equilibrium was put forward by Leon Walras in his book Elements of Pure Economics published in 1874, but the credit for bringing general level theory to practical level goes to Wassily Leontief. It was he who built input and output analysis.

General Equilibrium gives the pragmatic assertion of faith that prices and output in the economy can be determined simultaneously but in general equilibrium model to hold true number of equations should be equal to number of variables.

Concept of Stable and Unstable Equilibrium

Equilibrium in a market is stable if a displacement from the equilibrium brings into operation market forces which bring the market back into equilibrium. This can be shown with the help of figure 3.1.

In figure 3.1 DD is the demand curve with negative slope. SS is the supply curve with positive slope. The equilibrium quantity is OM and price is OP. Market is in stable equilibrium here because at the prices above the equilibrium price, quantity supplied will be more than the quantity demanded as in case of price OP1, this surplus in quantity in the market will bring the price down to the equilibrium price OP. If the price falls below the equilibrium price, the quantity demanded will be more than quantity supplied as shown at price OP2 as a result with a shortage of commodity, price will again rise to equilibrium price OP. Hence in the stable equilibrium approach there is an automatic adjustment of economic forces to reach at the equilibrium level.

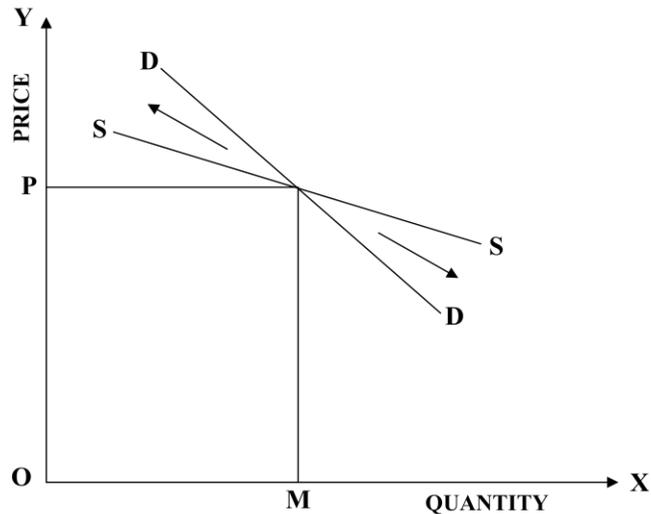


Figure 3.2 : Unstable Market Equilibrium

Unstable Equilibrium

Unstable equilibrium occurs when the supply curve has lesser slope than the market demand curve for the commodity and in this displacement from equilibrium brings the market forces into operation which takes the market further away from the equilibrium. This can be shown with the help of figure 3.2 given further:

You can see in the figure 3.2 that there is a shortage of the commodity at prices higher than OP which means supply is less than demand. This shortage causes the price to rise even further i.e. away from equilibrium. In this case both the demand curve and supply curve are falling downward and demand curve is steeper than the supply curve. So equilibrium cannot be attained in the market.

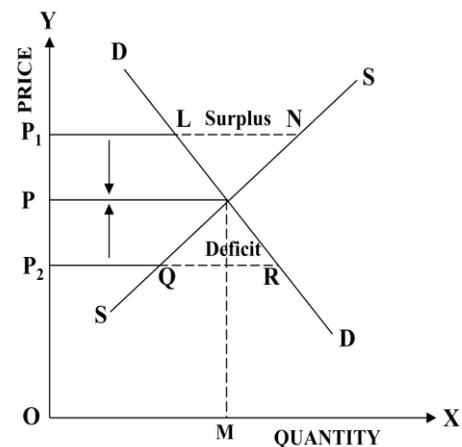


Figure 3.1 : Stable Market Equilibrium

3.6 MODEL BUILDING IN ECONOMICS

A model is a simplified representation of a real situation. An economic model consists of a set of equation that expresses the relationship between the variable under the investigation. Model shows the mutual relationship among the variables. It is also called abstraction from reality. Economic models are built for the purpose of analysis and

prediction. Analysis here means the adequacy by which we can explain the behavior of an economic agent and prediction means the ability of model to forecast the effect of changes in variables in the overall economy. The model is considered as a good model if it has both validity and predictive power. According to Milton Friedman the most significant characteristic of a model is its predictive power. Features of a good model contain the realism of assumptions and its capability of explaining the relationship among the variables. So we can say that economic models represent interrelationship among variables. Models are used in both micro and macro approaches.

(a) Micro Model of Price Determination

Micro model expresses the relationship through demand and supply and how these forces determine the price and it is given by well known economist Alfred Marshall. He has used the following equation in his model :

$$Q_d = a - bp \quad (i)$$

$$Q_s = x + b'p \quad (ii)$$

$$Q_d = Q_s \quad (iii)$$

Q_d here refers to quantity demanded, Q_s refers to quantity supplied, p represents price of the commodity, a, b, x and b' are constants or parameters.

Therefore these equations constitute a model. In this model, two variables price and quantity demanded have been considered. The aim behind this model is to determine the price and equilibrium quantity. Mathematical solution can also be provided for the given model if the numeric figures are available as the demand and supply functions of the commodity are given below:

$$Q_d = 65 - 20p \quad (iv)$$

$$Q_s = -5 + 15p \quad (v)$$

Since for equilibrium price quantity demanded is equal to quantity supplied, we can write the above equations as :

$$Q_d = Q_s$$

$$65 - 20p = -5 + 15p$$

$$-35p = -70$$

$$P = 70/35 = 2$$

Micro economic model can also be explained with the help of figure 3.3 given below:

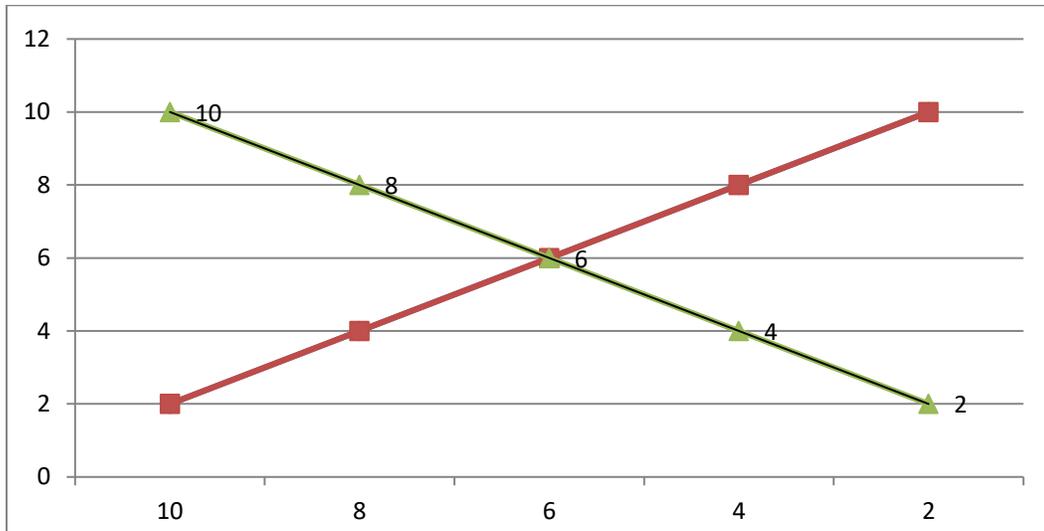


Fig. 3.3: Micro Economic model

In the figure 3.3 given above if the price of the commodity is below equilibrium price which is Rs. 6 i.e. Rs. 4 as seen from the figure, this will imply shortage of quantity of commodity supplied. Producers would want to sell more units of commodity and consumers would increase their demand but the desired quantity is not available. Therefore it will raise the price back to equilibrium price and vice versa.

(b) Macro Economic Model

Macro economic model was propounded by JM Keynes to explain the determination of equilibrium level of national income. In the Keynesian model national income is determined by the level of aggregate demand. Four basic equations put forward by Keynes are given below:

$$\begin{aligned}
 E &= C+I && \text{(i)} \\
 C &= a + bY && \text{(ii)} \\
 I &= I' && \text{(iii)} \\
 Y &= E && \text{(iv)}
 \end{aligned}$$

Here E represents Aggregate demand and has two components i.e. C (consumption) and I (investment). Y stands for national income, I' is constant it implies investment is given, a and b are constants and b represents marginal propensity to consume.

Mathematical Framework of the Model

$$\begin{aligned}
 Y &= C + I \\
 C &= 40 + .50Y \\
 I &= 30 \\
 \text{Hence } Y &= 40 + 0.50Y + 30 \\
 0.50 Y &= 70 \\
 Y &= 70/0.50 = 140
 \end{aligned}$$

Graphical Representation of Model

Use of Variables in Economic Model

There are two types of variables used in economic model, endogenous and exogenous. The endogenous variables are those variables in which value of one depends upon the value of the other variable i.e. these variables are determined within the system. Exogenous variables are those variables whose values are not dependent on the other variables within the model. Values of these variables are determined outside the system.

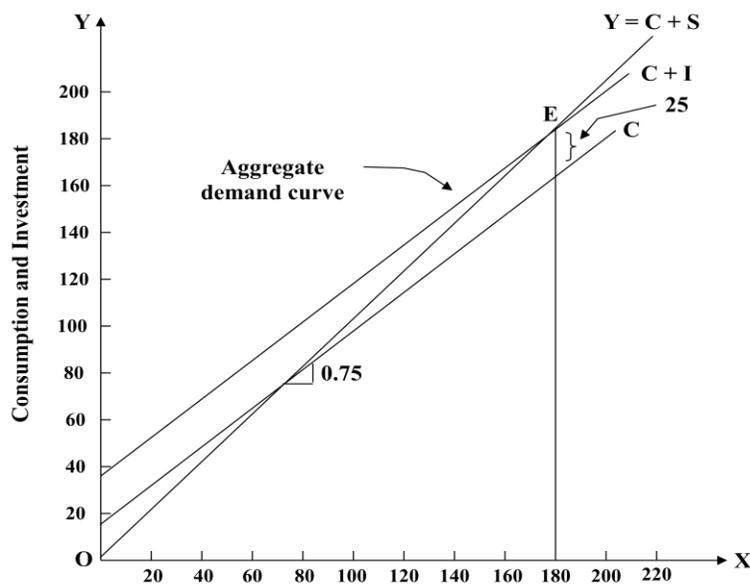


Figure 3.4 : Keynesian Macro-Model of Determination of Nation Income

3.7 CONCEPTS OF STATIC, COMPARATIVE STATIC AND DYNAMIC RELATIONSHIP

(a) Static Relationship

The concept economic static is important part of economic theory. It represents the sorts of phenomenon which is stationary, an economic variable is said to be stationery if its value does not change overtime. The concept of static analysis is used in micro economics and the functional relationship of the two variables is established whose values relates to the same point of time. A static state of economy does not mean lack of movement in the economy. Static state of economy is one where there is movement, but it is constant, regular, smooth and certain. Such an economy is devoid of all sudden jerks and shocks, In static economy, uncertainty is assumed away, with constancy of all quantitative measurements and all quantitative factors like technology and taste, the economy continues to churn over. Classicals have used the concept of static analysis to explain the price determination, distribution of the rewards of the factors of production etc. Static market equilibrium situation is explained by the sage law of market where supply creates its own demand and both demand and supply will be identical keeping other things equal.

(b) Comparative Statics

Comparative static analysis compares one equilibrium position with another. In comparative static analysis equilibrium position corresponding to different data sets is compared. Professor Shinder views it as “The set of data undergoes changes in course of time, and each new set of data has a new equilibrium position corresponding to it. It is therefore of great interest to compare the different equilibrium positions corresponding to different sets of data. Keynesian analysis given in a general theory is generally based on comparative statics and is concerned with a sequence of equilibrium positions where the system jumps from one position to another. According to Hansen comparative statics is leaps over the time involved in the transition to the successive positions of the equilibrium. The concept of comparative static is very useful technique for explaining the changing phenomenon without complicating the whole analysis. Comparative statics shows the determination of equilibrium values of given variables under postulated conditions with various data specified. In simple language we can say comparative static technique is used when one equilibrium position is compared with other equilibrium position. Comparative Static is explained below with the help of a figure 3.6 below:

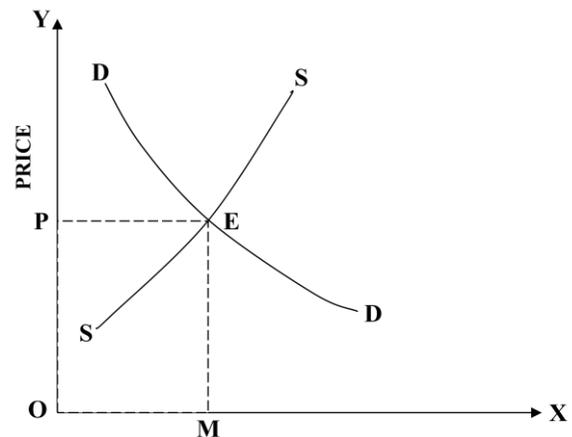


Figure 3.5 : Micro-Static Equilibrium

In the above figure 3.6 demand and supply function are given and the movement of demand from DD curve to D'D' curve i.e. from left to right shows that with increase in demand there will be corresponding shift in equilibrium position as well as the supply remains the same as shown in the figure. New equilibrium will be established at E₂ level and corresponding rise in price will be the result and this is the new equilibrium price. In comparative static analysis we are interested in comparing the new equilibrium position E₂ with the old equilibrium position E₁, not with the whole path, how it has travelled from E₁ to E₂. We are just bothered about the final position E₁ and E₂.

(c) Dynamic Economic analysis

Economic dynamics considers the relationship between certain variables whose values belong to the different points of time or different periods of time. It is the study of dynamic relations. Prof. Ragnar Frisch has originally developed the technique of dynamic analysis and defined it as "A system is dynamical if its behavior overtime is determined by the functional equations in which variables at different points of time are involved in an essential way." Dynamic analysis involves the role of time lags, it is concerned with how a path trends from one equilibrium position to another, it is concerned with the journey rather than the final destination. Dynamic system is self sustained and self contained. Dynamic analysis traces out the whole path through which the system passes overtime to reach new equilibrium position. Economic dynamics gives importance to the element of time, it studies the lagged relation among the variables it deals with elements of uncertainty, it also studies economic phenomenon in relation to preceding events. It analysis the process of adjustment or the path of equilibrium or disequilibrium in the economy. The concept of dynamic equilibrium can be shown in the diagram. Dynamic equilibrium is used in macro- economic models.

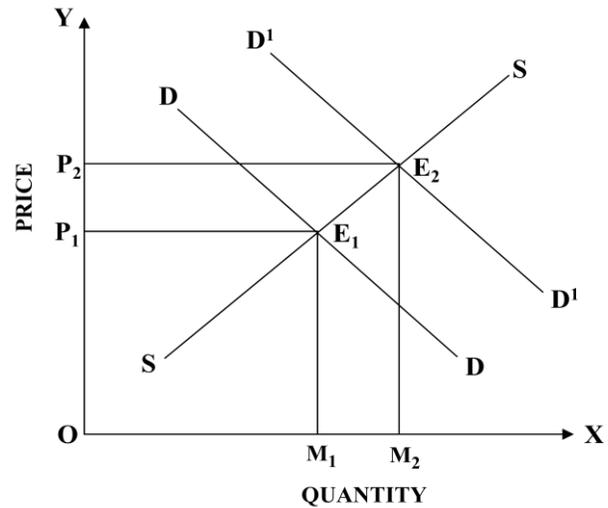


Figure 3.6 : Keynesian Model of Macro-Static Equilibrium

In the figure 3.7 aggregate demand is given and represented by $C+I$, level of national income is determined in time 't'. As a result of increase in investment the aggregate demand curve shifts upward and the new equilibrium position will be reached and income will rise from OY_0 to OY_1 due to increase in investment in time period 't'. The income will rise in time period $t+1$ and this increase in income will push the consumption demand also, output will have to be increased as a result income will further rise in period $t+2$ and finally new equilibrium will be established at OY_1 . Dynamic analysis has shown the path how new equilibrium has been achieved and how much time it takes to establish a new equilibrium.

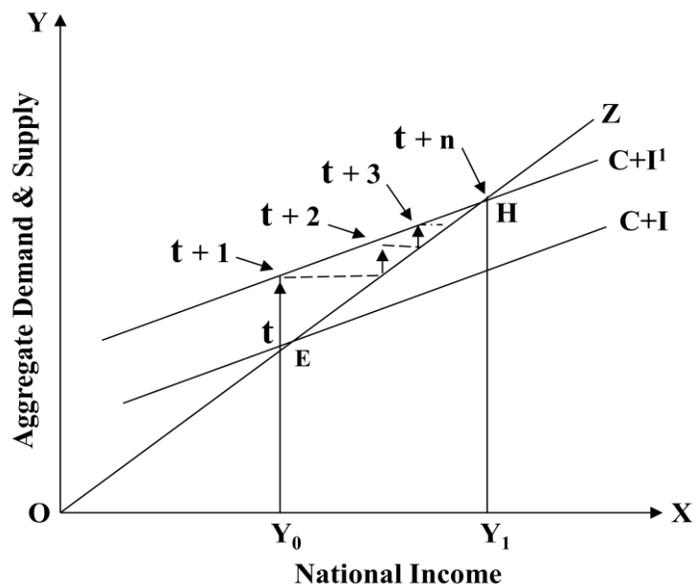


Figure 3.7 : Macro-Dynamic Equilibrium

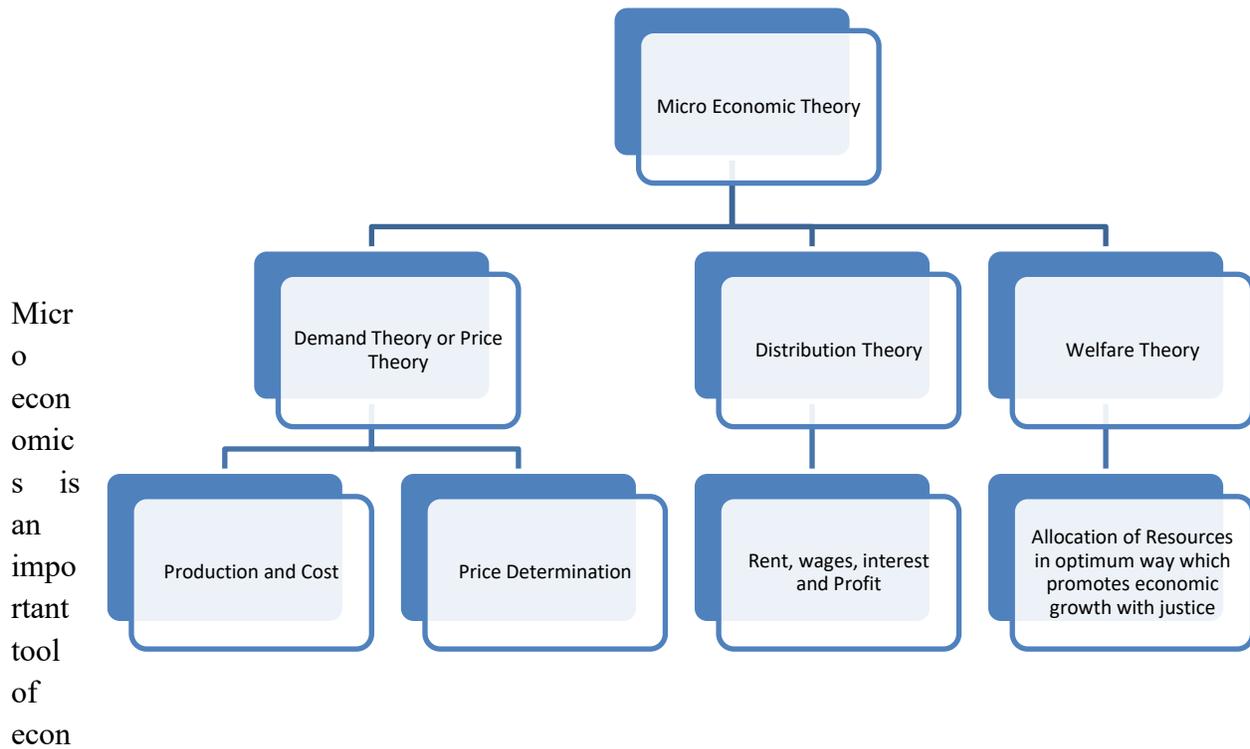
3.8 MICRO AND MACRO APPROACHES

Methodology of economics follows the methods of analysis. To solve the various problems in the economy there are two major approaches Micro and Macro.

Micro and Macro terms were first coined and used by Ragnar Frisch. Micro economics is derived from the Greek word Mikros meaning small and the term Macro economics is derived from the Greek word Makros meaning large. Micro economics deals with the study of a particular firm, small individual units of the economy such as individual firms, farmers, consumers, individual households etc.

(a) Scope of Micro Economics

Microeconomic theory studies the theory of demand, production, factor pricing, optimum resource allocation and theory of welfare.

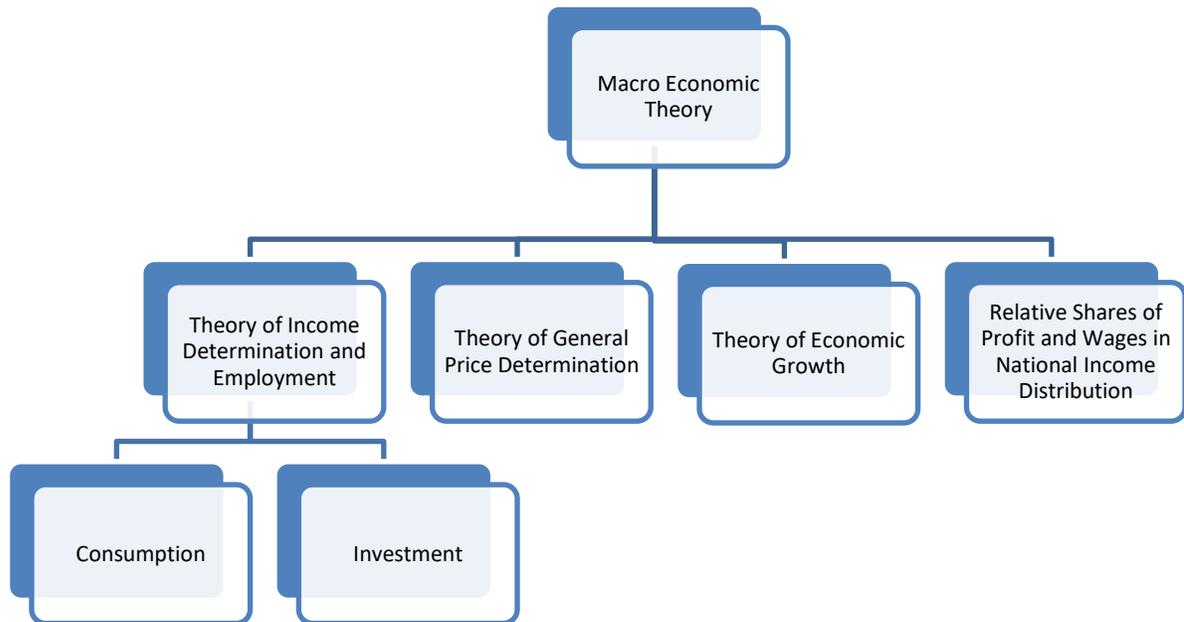


omics as it is helpful in understanding the operation of the economy, to determine the product and factor prices. It promotes economic welfare, it is helpful in formulation of economic policies, it studies the problems faced by individual units like Individual firms etc. It is helpful in making prediction about the future. Micro economics is generally known as static approach based on long run analysis, uses the partial equilibrium method for deriving the conclusion. Hence these are the limitations of micro economics. It studies the prospective from individual's point of view which sometimes give drastic results when applied to the economy as a whole e.g. saving is a virtue for an individual but if the whole economy saves it is detrimental.

(b) Macro Economics

Macro economics is called as aggregative approach. It studies the economy as a whole. According to Prof. Boulding, "Macroeconomics deals not with individual quantities as such but with aggregate of these quantities, not with individual income but with the national income, not with the individual prices but with national prices, not with individual output but with national output."

Scope of Macro Economics



Macroeconomics is also called as Keynesian revolution in which national income and employment are determined, it studies the general level of prices, it is concerned with inflationary and deflationary state in the economy, it is also called as theory of economic growth and it also analyses the relative shares of wages and profits in national income. Macro economics is a systematized and comprehensive body of thought. It highlights the importance of investment, underlines the crucial role of state intervention and studies the economy in aggregative way. It studies the interrelationship among different sectors of the economy. It is very useful tool in economic planning, it facilitates international comparison, and is helpful in understanding macro- economic paradoxes. In this concept Kurihara has aptly remarked, “There is much practical advantage in seeing through all the complex interrelationships of the economy as a whole and in concentrating on large aggregates which affects the whole economy.

Distinction between Micro and Macro Approaches

Micro economics a study of particular economic unit like consumer, a firm, particular price etc. whereas macro economics is a study of aggregate or whole. These two approaches can be differentiated on the following grounds:

Macroeconomics and Microeconomics compared

Basis	Macro Economics	Micro Economics
Unit of analysis	Large	Small
Assumptions	Based only on existing resources	Full employment, perfect competition, absence of state intervention or free working of price mechanism
Objective of Analysis	Principles, Problems and Policies relating to full employment of resources and expansion of the whole economy	Optimum allocation of resources with aim of maximum satisfaction, profit maximization
Instruments	Level of Income, aggregate production, investment and consumption (all regulated by income)	Particular firm, factor, industry (all regulated by price)
Approach	General Equilibrium approach	Partial Equilibrium Approach
Equilibrium or Disequilibrium	Analysis the state of disequilibrium	Assumes the position of equilibrium in the economy
Changes	Variables don't change or change will be slow and gradual	Variables change quickly

Integration of Micro and Macro Economics

For the clear understanding of the working of the economy there must be a large variety of multiple purpose tools and instruments. There needs to a synthesis of both micro and macro approaches as Samuelson observes “there is really no opposition between micro and macro approaches. Both are absolutely vital. Even less than half educated if you understand the one while being ignorant of the other. The economic system must be analyzed as an aggregate which is constituted of small myriad units. Both the approaches in reality are complementary to each other. Theories regarding the behavior of some macro- economic aggregates are derived from theory of individual behavior and hence, these approaches are actually interdependent. Here as Prof. Ackley has put it, “The relationship between macro economics and the theory of individual behavior is a two way street. On the one hand micro economic theory should provide the building blocks of our aggregate theories. But macro economics may also contribute to micro economic understanding. If we discover e.g. empirically stable macro-economic generalizations which appear inconsistent with micro economic theory, or which relate to aspects of behavior which micro economics has neglected, macro economics may permit us to improve our understanding of individual behavior”.

3.9 SUMMARY

Methodology of economics is very important. It derives laws, theories, principles, hypotheses which explain the behavior of phenomena it attempts to analyze. Methodology of economics involves kinds of methods to be adopted like deductive and inductive methods of reasoning. Very important in methodology of economics is to analyse and interpret the situation. The techniques employed for the analysis are static, comparative statics or dynamics. After analysis interpretation becomes very important and keeping in view the interpretation part, economic models have been used. The methodology of economic first starts with construction of economic theory which involves framing of hypotheses, setting up assumptions, then analysis of theory, while the second phase of methodology is concerned with the applied aspect of theory which is concerned with use of variables, parameters, methods, models, statistics to frame the economic policies and predicting the future events.

3.10 GLOSSARY

- **Microeconomics:** It is concerned with the study of a particular firm. Small individual units of the economy such as individual firms, farmers, consumers, individual households, and so on.
- **Macroeconomics:** Macroeconomics does not deal with individual quantities but studies the totality of these quantities through national income instead of income, national price instead of individual price, national income instead of individual product.

3.11 CHECK YOUR PROGRESS

(A) Fill in the blanks:

- (i) Once a theory is formed it must be
- (ii) Partial equilibrium approach assumes.....conditions.
- (iii) General Equilibrium analysis is used ineconomics.
- (iv) Are the two basic problems of an economic method.
- (v) Static state has so constant

(B) State whether the following statements are true or false :

- (i) Assumptions usually complicate analysis.
- (ii) Deductive method is also called analytical and abstract method.
- (iii) Inductive method is based on experiences and observations.
- (iv) General equilibrium looks like multimarket equilibrium.
- (v) The concept of equilibrium means a state of balance.
- (vi) Endogenous variables are determined outside the system.
- (vii) Micro economics deals with the economy as a whole.
- (viii) Economic models are built for purposes of analysis and prediction.

3.12 ANSWERS TO CHECK YOUR PROGRESS

- (A)** (i) verified (ii) ceteris paribus (iii) macro (iv) analysis and prediction
(v) movement

(B) (i) True (ii) True (iii) False (iv) False (v) True (vi) False (vii) True

3.13 TERMINAL QUESTIONS

1. What is equilibrium? Explain the concept of stable and unstable approaches of equilibrium.
 2. What is scientific theory? Explain the steps involved in the construction of scientific theory.
 3. Discuss the nature of economic models with relevance to micro and macroeconomics.
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3.14 SUGGESTED READINGS

Deein J., Managerial Economics, Prentice Hall, Englewood Cliffs, N. J.

Jhingan, M. L. Advanced Economic Theory, Vrinda Publications (P) Ltd., New Delhi.

Dr. D.M. Mithani, Managerial Economics- Theory and Applications : Himalaya Publishing House.

Mehta, P. L., Managerial Economics – Analysis, Problem and Cases, Sultan Chand & Sons, New Delhi.

UNIT 4- LAWS OF DEMAND AND SUPPLY

Structure

- 4.1 Introduction
- 4.2 Law of Demand
- 4.3 Reasons for the Shape and Form of Demand Curve
- 4.4 Exceptions to the Law of Demand
- 4.5 Concept of Supply
- 4.6 Summary
- 4.7 Glossary
- 4.8 Check Your Progress
- 4.9 Answers to Check Your Progress
- 4.10 Terminal Questions
- 4.11 Suggested Readings

OBJECTIVES

After studying this unit, you should be able to understand:

- The meaning of demand and supply
- The law of demand
- Factors affecting demand
- Exceptions to the law of demand
- Types of Demand
- The law of supply
- Importance of Law of Demand

4.1 INTRODUCTION

Laws of demand and supply are the fundamental laws of economics. They provide basis to the economic theory. Law of demand deals with the relationship between demand and price and states that there is inverse and functional relationship between demand and price. Law of supply is the law which deals with the relationship between supply and price and states that there is direct relationship between supply and price. To hold these laws true certain conditions must be fulfilled as consumer should be rational and all the variables which affect demand and supply other than price should be held constant. In this unit, the

laws of demand and supply, factors affecting demand and supply and other concepts related to these laws have been explained.

Concept of Demand

The term "demand" may be described as the desire for a commodity, ability to pay for it and to acquire it at a particular point of time. The demand for a good at a given price is the quantity of it that can be bought per unit of time at a prevalent price. Hence only desire or want cannot become demand unless it is accompanied by ability i.e. possessions of sufficient money and willingness to buy a certain commodity at a certain point of time and at a certain price. Although there is a large number of factors that determine demand, the most effective of these are – (i) Price of the commodity, (ii) Price of the related goods, (iii) Income of the buyer, (iv) Taste of the consumer and (v) Buyer's expectations about the future. These may symbolically be expressed in the following forms. Assume that you have to consider the demand for commodity x, then it can be expressed as D_x . Now D_x i.e. demand for x can be explained as :

$$D_x = f(P_x, P_o, Y, T \text{ and } E)$$

Where P_x stands for Price of commodity x

P_o stands for Price of other (related) commodities which include substitute and complementary goods.

Y stands for income of the buyer

T stands for taste (also fashion) of the consumer and

E stands for expectations about the future.

These features reveal that first of all there is the emergence of desire in the consumer's mind to buy a particular product. Further for the demand cycle to complete, customer should have the willingness and ability to pay for the product and finally purchases the product for a price.

Determinants of Demand

1. Price of the Commodity

Barring a few exceptions there is inverse relationship between the price of the product and its demand, which means that higher the price of a product, lesser will be its quantity demanded, and vice versa.

2. Prices of Related Goods

The related goods may be substitutes or complementary. The prices of related goods also affect the demand for a good. In case of substitute goods the demand of one product will go up if the price of its substitute goes up and vice-versa. For example DTH and cable TV

are substitutes of each other, if charges under DTH increase then demand of cable TV connections will increase. Likewise in case of complementary goods, if the price of one product goes up then the demand of its complementary product will go down and vice-versa. For example the recent hike in price of petrol has led to decrease in the demand of petrol operated cars.

3. Income of the buyer and its distribution

Another important factor that affects the demand of the goods is the level of income of the buyers and the distribution of income in the economy. Generally demand of most of the products are positively associated with the level of income of the consumers. In simple words we can say that in respect of most of the commodities the rule 'higher the income, higher will be the level of demand' will apply. Further, the way income is distributed amongst the residents of a nation is another determinant affecting demand.

4. Tastes of the buyer

This is again a significant factor affecting the demand of the product. People buy only those products which meet their preferences and are according to their liking. Customers may not buy a product even at low price if it is not according to their taste. Companies have to take special care of the tastes and preferences of the customers even though it is a subjective factor. Further, tastes and preferences of the customers keep on changing with the passage of time and affect the demand of the product. On the other hand, the goods which are according to the tastes of the buyer commands high demand in the economy even if they are priced very high.

5. Expectations about the future

Expectations of the consumer about the future prices also affects the existing size of demand significantly. If, for example, the consumer expects a rise in the price of a commodity in future, he may buy a large quantity of it in the present, but, if he expects a decline in its price, he may defer some of his purchases for future.

Besides these, there are many other factors which influence demand to some extent. These include the government policy, wealth of the buyer, size and composition of population, advertisement and distribution of national income etc.

Of all the variables mentioned, earlier, price of happens to be the most potent factor affecting demand therefore, the rest of the variables (P_o , y , T and E) are assumed to be constant or unchanged. Hence, with this assumption, the demand function may be expressed as under:

$D_X = f (P_X) < 0$, ceteris paribus (other factors remaining the same). It shows that demand for and price of a commodity are inversely related.

4.2 LAW OF DEMAND

Law of demand explains the relationship between the price of the product and its demand. According to law of demand, “other things remaining same, there is inverse relationship between the price of the product and demand of the product”.

Therefore, in simple words law of demand states that in case the price of the product goes up its demand will go down and vice-versa. Law of demand only states the type of relationship that exists between demand and supply. It does not quantify the relationship. In layman’s language it states that fall in price will increase demand and increase in price will reduce demand but it does not mean that demand will change in proportion to change in price. The term ‘other things remaining constant’ used in the definition is the basic assumption of this law which means that this law is applicable when other things like taste of consumers, income level of buyers, and all other factors other than price are assumed to be constant.

Demand Schedule

Demand schedule refers to the schedule of hypothetical prices and the quantities of a commodity demanded by a particular buyer corresponding to these prices. In simple words we can say demand schedule is a schedule wherein different quantities that a consumer would be ready to buy of a particular product are disclosed. A hypothetical demand schedule of a buyer of oranges is shown below:

Table 1: Demand of a Consumer for Oranges

Price of orange per unit (in rupees)	Quantity demanded of oranges (in dozens)
10	3
8	5
6	6
4	8

A rational consumer normally responds to the changes in the price of the product by increasing or decreasing his demand. The demand schedule is the schedule of quantity of oranges demanded by a rational consumer at different prices. The demand schedule shows that as the price of oranges is rising the quantity of oranges demand by the consumer is decreasing. When the price is Rs. 4 per orange consumer demanded 8 oranges, when the price rose a little to Rs. 6 quantity demanded decreased to 6 oranges, with further rise in price to Rs. 8 per orange, demand fell to 5 oranges. At a price of Rs. 10 per orange quantity demanded is 3 oranges only.

Demand Function and Demand Curve

The law of demand shows the relationship between demand for a commodity (dependent variable) and its determinants (independent variables), also known as demand function. You have already gone through the concept which is expressed as $D_X = f(P_X)$. Since D_X and P_X are inversely related, the slope of the demand curve is generally negative. This can also be expressed as follows.

$$D_X = a - bP_X$$

Demand curve would be linear when its slope ($\Delta P/\Delta D$) remains constant at every point of the curve. Now, in the aforesaid equation (i.e. $D_X = a - bP_X$), a is an intercept or constant which shows demand at the zero price, and b which shows the slope $\Delta P/\Delta D$ also assumed to remain constant. This may be observed from the diagram given below.

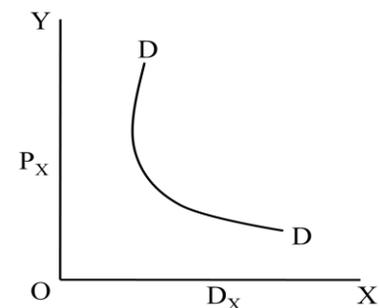


Figure 4.2

As you see, the demand curve is linear and its slope is declining from left to right. Given the demand function, if the values of a and b are known, D_X can be found out in reference with a given price. Similarly, P_X for D_X can also be calculated. This may be explained more clearly with the help of the following example:

Suppose $X = 50 - 2P$ and price per unit is Rs. 5/-

Then $X = 50 - (2 \times 5)$

$= 50 - 10 = 40$ commodities

A curve will be non-linear when its slope ($\Delta P/\Delta D$) keeps varying. In this case demand function can be expressed as $D_X = a/P_X - b$. It would have the shape of a rectangular hyperbola

i.e. $D_x = \frac{a}{D_x + c^{-b}}$ in which $a, b, c > 0$.

Demand curve is the graphical representation of the relationship between price and quantity demanded of the product. As the relationship between demand and price is negative, demand

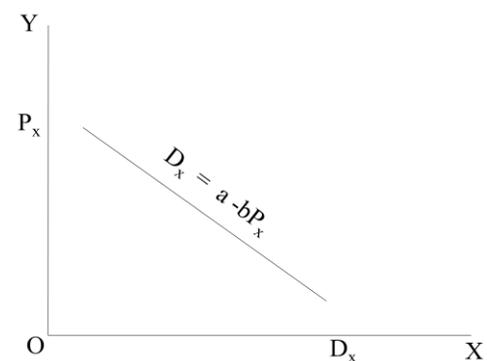


Figure 4.1

curve slopes downward from left to right. If we exhibit quantity of oranges demanded on X-axis and price of oranges on Y-axis and then depict a diagram of the basis of the figures in the table given earlier by joining the line representing different prices with corresponding demand, what we have, is demand curve.

In the figure 4.3, you can see that the demand curve slopes downwards from left to right, showing the inverse relationship between price and quantity as in Figure 4.3. With each successive increase in price quantity demand is decreasing. In the figure when price was OP_3 quantity demanded was OQ_3 . When price rose to OP_2 quantity demanded reduced to OQ_2 and when price rose to OP_1 , the demand was reduced to OQ_1 .

Market Demand, Market Schedule and Market Demand Curve

Market demand is the aggregate demand of the product at different prices in the market. It is the sum of quantity demanded by all the individuals in the market. It is derived by adding the quantities demanded by each consumer for the product in the market at a particular price. The series of quantities demanded by all the consumers for a product in the market at alternative hypothetical prices is known as the Market Demand Schedule. If the data are represented in the form of graph, the resulting curve will be the Market Demand Curve. From the point of view of the seller of the product, the market demand curve shows the various quantities that he can sell at different prices. Like demand curve of an individual, market demand curve also slopes downward because it is simply the summation of demands made by the individuals.

Movement on the Same Demand Curve and Shifts in Demand Curve

It is important for a business manager to know the impact of change in price of the commodity and other factors on the shape and structure of the demand curve. In case of

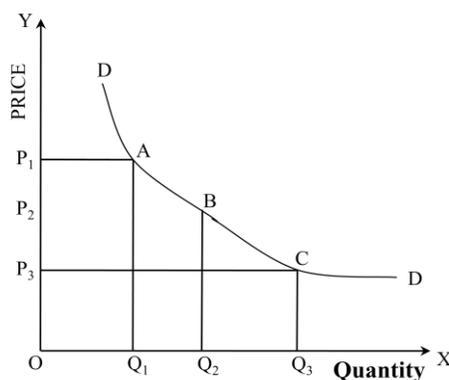


Figure : 4.3

some products change in price on the movement of demand curve is more pronounced than change in other factors while in case of some other products, change in demand responds more because of change in factors other than price. The effect of change in demand of a product due to change in price and other factors is explained below:

i) Effect of Change in Price on Demand Curve

Demand can change due to two reasons i.e. firstly, due to change in price and second due to change in factors other than price. In case demand changes because of increase or decrease in price it is known as expansion of demand and contraction of demand respectively and movement of demand takes place along the same demand curve. Such movement along the same demand curve is shown in Figure 4.4. Price declines from P_1 to P_2 and demand goes up from Q_1 to Q_2 . This is a case of extension of demand which is represented by movement from point A to point B along the demand curve. On the opposite, if price goes up from P_2 to P_1 demand falls from Q_2 to Q_1 . This is a case of contraction of demand. This is represented by movement from point B to point A along the demand curve DD.

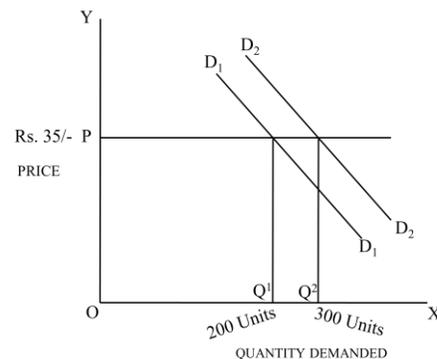


Figure 4.5

ii) Effect of Change in other factors on the Demand Curve

If the demand changes due to change in factors other than price like due to change in taste and income, such increase or decrease in demand is represented through shift of demand curve rather than movement of demand along the same demand curve. In case the ceteris paribus assumption is relaxed; factors other than price influence demand and the impact of these factors on demand is described through shifts in demand. This shift in demand represents increase or decrease in demand. This kind of change is shown in Figure 4.5.

Suppose the quantity demanded by a consumer at price say Rs. 35 is 200 units. Now if his income increases, he will demand more commodities, say 300 units, note that demand has increased from 200 to 300 but price is same i.e. Rs. 35. Now the new demand 300 units is shown by the new demand curve D_2D_2 . This is a case of shift in demand. Due to fall in income, less of the good may be demanded at the same price and this will be a case of decrease in demand. Thus increase or decrease in demand with shifts in demand curves upward or downward are different from expansion or contraction of demand.

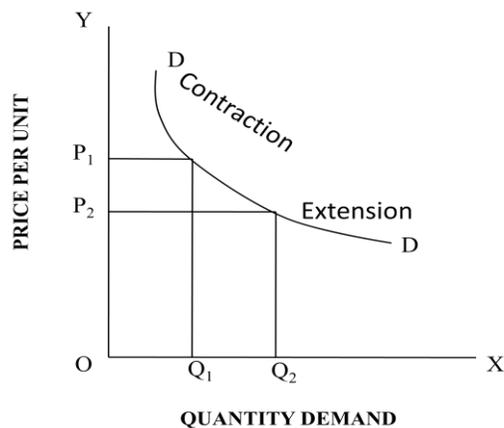


Figure 4.4

4.3 REASONS FOR THE SHAPE AND FORM OF DEMAND CURVE

You must have noticed that the law of Demand reflects an inverse relationship between price and quantity of any commodity and is represented by Demand Curve. Let us identify the reasons for a typical Demand Curve which usually slopes downwards from left to right.

Reasons for the Shape of a common Demand Curve :

1. Law of Diminishing Marginal Utility

Law of diminishing marginal utility says that as one keep on consuming more and more units of a given product, the satisfaction/utility derived from each successive unit goes on decreasing. The law of demand is based on this law. Since each successive unit brings less utility, consumer buys more units only if the price of the commodity falls so that his marginal utility from the commodity becomes equal to the reduced price and vice-versa.

2. Substitution Effect

Substitution effect means the effect on the demand of a product due to change in its price when its substitute products are available. Substitution effect also leads the demand curve to slope downward from left to right. As the price of a commodity falls, but the prices of its substitute goods remain the same, the consumer will buy more of that commodity. For instance, tea and coffee are the substitute goods. If the price of tea goes down, the consumers may substitute tea for coffee, even when the price of coffee is same. Therefore, with a fall in price, the demand will increase due to favourable substitution effect and vice-versa. This also proves that the demand curve will have negative slope.

3. Income Effect

Income effect also contributes to the downward slope of demand curve. Income effect is the effect of change in real income leading to change in quantity demanded by the buyer. Real income is income of buyer measured in terms of goods and services. For example as the price of the commodity falls, the real income of the consumer goes up. Let us assume that a consumer has Rs.30 and he wants to buy apples. The price of apples is Rs.15 per kg. It means the consumer can buy two kilograms of apples with his present money possession. Now, suppose, the price of the apples falls to Rs.10 per kilogram which leads to an increase in his real income by Rs.10, the consumer has two options, either he will buy more quantity of apples than before or he will buy some other commodity with his increased income. When he exercises the first option, more quantity is purchased at reduced price and hence the demand curve slopes downward.

4. Psychological Effects

Psychological effect is also one of the factors contributing to the negative slope of demand curve. It suggests that when the price of a commodity falls, people favour to buy more. Therefore, the demand increases with the fall in prices and vice-versa. For example, then the price of mangoes fall, it is purchased for all the members of the family.

5. New Consumers

Price of a product is inversely related with the consumer base of the product i.e. higher the price of product, lower is the consumer base and vice-versa. When the price of commodity falls, many other consumers who were not consuming that commodity previously will start consuming the commodity. As a result, total market demand goes up. For example, if the price of TVs falls, even the poor man can start buying the TV set. Consequently, the total demand for televisions will go up.

6. Multiple Uses

Some commodities have alternative uses i.e. they can be put to several uses. In case of these types of commodities, when the price goes up they will be used for important purposes, only so their demand will be limited. On the other hand, when the price falls, consumers will start using these commodities for more purposes which will increase its demand. For instance, when the price of milk increases, it will be used for important purposes but as the price falls, it will be used for many other uses and its demand will increase.

4.4 EXCEPTIONS TO THE LAW OF DEMAND

The law of demand like many other economic concepts is not free from exceptions. There are certain conditions or situations in which law of demand will not hold good, i.e. there are some cases in which more quantity of a product will be demanded at a higher price and less at a lower price. In such cases the slope of the demand curve will also be different. Following are the exceptions to the law of demand:

a. Conspicuous Goods

Some products have demand only because they are priced high as some consumers measure the utility of a commodity by its price i.e., if the commodity is expensive they think that it has got more utility and are ready to pay even higher price. Therefore, they buy more of this commodity if the price is high and vice-versa e.g. gold and diamonds. Higher the price of diamonds and gold, higher is the prestige value attached to them and hence higher is the demand for them.

b. Giffen Goods

Generally those goods which are considered inferior by the consumers are priced low and which occupy a substantial place in a consumer's budget are called 'Giffen goods'. Examples of such goods are coarse grains like bajra, low quality of rice and wheat etc. Sir

Robert Giffen, an economist, found that as the price of bread increased, the British workers purchased more bread and not less of it. He was surprised to see this as this was something inconsistent with the law of demand. What was the reason for this? The reason given for this is that it is not just the price of bread alone which went up, rather prices of number of other products including meat and daily use food items also skyrocketed and since the price of meat and other food items went up substantially, workers were forced to reduce the consumption of meat and other more expensive foods. Since bread even when its price was higher than before was still the cheapest food article, people consumed more of it and not less when its price went up. On the other hand, when price of bread falls, the resultant increase in real income is spent on the consumption of other superior goods and consequently the demand for bread falls although its price has also fallen.

c. Future expectations about price

This is another exception to law of demand. People tend to buy more quantity of products at higher prices when they expect further rise in price. It has been observed that there is a general tendency amongst the people that when the prices are rising, they expect that the prices in the future will be still higher and they tend to buy larger quantities of the commodities. For example, when there is war going on in the oil producing economies of the world, people expect that prices of oil would rise in future. They demand greater quantities of oil as their prices rise. But it is to be noted that here it is not the law of demand which is invalidated but there is a change in one of the factors which was held constant while deriving the law of demand, namely change in the price expectations of the people.

d. Ignorance about Prevailing Prices

Sometimes consumer buy more quantity of a product at high prices out of ignorance i.e. buyer is not aware about the prevailing price and buys more quantity at higher prices.

e. When Consumers are not rational

This is one of the assumptions that the consumer is rational. In case the consumer act irrationally even in that case he depicts buying behavior which is inconsistent with the law of demand.

Further, law of demand is based on the 'ceteris paribus' assumption i.e. factors other than price remains constant. In case factors other than price also change, the price and demand may not change the same way as reported by the law of demand.

Types of Demand

Demand is classified into three categories. They are:

1. Price Demand

2. Income Demand

3. Cross Demand

1. Price Demand

Price demand is the quantity demanded of any product at a given price. Law of demand is based on price demand only as it refers to the various quantities of the good which consumers will purchase at a given time and at certain hypothetical prices assuming that other conditions remain the same. In simple words, in price demand we are generally concerned with the relationship between price and demand only.

2. Income demand

Income demand refers to the relationship between income and demand i.e. it refers to the various quantities of a commodity that a consumer would buy at a given time at various levels of income. Generally, when the income increases, demand increases and vice versa.



Figure – 4.7 : Shows the relationship between income and demand

3. Cross Demand

Concept of cross demand comes to light in case of substitute and complementary goods. It refers to the relationship between demand of one commodity and price of another commodity. When the demand of one commodity is related with the price of other commodity it is called cross demand.

Substitute goods are those goods which can be used in place of each other e.g. tea and coffee. In case of substitute commodities demand and price are positively related. This means if the price of one product is increased then the demand for other increases and vice versa. On the other hand, Complementary goods are those goods which are used together

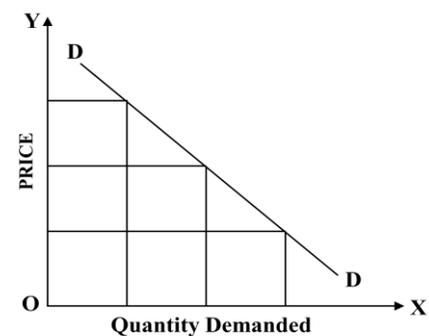


Figure 4.6 : Shows the relationship between price and demand

to satisfy a want. In other words, complementary goods are those goods which join together to make one commodity and individually they are incomplete. Example of complementary commodities is pen and ink. This means when the price of one commodity increases the demand for the other falls.

Figure 4.8 represents the price and demand relationship of products which are substitutes to each other. While figure 4.9 represents price and demand relationship of commodities which are complementary to each other. In figure 4.8 quantity of product x is shown on x-axis and price of its substitute is shown on y-axis. The curve has a positive slope which means that increase in price of a product will lead to increase in the demand of its substitute. The reverse is seen in figure 4.9 which shows the relationship between price and demand of complementary products.

Importance of the Law of Demand

The law of demand plays an important role for forward planning of a business unit and also helps in decision making. The practical and theoretical importance of law of demand is discussed in following lines:

1. Helps government in policy framing and other important issues

Law of demand helps the government in solving critical issues e.g. the finance minister takes the help of this law to know the effects of his tax reforms and policies. While imposing sales tax, government will take into account the elasticity of demand of the product in question. Government may impose taxes only on those commodities which have relatively inelastic demand.

2. Useful to farmers

This law is beneficial for the farmers also, as with the help of law of demand farmer knows how far a good or bad crop will affect his economic condition. For example in case there is

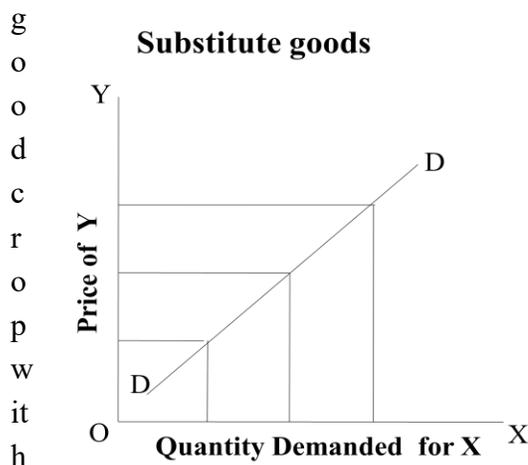


Figure 4.8

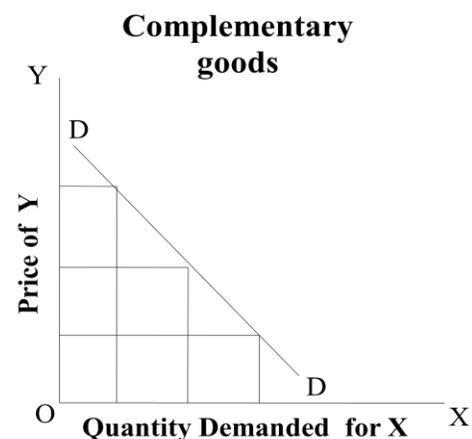


Figure 4.9

ut any corresponding increase in demand then price of the product will definitely go down. It is not beneficial from the farmers' point of view though the rest of the society will be benefited. Similarly in case crop is bad but demand of the product has gone up substantially then farmers will reap benefit of this.

3. Helps price determination under monopoly

Law of demand helps the monopolist in fixing the price of his product. Using law of demand, he can fix that price for his product which will help him in earning maximum possible profits.

4. In the field of planning

The demand schedule has great importance in planning for individual commodities and industries. In such cases it is necessary to know whether a given change in the price of the commodity will have the desired effect on the demand for commodity within the country or abroad. This is known from a study of the nature of demand schedule for the commodity.

Other Terms associated with Law of Demand

Joint demand

This term is applicable in case of complementary products or when several commodities are demanded for a joint purpose or to satisfy a particular want e.g. milk, sugar and tea are jointly demanded to make tea. Similarly, we may demand paper, pen and ink for writing, car and petrol for transportation. Demand for such commodities in bunch is known as joint demand. Demand for land, labour, capital, material and machinery in an organization for producing a commodity is also a case of joint demand.

Composite demand

This term is applicable in case of products having multiple purposes. The demand for a commodity which can be put to several uses has a composite demand. For example, milk is used in tea, coffee, for making cheese and curds etc., electricity is used for lighting, heating, for running the engine, for the fans etc. Similarly coal is used in industries, for cooking in power plants, in rail engines etc. Demand for goods having alternative uses is termed as composite demand.

Direct and Derived demand

The demand for a commodity which is for direct consumption, i.e. Demand for ultimate object, is called direct demand, e.g. food, cloth, etc. Direct demand is also called autonomous demand. Here the demand is not linked with the purchase of some main products. When the commodity is demanded as a result of the demand for another commodity or service, it is known as the derived demand or induced demand. For example, demand for cement is derived from the demand for building construction; demand for tyres is derived from the demand for cars or scooters, etc. Similarly, demand for labour is derived demand because this demand is linked to the demand for the product for which labour is hired.

4.5 CONCEPT OF SUPPLY

Supply is the quantity of the product offered for sale by the supplier at different prices and at a given time, other things remaining the same.

Law of Supply

The Law of supply states that other things being equal, the higher the price, the greater the quantity supplied or the lower the price, the smaller the quantity supplied.

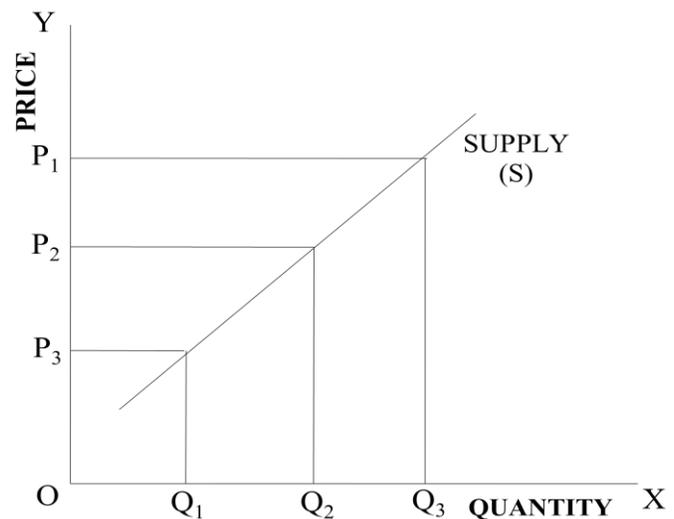


Figure 4.10

It can thus be inferred that according to the law of supply the relationship between product price and product supply is direct i.e. with increase in price, supply of the product also increases and vice-versa, assuming no change in other factors.

Supply Schedule

Supply schedule refers to a series of quantity supplied at various prices by the supplier at a given point of time.

Supply Curve

Supply curve is the graphic presentation of the law of supply. As the relationship between product price and its supply is positive, therefore supply curve has positive slope and is an upward moving curve. Supply curve is shown below in figure 4.10 :

In figure 4.10 supply is shown on y-axis and quantity on x-axis. Supply curve is represented by S, which is moving upward from left to right and therefore it has positive

slope. With each rise in price, quantity supplied is increasing. At P_1 quantity supplied is Q_1 , when price rose to P_2 from P_1 , quantity supplied increased to Q_2 . Similarly further rise in price from P_2 to P_3 increased the quantity supplied from Q_2 to Q_3 .

Factors Affecting Supply

The factors which affect the supply of the product are explained below:

1. Size of Population

Larger the size of population, larger will be quantity supplied and vice versa.

2. Level of income

Level of income determines the purchasing power of the buyer. In case the purchasing power of the buyer is more, he will demand more quantity and therefore quantity supplied will also be high. In simple words, there is direct relationship between quantity supplied and the price of the product.

3. Price of Related Products

Price of the related products also affects the supply of the product. The related product may be a substitute or complementary product. In case the price of the substitute rise, then demand of this product will rise and consequently its supply will also rise. Reverse will be true in case of complementary products.

4. Government Policy

Government policy also affects the supply of the product. In case of high prevailing demand pull inflation, government will try to boost the supply of the product to bring the inflation down.

5. State of Technology

Technology helps in improving the quality of the product and at the same time reduces its cost. Degree of technological development is directly associated with the state of technology. Better the technology, higher will be the quantity supplied and vice-versa.

6. Change in Cost of Factors of Production

Change in cost of factors of production also affects the supply of the product. This change may force the producer to change the line of production or change the proportion of different products in the product mix. Either way the supply of the product will change in the market.

Market Equilibrium

Demand has negative relationship with price and supply has positive relationship with price. Market equilibrium lies at the intersection of demand and supply curve. The point of intersection is the point which reveals the equilibrium price P and equilibrium quantity Q as shown in the figure 4.11 below. At equilibrium price, sellers would be selling the goods and buyers would be buying the goods and both would feel satisfied. In simple words, market equilibrium is the best possible choice where both buyer and sellers would attain maximum possible satisfaction. In the figure 4.11, both demand and supply curves intersect each other at point E which is the point of equilibrium where the seller sells OQ quantity of commodities at price OP and both seller and buyer are at equilibrium.

4.6 SUMMARY

Law of demand is one of the most popular and fundamental laws of economics. It states that the relationship between price and demand is inverse i.e. demand of a product increase with decrease in price and vice-versa. However, to establish this inverse relationship between price and demand, law of demand has assumed that other factors like price of related commodities, income of buyer and his taste will remain intact. There are exceptions to law of demand also. Further it is stated that in case demand changes because of change in price only then such a change is represented through movement on the same demand curve. In case demand changes due to change in factors other than price, then such a change in the demand is represented by the shift of demand curve. Further, this unit also discusses the importance of demand for various segments of the society like its utility for the farmers, monopolist and government etc.

4.7 GLOSSARY

- **Demand:** "The desire and ability to obtain a particular good at a specific time and price."
- **Law of Demand:** According to this law, keeping other things constant, there is an inverse relationship between price and demand.
- **Supply:** The quantity of a good that a producer is willing to sell in the market at different prices at a given time, keeping other things constant.

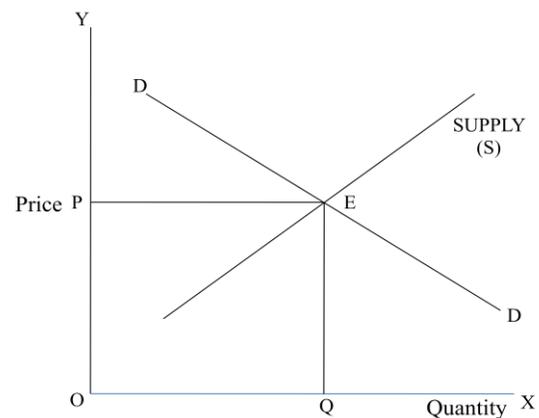


Figure 4.11

4.8 CHECK YOUR PROGRESS

(A) **Fill in the blanks :**

- (i) Want means to buy a commodity.

- (ii) Changes inlead to movement of demand along the same demand curve.
- (iii) The sum-total of demand of a product from all the individuals is known as.....
- (iv) Demand curve slopes.....

(B) State whether the following statement are true or false :

- (i) An increase in income increases the demand for all kinds of goods.
- (ii) If more is demanded at the same price, it is known as increase in demand.
- (iii) Law of Demand quantifies the relationship between demand and supply.
- (iv) Complementary products are competitors to each other.
- (v) Derived demand is also known as autonomous demand.
- (vi) Giffen goods are inferior goods.
- (vii) Ceteris Paribus means all factors are dynamic.
- (viii) Supply curve has positive slope.
- (ix) Market equilibrium lies at the point of intersection of demand and supply curve.

4.9 ANSWERS TO CHECK YOUR PROGRESS

- (A)** (i) willingness (ii) price (iii) market demand (iv) downward to the right
- (B)** (i) False (ii) True (iii) False (iv) False (v) False (vi) True (vii) False (viii) True
(ix) True

4.10 TERMINAL QUESTIONS

(A) Short Answer type Questions :

1. What do you understand by demand ?
2. Under what conditions a demand curve may slope upwards from left to right ?
3. State the various types of demand.

(B) Long Answer Type Questions :

1. Distinguish between increase in demand and extension in demand.
2. Explain the various determinants of demand.
3. Explain the Law of Supply and point out its determinants.

4.11 SUGGESTED READINGS

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UNIT 5-ELASTICITY OF DEMAND AND SUPPLY

Structure:

- 5.1 Introduction**
- 5.2 Price Elasticity of Demand**
 - 5.2.1 Degrees of Price Elasticity of Demand**
- 5.3 Income Elasticity of Demand**
- 5.4 Cross Elasticity of Demand**
- 5.5 Measurement of Elasticity of Demand**
- 5.6 Determinants of Price Elasticity of Demand**
- 5.7 Importance of Elasticity of Demand**
- 5.8 Elasticity of Supply**
- 5.9 Determinants of Elasticity of Supply**
- 5.10 Summary**
- 5.11 Glossary**
- 5.12 Check your Progress**
- 5.13 Answers to Check your Progress**
- 5.14 Suggested Readings**

OBJECTIVES

After going through this Unit, you should be able to :

- understand the meaning of elasticity of demand
- quantify the elasticity of demand
- identify the determinants of elasticity of demand and supply

5.1 INTRODUCTION

Management of any business organization does not only need to be informed about the direction of and change in demand as it would provide insufficient information to plan any change in any production or sales plan. It must also have information regarding the

magnitude of the impact of changes in the functions like price, income taste and expectations etc. on the quantity demanded. It is with the understanding of these effects that the firm can hope to predict the quantum of its sales and sales revenue. The analysis of demand is incomplete without an understanding about the concept of supply and its different dimensions.

5.2 PRICE ELASTICITY OF DEMAND :

Law of demand simply indicates only the direction of change in demand resulting from certain change in price. It fails to explain how much demand for commodity will rise in response to fall in the price of the commodity. The economists have developed the concept of price elasticity of demand which explains how much change in demand will occur due to change in price.

In the words of Mrs. Joan Robinson, “elasticity of demand at any price is the proportional change of amount purchased in response to a small change in price.”

Thus, the price elasticity of demand measures the ratio of percentage change in quantity demanded of a commodity to a given change in its price. It may also be expressed as:

$$E_d = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

5.2.1 Degrees of Price Elasticity of Demand

Elasticity of demand for different commodities varies with change in prices. The values of elasticity of demand varies from infinity to zero. The following paragraphs would give you an examination of the various types of price elasticity of demand.

(a) Perfectly Price Elastic Demand, i.e. $E_p = \infty$

Perfectly price elastic demand means that a small change in price results in infinite change in quantity demanded. In this

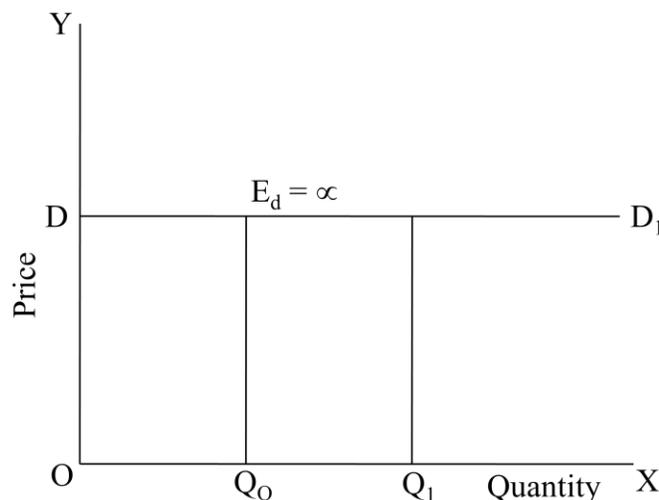


Figure 5.1

case at a given price, consumer can buy any amount of commodity. It has been illustrated in the Figure 5.1.

In this Figure, DD_1 is the demand curve, which is parallel to X-axis. It reveals that unlimited amount of the commodity is available at given price. A consumer can buy OQ_0 or OQ_1 amount of commodity at a given price. If price is increased by small amount, the demand of the commodity may fall to zero. The value of elasticity of demand in this case is infinite.

(b) Perfectly Inelastic Demand, i.e. $E_p = 0$

Perfectly inelastic demand is one in which change in price has no effect on quantity demanded. In other words, whatever may be the change in price, demand for the commodity does not change. It is explained in the Figure 5.2.

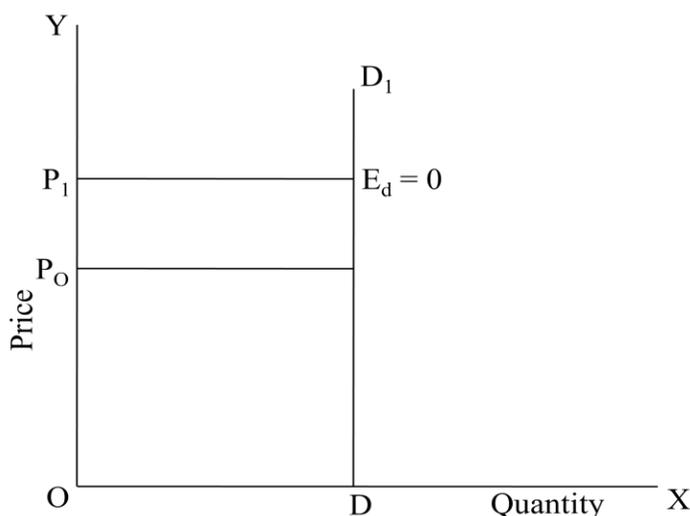


Figure 5.2

In this Figure, DD_1 is the demand curve, which is parallel to Y-axis. It shows

that when price of the commodity is OP_0 , the quantity demanded is OQ . When price of the commodity increases from OP_0 to OP_1 , amount of the commodity demanded remains constant, i.e., OQ . The value of elasticity of demand in this case is zero.

(c) Unitary elastic demand, i.e. $E_p = 1$

Unitary elastic demand is one when proportionate change in quantity demanded is equal to proportionate change in price. In other words, price and quantity demanded change in same proportions. It can be explained in the Figure 5.3.

In this Figure, when price of the commodity is OP_0 the quantity demanded is OQ_0 . When the price of the commodity falls from OP_0 to OP_1 , the quantity demanded increases from OQ_0 to OQ_1 . In this case, change in price is equal to change in quantity demanded. The value of elasticity of demand is equal to one.

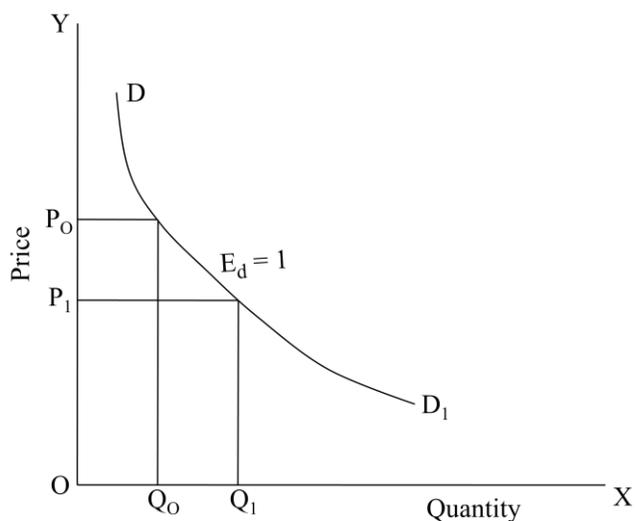


Figure 5.3

(d) Relatively Elastic Demand, i.e. $E_p > 1$

Relatively elastic demand is one when the change in demand for the commodity is more than change in the price. In other words, a small change in price causes more than proportionate change in demand. The phenomenon can be expressed in the Figure 5.4.

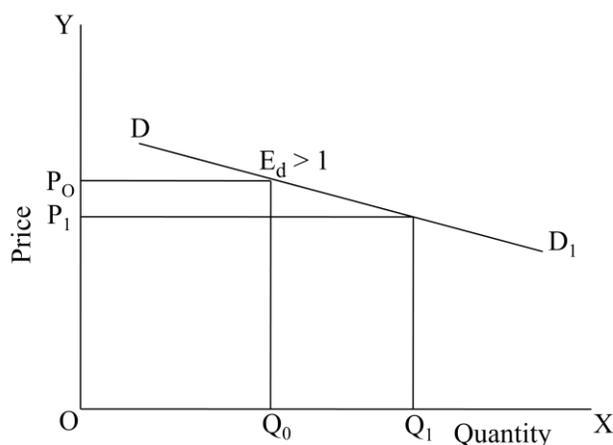


Figure 5.4

In the Figure 5.4, DD is the demand curve. When price of the commodity is OP_0 , the quantity demanded is OQ_0 but taken price of the commodity falls from OP_0 to OP_1 , the quantity demanded enhances from OQ_0 to OQ_1 . In this diagram, the change in quantity demanded is more than change in price. The value of elasticity of demand, in this case is greater than one.

The value of elasticity of demand, in this case is greater than one.

(e) Relatively Inelastic Demand, i.e. $E_p < 1$

When change in quantity demanded is less than proportionate change in price, the demand is said to be relatively inelastic. It can be explained with the help of the Figure 5.5.

In this Figure, at price OP_0 , quantity demanded is OQ_0 . When price of the commodity increases from OP_0 to OP_1 , the quantity demanded declines from OQ_0 to OQ_1 . The diagram reveals that proportionate change in quantity demanded (Q_0Q_1) is less than the correspondence change in price (P_0P_1) of the commodity. The value of elasticity of demand in this case is less than one.

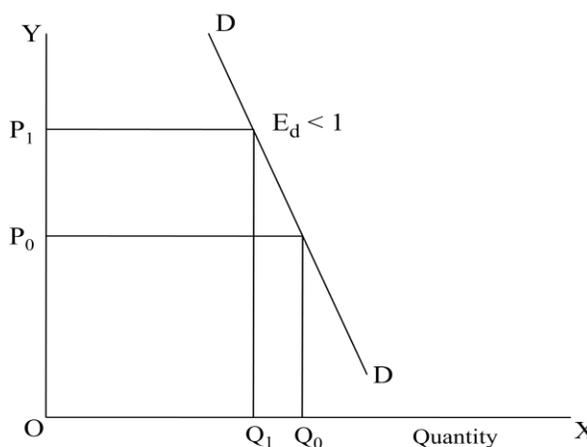


Figure 5.5

5.3 INCOME ELASTICITY OF DEMAND

Income elasticity of demand is related with the effect of change in income of the buyer on demand. Thus, it refers to relative change in quantity demanded caused by the given proportionate change in income.

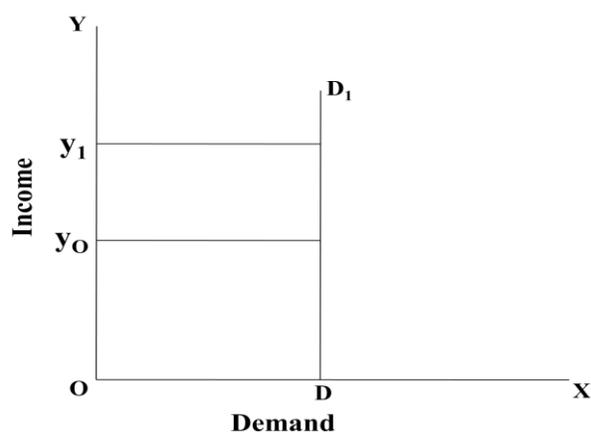
$$E_y = \frac{\text{Proportionate change in demanded}}{\text{Proportionate change in income}}$$

The income elasticity of demand has five degrees.

(i) Zero Income Elasticity, i.e. $E_y = 0$

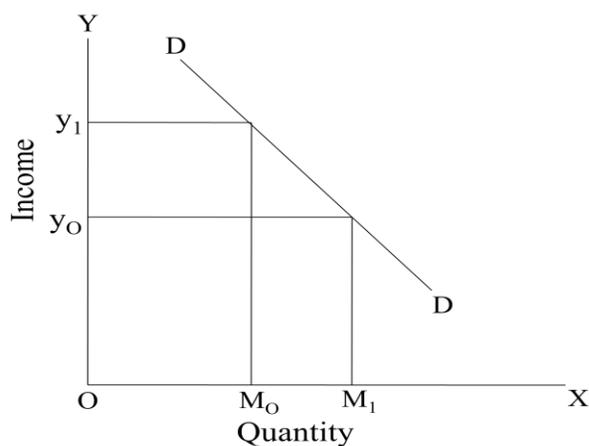
It means with change in income the demand for the commodity remains constant. It can be explained with the help of the Figure 5.6.

The Figure 5.6 depicts zero income elasticity of demand. On X-axis quantity demanded and on Y-axis income have been drawn. DD_1 is the demand curve, which is parallel to Y-axis. It shows that when income of the consumer increases from OY_0 to OY_1 , the demand for the commodity remains constant, i.e., OM . In this case $E_y = 0$.

**Figure 5.6****(ii) Negative Income Elasticity**

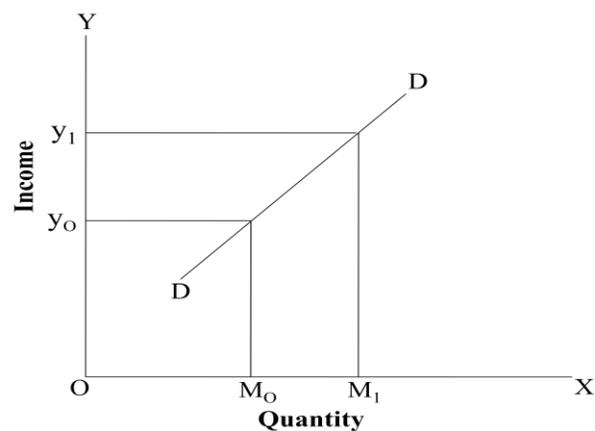
It means consumer buys less amount of commodity with increase in his income. The income elasticity of inferior goods is negative because the consumer tends to decrease the consumption of such goods when his income increases in order to improve his standard of living. It is explained in the following figure.

The Figure 5.7 shows the negative income elasticity of demand. It clearly reveals that increase in income from OY_0 to OY_1 has reduced the demand from OM_1 to OM_0 .

**Figure 5.7****(iii) Unit Income Elasticity**

It means proportionate change in quantity is equal to proportionate change in income. It can be explained with the help of the Figure 5.8.

The Figure 5.8 highlights that percentage change in quantity (M_0M_1) and percentage change in income (y_0y_1) are equal. Income elasticity of demand is unity in this case.

**Figure 5.8**

(iv) High Income Elasticity

It means the relative change in quantity demanded is more than the corresponding increase in income. The goods with high income elasticity are usually articles of luxuries. The value of income elasticity is greater than one in this case.

In Figure 5.9, DD is the demand curve, which is positively sloped. The demand curve DD clearly reveals that relative change in quantity demanded (M_0M_1) is greater than the change in income of the consumer (y_0y_1). Income elasticity in this case is greater than one.

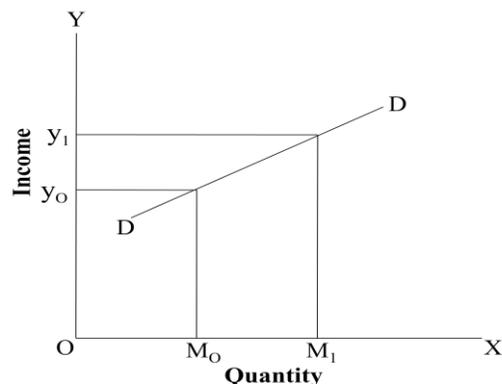


Figure 5.9

(v) Low Income Elasticity

It means that percentage increase in quantity demanded is less than the percentage increase in income. It is explained in the following increase in figure.

The Figure 5.10 shows low income elasticity. It clearly reveals that relative increase in quantity demanded is less than proportionate change in income.

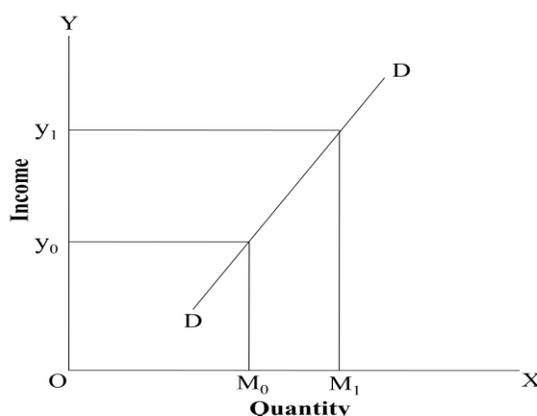


Figure 5.10

5.4 CROSS ELASTICITY OF DEMAND

Cross elasticity of demand refers to the relative change in the demand for a particular product (X) in response to a given change in the price of a related product (y). Related products are of two types, namely (i) substitutes and (ii) complementary. In case of substitutes, such as tea and coffee, the demand for one commodity is directly related to the change in the price of the other commodity. For example, if the price of coffee increases, demand for tea shall also increase. On the other hand, two goods are said to be complementary when both goods are jointly used for meeting a particular want. Car and petrol, pen and ink, shoes and socks etc. are examples of complementary goods. Such goods are supportive to each other rather than competitive in nature. If the price of one commodity, say for example, petrol increases, it leads to fall in the demand for the use of Car. The cross elasticity of both substitutes and complementary goods is explained below.

The cross elasticity of demand can be expressed in the form of following formula:

(a) Positive Cross-elasticity of Demand

It refers to a situation in which an increase in the price of one commodity leads to the rise in the demand for other commodity. It happens when both commodities are substitutes, such as tea and coffee. It is explained in the figure 5.11.

In the Figure, demand curve DD_1 slopes upward. It means when price of coffee increases, the demand for tea (close substitute) increases. It is clear from the figure that when price of coffee has increased from OP_0 to OP_1 , the quantity demanded for tea has increased from OQ_0 to OQ_1 .

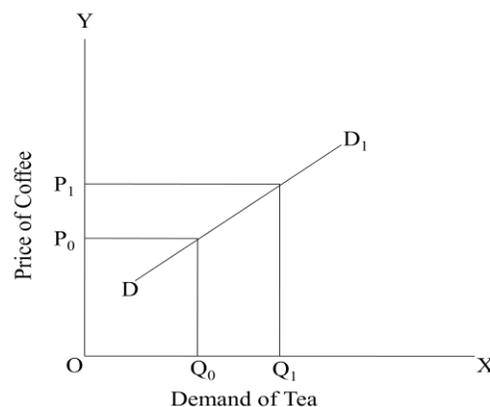


Figure 5.11

(b) Negative Cross-elasticity of Demand

In case of complementary goods, the cross elasticity of demand is negative. It means with increase in price of one commodity, the demand for other commodity declines.

The Figure 5.12 highlights that when price of the commodity Y, say petrol increases, the quantity demanded of car declines. Thus, cross-elasticity of demand for complementary goods is negative.

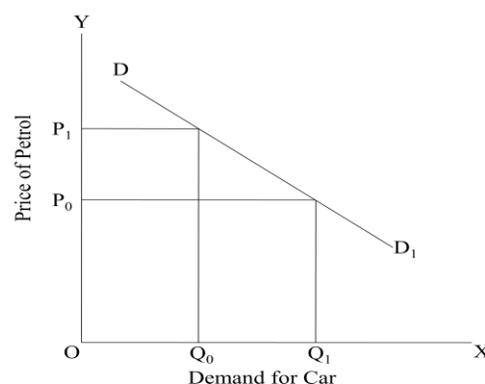


Figure 5.12

5.5 MEASUREMENT OF PRICE ELASTICITY OF DEMAND

The following are the methods to measure the price elasticity of demand.

(A) Total Expenditure Method

According to this method, elasticity of demand can be measured with the help of direction of change in amount of expenditure incurred on the commodity with the change in price of the commodity. By comparing the new total outlays that is, total expenditure in the old total outlays, price elasticity of demand is determined in the following manner :

i) Unit Price Elasticity of Demand ($E_p = 1$)

When total expenditure remains constant irrespective of any change in price, price elasticity of demand is equal to one, i.e. unit.

Example A

Price in Rs.	Demand	Total Expenditure in Rs.
10 per Kg	8 Kg	80
16 per Kg	5 Kg	80

It is clear from the above example that there is no change in total expenditure as a result of increase in price. Hence price elasticity of demand is equal to one.

ii) High Price Elasticity of Demand ($E_p > 1$)

When change in total expenditure moves in opposite direction of the corresponding change in price, the price elasticity of demand is greater than one. In other words E_p is highly elastic.

Thus, when price falls but total expenditure increases and vice-versa price elasticity of demand is high, i.e. $E_p > 1$.

Example B

Price in Rs.	Demand	Total Expenditure in Rs.
10 per Kg	10 Kg	100
15 per Kg	5 Kg	75

It is clear from the above example that an increase in price has led to a fall in total expenditure and as such E_p is highly elastic.

iii) Price Elasticity of Demand being less than one :

When change in total expenditure moves in the same direction in which the price is changing, E_p is less than one. In other words E_p is less than one when increase/ decrease in price is accompanied by increase/ decrease in total expenditure.

Example C

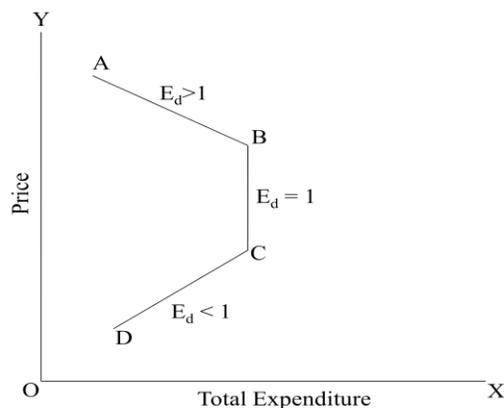
Price in Rs.	Demand	Total Expenditure in Rs.
10	10 Kgs	100
7	12 Kgs	84

It is clear from the above example that fall in price has led to fall in total expenditure. Thus, change in both total expenditure and price is moving in the same direction and hence $E_p < 1$.

Diagrammatic presentation of outlay method

On X-axis, total expenditure has been shown and price on the Y axis. ABCD is the demand curve. AB segment of demand curve shows the elasticity of demand greater than one, BC part depicts elasticity of demand equal to one and CD part highlights elasticity of demand less than one.

AB part of the Figure depicts that with fall in price, total expenditure increases. BC part shows that total expenditure remains constant with change in price. CD part shows that with fall in price of the commodity total expenditure declines.

**Figure 5.13**

(B) Point Method

In this method, elasticity of demand is measured at the different points of the straight line of demand. This method is used to measure elasticity of demand more frequently. In this method a straight line demand curve is taken, which touches X and Y axis.

In Figure 5.14, AB is demand P which is touching X and Y-axis. The, elasticity of demand at different points of demand curve can be measured through the following formula.

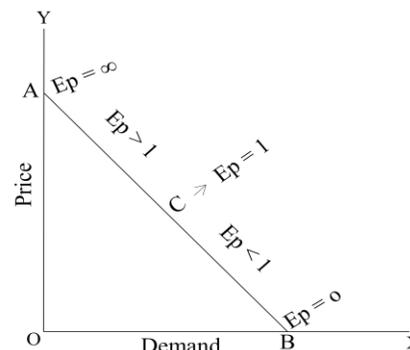


Figure 5.14

$$E_p = \frac{\text{Lower segment of demand curve}}{\text{Upper segment of demand curve}}$$

Thus at point C, E_p is equal to one because $BC = AC$. On any other point lying between A and C on the demand line, price elasticity is greater than one; at point A, E_p is equal to infinity; at point B, it is zero; and at any other point lying between C and B, price elasticity of demand is less than one.

(C) Average Revenue and Marginal Revenue Method :

Price elasticity of demand is closely related to changes in AR and MR. E_p is measured according to the following formula.

$$E_p = \frac{\text{Average Revenue}}{\text{Average Revenue} - \text{Marginal Revenue}} = \frac{AR}{AR - MR}$$

- Thus
- (i) E_p will be infinity when $AR = MR$;
 - (ii) E_p will be one if MR is zero
 - (iii) E_p will be more than one if $AR > MR$, but $MR > 0$
 - (iv) E_p will be less than one when MR is negative

5.6 DETERMINANTS OF PRICE ELASTICITY OF DEMAND

The price elasticity of demand is influenced by large number of factors. Some of these important factors are discussed below:

(i) Availability of Substitutes

The goods having substitutes have generally elastic demand. With the change in prices of the substitutes, customers shift to other competing goods. On the other hand, goods having no close substitute command more price. The reason being, people have no other choice in this case. Thus, goods having substitutes have generally elastic demand.

(ii) Proportion of Income Spent

The amount of income spent on the commodity also determines the elasticity of demand for the product. If small amount of money is spent on the commodity the demand for such commodity is always inelastic. On the other hand, commodity demand is elastic if

large amount of money is spent on the commodity. For example, demand for salt is inelastic because expenditure on salt is just a small fraction of total expenditure.

(iii) Time Period

Time period under consideration also influences the elasticity of demand. In short period, the demand for the commodity is generally inelastic because it is difficult for the consumers to adjust themselves in short period, when there is change in prices. On the other hand, in long period, the demand for the commodity is elastic. The reason being, the consumer tries to adjust himself in the long period. Moreover, in the long period, the consumer also tries to change his habits, etc.

(iv) Postponement of Demand

If the demand for the commodity can be postponed, the demand for such commodity is elastic. On the other hand, if demand cannot be delayed, the demand for such commodities is inelastic. For example, the demand for luxuries is generally elastic, because the purchase decision for these commodities can be postponed, whereas in case of essential commodities, it is inelastic. The reason being, the demand for these commodities cannot be postponed, even when there's a steep rise in prices of these commodities.

5.7 IMPORTANCE OF ELASTICITY OF DEMAND

The elasticity of demand has a lot of significance to businessmen, policy-makers and general public. All important decisions regarding price, output and expenditure are determined by the elasticity of demand. Thus, the elasticity of demand has significance while taking rational decisions.

(a) For Businessmen

Businessmen take into consideration elasticity of demand of the product while fixing the prices of their commodities. Businessmen fix high price of products having inelastic demand. The reason being, the consumer has to buy that commodity even if it commands high price. On the other hand, low price will be fixed for commodity having elastic demand. Because commodity having elastic demand will fetch more revenue when low price of the commodity is fixed.

(b) For Factors of Prices of Production

The prices of factors of production are also fixed on the basis of their elasticity of demand. The factors having inelastic demand in the market will get higher prices as compared to factors having elastic demand. For example, highly skilled persons enjoy higher price on account of inelastic demand of their services. On the other hand, unskilled workers due to excess availability in the market fetch low prices.

(c) For International Trade

The country stands to gain in the international trade, when it exports more commodities having inelastic demand in the international market.

(d) For Taxes on Commodities

The elasticity of demand also guides the finance minister while imposing taxes on different commodities. More taxes are imposed on commodities having elastic demand and less amount of taxes are levied on commodities possessing elastic demand. The reason being, when more taxes are imposed on commodities having less elastic demand, the demand for such commodities do not decline considerably. On the other hand, if higher taxes are levied on commodities having elastic demand, the demand for such type of commodities will decline

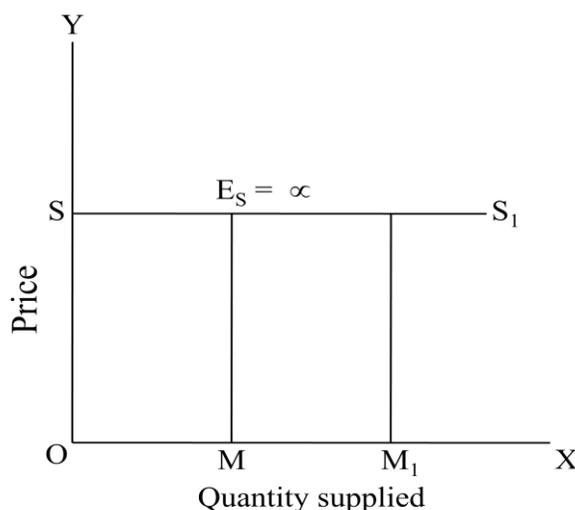


Figure 5.15

to a large extent. The total revenue in this case will also decline. Thus, finance minister takes into consideration elasticity of demand while imposing taxes on the commodities.

(e) In Case of Joint Products

Joint products are those products which are produced in a single production process. For example, rice and husk mutton and kin, etc Production of these commodities occurs simultaneously. The prices of these joint products are determined on the basis of elasticity of demand. In case of rice and husk, demand for rice being inelastic, it is fixed at higher price, whereas husk having elastic demand is priced low.

5.8 ELASTICITY OF SUPPLY

Elasticity of supply refers to the ratio of percentage change in quantity supplied to percentage change in price. Thus, elasticity of supply is the relative change in quantity supplied in response to the relative change in price.

Formula for calculation of elasticity of supply is given below:

$$E_s = \frac{\text{Proportionate change. in quantity supplied of commodity X}}{\text{Proportionate change in price of commodity X}}$$

Degrees of Price Elasticity of Supply

Elasticity of supply has five degrees as discussed below.

(i) Perfectly Elastic Supply

Perfectly elastic supply means infinite quantity of commodity is available at given price. Small change in price causes an infinite change in supply of the commodity. If the price of the commodity reduces to small extent, the quantity supplied becomes zero. This can be explained with the help of the Figure 5.15.

In the Figure 5.15, supply curve SS_1 is parallel to X-axis. It shows that at price OS , The seller is ready to sell any quantity of goods. The value of elasticity of supply in this case is infinite ($E_s = \infty$).

(ii) Perfectly Inelastic Supply

It means with the change in price, supply of commodity remains constant. In the other words, change in price does not effect quantity supplied the commodity. In this case, the value of elasticity of supply is zero.

In the Figure 5.16, supply curve SS_1 is parallel to Y-axis. It means at price OP or OP_1 , the amount of quantity supplied is OS . It means with change in price supply of the commodity remains constant.

(iii) Unitary Elastic Supply

It means proportionate change in quantity supplied is equal to proportionate change in price.

The value of elasticity of supply in this case is one.

In the Figure 5.17, SS_1 is positively sloped-supply curve moving upward from left to right. It shows that price and quantity supplied change in same

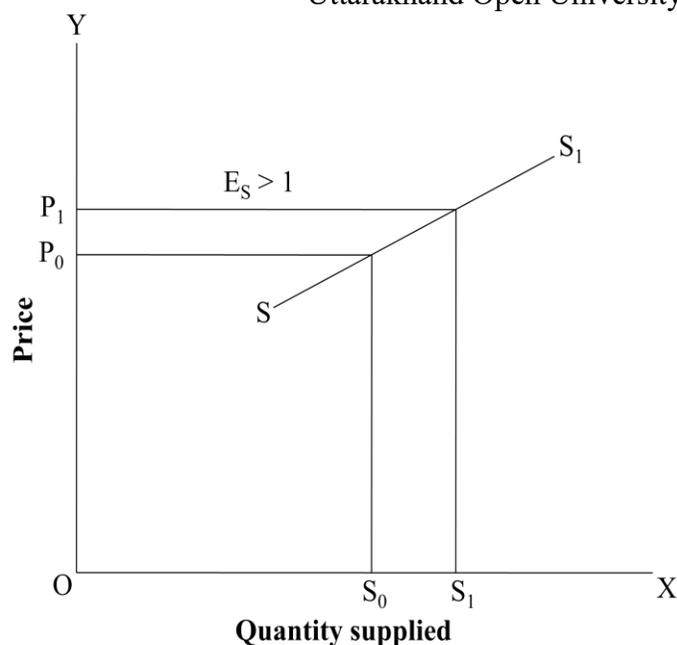


Figure 5.18

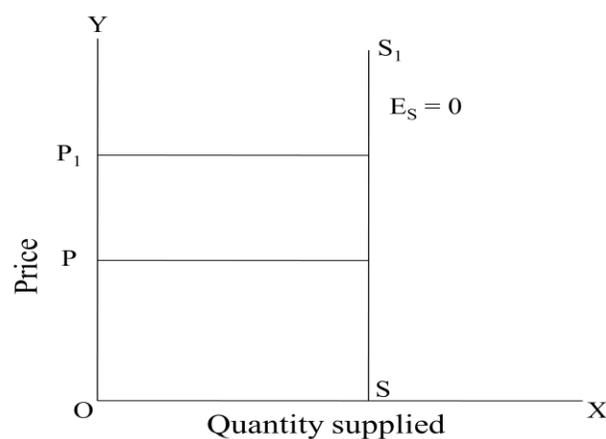


Figure 5.16

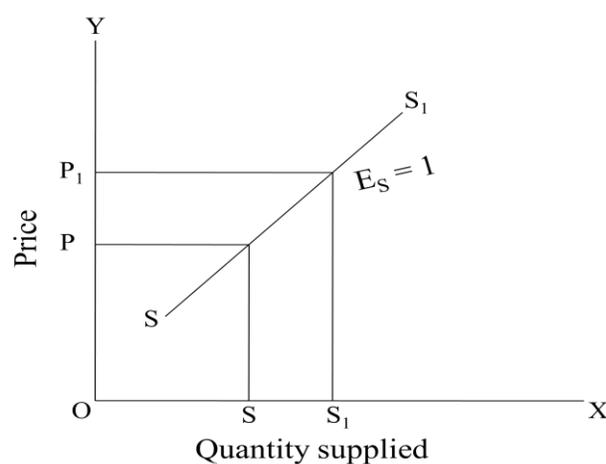


Figure 5.17

proportion.

(iv) Relatively Elastic Supply

Relative elastic supply curve means proportionate change in supply is more than proportionate change in price. It means small change in price causes considerable change in quantity supplied. It can be represented in the Figure 5.18.

In this Figure, SS_1 is relatively elastic supply curve. It shows that when the price of the commodity increases, the quantity offered for sale is relatively more. In this diagram percentage change in quantity supplied (S_0S_1) is more than percentage change in price of the commodity (P_0P_1). The value of elasticity of supply is more than one in this case.

(v) Relatively less elastic Supply

It means proportionate change in quantity supplied is less than proportionate change in price. It means with the increase in price, the quantity supplied of the commodity does not increase much. It can be expressed with the help of the Figure 5.19.

It is clear from the figure that the relative increase in quantity supplied is less than relative rise in price (P_0P_1). The value of elasticity of supply in this case is less than 1.

5.9 DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

The elasticity of supply depends upon the large number of factors. Some of the important factors have been discussed in the following paragraphs:

(a) Time Element

Time element is one of the main factors responsible for the elasticity of supply. If time is short, even at very high price, the amount of commodity to be supplied in the market remains constant or very small increase in supply is possible. Hence elasticity of supply is low in the short period.

The supply curve in this case would be relatively inelastic.

For example, in case of milk, vegetables, etc. supply of these commodities cannot be

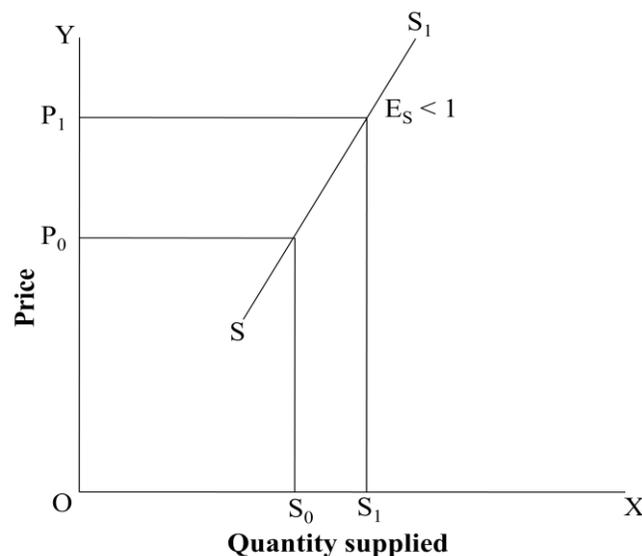


Figure 5.19

increased immediately. Supply of commodity becomes elastic with the increase in time period, because in long period, the supply of commodity can be adjusted through expansion in the size of plant.

(b) Availability of Inputs

Elasticity of supply also depends on availability of inputs. If inputs are made available to producers well in time, the supply of the commodity will be elastic.

(c) Storage Capacity

Elasticity of supply is also influenced by storage capacity. If the better storage is available to the producers, the commodity supply will be elastic, otherwise it will be inelastic.

5.10 SUMMARY

There are five types of elasticity of demand. More and less elastic demand and supply play an important role in business decision making. Total expenditure method shows the method of measuring the elasticity of demand on the basis of total expenditure incurred on the commodity. The businessman should fix higher price of the commodity having less elastic demand and low price of the commodity having more elastic demand. The elasticity of demand helps the businessman to understand the nature of the commodity. The elasticity of supply helps the businessman to understand the various factors affecting the supply of the commodity.

5.11 GLOSSARY

- **Price Elasticity of Demand:** It refers to the degree of change in demand due to a change in price.
- **Income Elasticity of Demand:** This refers to the change in the quantity demanded of a good due to a change in the consumer's income.
- **Cross Elasticity of Demand:** It refers to the change in the demand for a good X due to the change in the price of a related good Y.

5.12 CHECK YOUR PROGRESS

(A) Fill in the blanks:

- (i) Price elasticity of demand is unity when the change in demand is to the change in price.
- (ii) In case of substitutes the cross elasticity is
- (iii) Cross elasticities for both substitutes and complementary vary between and infinity.
- (iv) Businessman fixes price of products having inelastic demand.

(v) As per the law of supply, there exists a relationship between price and quantity of goods supplies.

(vi) In case of seasoned goods, old stock is usually cleared by selling it at.....

(B) Point out whether the following statements are true or false:

- (i) Demand for a product is more elastic over a period than at a point of time.
- (ii) The price of commodities whose demand is highly elastic is high.
- (iii) If the demand is inelastic and price increases, total revenue will rise.
- (iv) It is wise for the Government to impose high taxes on the commodities whose demand is highly elastic.
- (v) In order to increase supply of a good, cost of basic inputs should be reduced.
- (vi) If the proportionate change in quantity supplied is less than proportionate change in price, it is known as highly elastic supply.

(C) Multiple Choice Questions:

1. The value of elasticity of demand being greater than one means the commodity under consideration is:
 - (a) Luxury
 - (b) Necessity
 - (c) Both a and b
 - (d) Neither a nor b.
2. The value of elasticity of demand in case of comforts is:
 - (a) Equal to 1.
 - (b) greater than 1.
 - (c) Less than 1.
 - (d) None of above.
3. What will be the value of elasticity of demand, when with change in prices, total expenditure remain constant?
 - (a) Equal to 1.
 - (b) Greater than 1.
 - (c) Less than 1.
 - (d) None of above.
4. The value of elasticity of demand being less than 1 means the commodity under consideration is:
 - (a) Necessity of life
 - (b) Luxury.
 - (c) Both a and b
 - (d) none of the above.
5. What is the shape of perfectly inelastic demand curve?
 - (a) Parallel to X-axis
 - (b) Parallel to Y-axis.
 - (c) Neither a nor b
 - (d) Negatively sloped.
6. Perfectly elastic demand curve will, be:
 - (a) Parallel to X-axis
 - (b) Parallel to Y-axis
 - (c) Both a and b
 - (d) Positively sloped.

5.13 ANSWERS TO CHECK YOUR PROGRESS

- (A). (i) Exactly proportionate (ii) Positive (iii) Zero (iv) High (v) Positive (vi) Lower price
 (B). (i) True (ii) False (iii) True (iv) False (v) True (vi) False
1. (a) 2. (a) 3. (a) 4. (b) 5. (b) 6. (a)
-

5.14 TERMINAL QUESTIONS

(A) **Short Answer Questions:**

1. What is meant by elasticity of demand?
2. What is meant by income elasticity of demand?
3. Explain the concept of cross-elasticity of demand with the help of examples.
4. Define inelastic demand.
5. What is meant by unitary elastic demand?
6. Define supply.
7. What is meant by perfectly elastic supply?

(B) **Long Answer Questions :**

- (i) Explain the factors influencing elasticity of demand.
 - (ii) Discuss the point method of measuring elasticity of demand.
 - (iii) Explain the total outlay method of measuring elasticity of demand.
 - (iv) Explain the law of supply.
-

5.14 SUGGESTED READINGS

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UNIT 6-INDIFFERENCE CURVE ANALYSIS

Structure

- 6.1 Introduction**
- 6.2 The Indifference Curve Approach**
- 6.3 Concept of Marginal rate of Substitution**
- 6.4 Properties of Indifference Curve**
- 6.5 Budget line**
- 6.6 Income Effect**
- 6.7 Consumer's Equilibrium**
- 6.8 Relationship between Price Effect, Income Effect and Substitution Effect**
- 6.9 Derivation of Demand Curve with the help of Indifference Curve**
- 6.10 Application of Indifference Analysis in business**
- 6.11 Summary**
- 6.12 Glossary**
- 6.13 Check Your Progress**
- 6.14 Answers to Check Your Progress**
- 6.15 Terminal Questions**
- 6.16 Suggested Readings**

OBJECTIVES

After studying this unit,

- You should be able to understand the consumer behavior when two commodities are offered to the consumer,
- The conditions under which the consumer tries to attain the maximum satisfaction,
- The method of derivation of the demand curve and the separation of the income effect and the substitution effect, when there is a change in the price of the commodity.

6.1 INTRODUCTION

The traditional utility analysis was based on the assumption that utility can be cardinally measure i.e. it can be measured in numbers e.g. 2, 4, 6, 8 or any other number. Later, the economists observed that in practice, utility cannot be cardinally measured. They developed an alternative to this old utility concept which was explained through indifference analysis. This concept is based on ordinal measurement of utility which means measurement of utility in terms of comparability.

Edgeworth and Fisher were the major contributors to the theory of indifference curve analysis. According to them, physical measurement of utility is not feasible. A consumer can only rank the utility derived from various commodities. Ordinal measures express the preference of consumers for different goods.

Indifference curve shows different combinations of two commodities which give equal satisfaction to the consumers. The consumer is indifferent about his choice. In other words, consumer gets equal satisfaction from all combinations of goods.

Assumptions of Indifference Curve Analysis

The indifference curve analysis is based on the following assumptions:

1. **Rationality:** The consumer is assumed to be rational. Consumer wants to get maximum utility, given his income and market prices of commodities. Consumer has full knowledge of market information.
2. **Ordinal Utility:** It is assumed that consumer can rank his preferences according to the satisfaction of each combination.
3. **Diminishing Marginal Rate of Substitution:** The rate at which certain amount of one commodity is substituted for another is called the marginal rate of substitution and it is assumed that the marginal rate of substitution (MRS) tends to fall.
4. **Consistency:** It is assumed that the consumer is consistent in his choice. If in one period, consumer chooses combination A over B, consumer will not choose B over A in another period, when both combinations are presented to him. This assumption may be symbolically expressed as :
If $A > B$, then $B < A$.
5. **Transitivity:** It is assumed that consumer choices are determined by transitivity. Assume, there are three combinations of goods A, B and C. If A is preferred to B, and B is preferred to C, then A must be preferred to C. Similarly, if A is indifferent to B, and B to C, then A is indifferent to C. Symbolically we may write it as

If $A > B$ and $B > C$, then $A > C$.

6.2. THE INDIFFERENCE CURVE APPROACH

Indifference curve indicates different combinations of two commodities which give equal satisfaction to the consumers. In other words, consumer becomes indifferent towards them. The table given further illustrates these combinations on the basis of which an indifference curve can be drawn.

Combination	Commodity -X	Commodity -Y
A	1	10
B	2	7
C	3	5
D	4	4

The above table highlights that consumer gives equal preference to combinations A, B, C or D. The consumer gets equal satisfaction from different combination of two commodities. For example, in combination A, consumer gets 1 unit of X and 10 units of Y and in D combination 4 units of X and 4 units of Y. It shows that different combinations of the commodities give equal satisfaction to the consumers. The above table also highlights that if consumer wants to have additional unit of X, he will have to sacrifice some units of Y in order to get equal satisfaction from different combinations.

Indifference Curve

Indifference curve is derived from data contained in the indifferent schedule. Indifference curve is negatively sloped. It indicates that if consumer wants to have more units of X commodity, he will have to sacrifice some units of Y commodity to get equal level of satisfaction. In the fig. 6.1, combinations A, B, C and D drawn on indifference curve give same level of satisfaction.

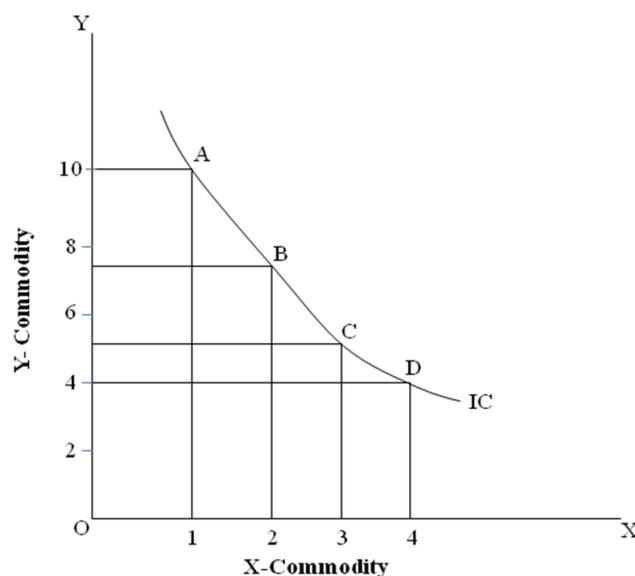


Figure 6.1

6.3 CONCEPT OF DIMINISHING MARGINAL RATE OF SUBSTITUTION (MRS)

The indifference curve analysis is based on law of diminishing marginal rate of substitution (MRS). It means how much commodity of Y which consumer is ready to forego in order to have one additional unit of commodity X, so that he may be able to get same level of satisfaction.

Explanation of Diminishing Marginal Rate of Substitution (MRS)

According to this law if consumer wants to have additional unit of commodity X, he will leave less and less units of other commodity say commodity Y.

In the other words MRS of X for Y will go on diminishing. The law can be explained with the help of following table and diagram:

Combination	Commodity -X	Commodity -Y	MRS
A	1	15	-
B	2	11	1:4
C	3	8	1:3
D	4	6	1:2
E	5	5	1:1

Table showing different combinations of the commodities X and Y.

The above table shows that if consumer wants to have one more units of X, he will leave 4 units of Y. Similarly, when consumer wants to have 3 units of commodity X, consumer will be ready to sacrifice 3 units of commodity Y. Further if he wants to have 4 units of X, he will sacrifice only 2 units of the commodity. It means marginal rate of substitution of X for Y will go on diminishing. MRS can be explained with the help of Figure 6.1

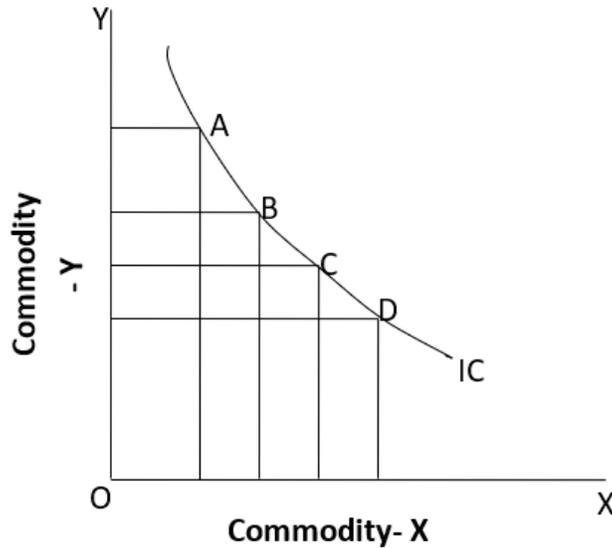


Figure 6.2

The above Figure highlights the diminishing marginal rate of substitution. It means when consumer moves from point A to B and from C to D the marginal rate of substitution of X for Y will go on diminishing. As we move from A to be the consumer is sacrificing y by

$$\Delta Y = Y.$$

You can understand the concept of Marginal Rate of Substitution (MRS) with the help of the following equation also.

Assume that the Indifference Curve is expressed through the equation:-

$$U = f(x, y) = s$$

Figure 6.2

Now if the consumer substitutes x in place of y, the utility accruing to him from y will be less. This loss of utility can be expressed as : $\Delta Y \cdot MU_y$. On the other hand, due to the subsequent increase in the quality of X (in order to mention the same level of satisfaction) the additional amount of utility can be expressed as : $\Delta X \cdot MU_x$.

Since s (the level of satisfaction) in the equation is constant, therefore,

$$- Y \cdot MU_y = \Delta X \cdot MU_x$$

or
$$\frac{-\Delta Y}{\Delta X} = \frac{MU_x}{MU_y}$$

Now the equation $\left(\frac{\Delta Y}{\Delta X}\right)$ shows the negative rate of the slope of the Indifference curve which is termed as the Marginal Rate Substitution (MRS) of X for Y.

Reasons for diminishing Marginal Rate of Substitution

The diminishing MRS implies that for every equal addition in the quality of commodity X. The consumer would be learning out of at a diminishing rate. The fundamental reasons for the phenomenon are being discussed below.

1. In order to remain at the same level of satisfaction and thereby on the same Indifference curve, it is essential for the consumer to reduce the equality of one commodity (say Y) if he increases the quality of the other (say x).
2. According to the Law of diminishing Marginal Utility, the addition in the utility due to the use of additional quality of X would be compensated by the decreasing amount of utility due to a reduction in the quality of Y. Now, for the consumers the marginal significance of Y would be rising which means that he will be prepared for a lesser amount of sacrifice by leaving out controlling lesser quality of the commodity he is giving up (Y in this case). By doing so he equates the gain in the utility (due to an increase in X) with the loss in utility by reducing Y.

6.4 PROPERTIES OF INDIFFERENCE CURVE

The properties of indifference curve are based on following assumptions:

(a) Non-satiety: It is assumed that the consumer will always prefer a large amount of a commodity to small amount of other commodity, provided the amount of other goods at his disposal remains unchanged. This means that the consumer has yet not reached the point of satiety in the consumption of any good.

(b) Transitivity: This implies that the tastes of the consumer are consistent. Let us suppose that there are three combinations of two goods, i.e., A, B and C, and the consumer is indifferent between A and B, B and C, then obviously the consumer will also be indifferent between A and C. Thus, if the consumer prefers A to B and B to C, the consumer will also prefer A to C.

(c) Diminishing Marginal Rate of Substitution: The consumer is to substitute more and more units of Y for one unit of X. So the consumer will give up fewer units of Y for each additional unit of X.

6.4.1 Indifference Curves are Downward Sloping

Indifference curve slopes downward from left to right. It is based on the assumption that if consumer wants to have more units of X, consumer will have to leave some units of commodity Y. It has been shown in the Fig. 6.3.

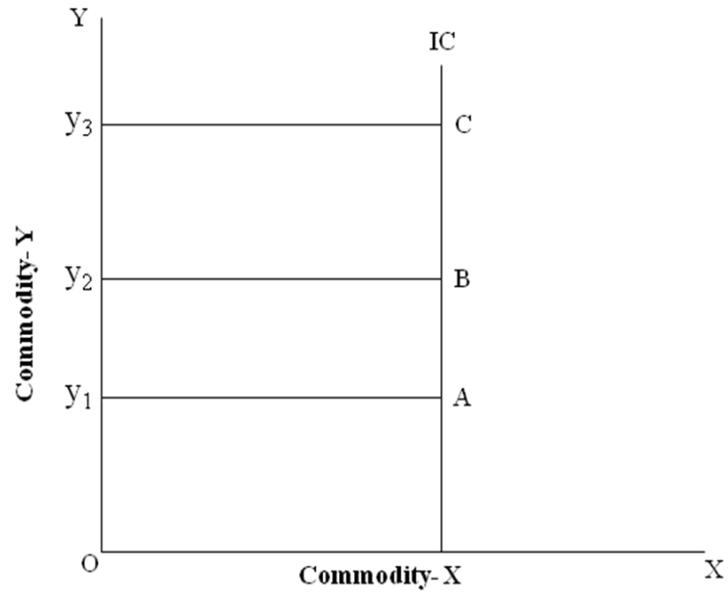


Figure 6.4

Indifference curve cannot be parallel to Y axis as shown in Fig. 6.4. It means consumer is having more units of commodity Y with constant amount of commodity X. It is against the basic assumption of indifference curve. It means if consumer wants more units of the commodity, consumer will leave some units of other commodity.

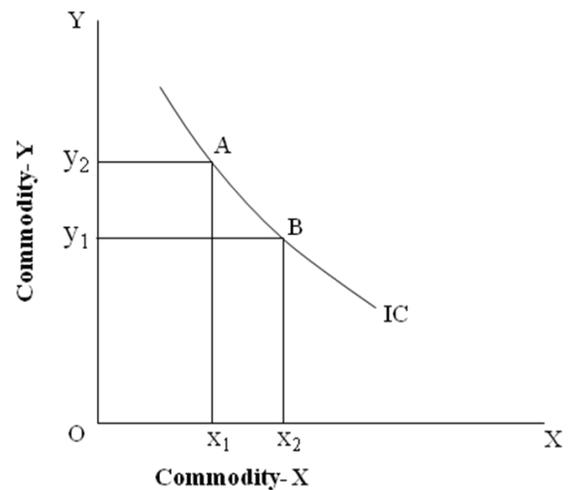


Figure 6.3

Similarly indifference cannot be parallel to X-axis as shown in Fig. 6.5. It means consumer is having more units of commodity X with constant amount of commodity Y. It is against the basic assumption of indifference curve. It means if consumer wants more units of the commodity, consumer will leave some units of other commodity.

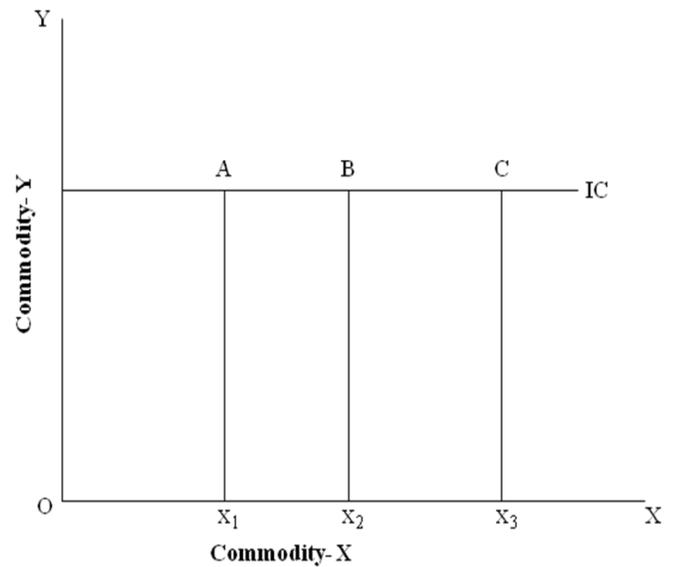


Figure 6.5

Indifference curve cannot be positively sloped. It indicates that consumer is preferring more units of both the commodities, which is not feasible in the indifference curve analysis. It is shown in the Fig. 6.6.

In this Figure, consumer is getting more units of both commodities, when consumer moves from point A to B and from point B to C and so on.

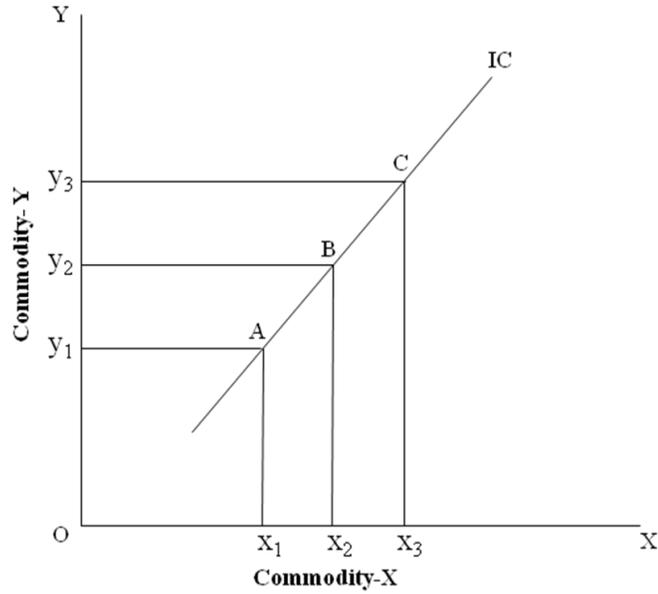


Figure 6.6

6.4.2 No Two Indifference Curves Cut Each Other

Two indifference curves cannot cut each other. It will highlight the same amount of two commodities at lower and higher indifference curve. It is against the assumption of properties of indifference curves. In Figure 6.7, combination B and C on the lower and higher indifference curve gives same level of satisfaction.

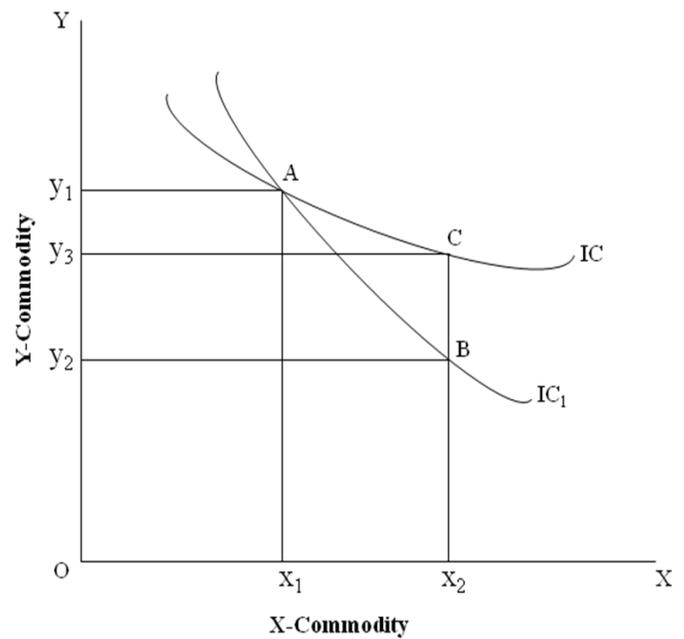


Figure 6.7

6.4.3 Higher Indifference Curve Represents Higher Level of Satisfaction

It means consumer gets more satisfaction when consumer moves from lower indifference curve to higher indifference curve. In the Figure 6.8, consumer is getting more satisfaction from indifference curve IC_2 as compared to lower indifference curve IC_1 .

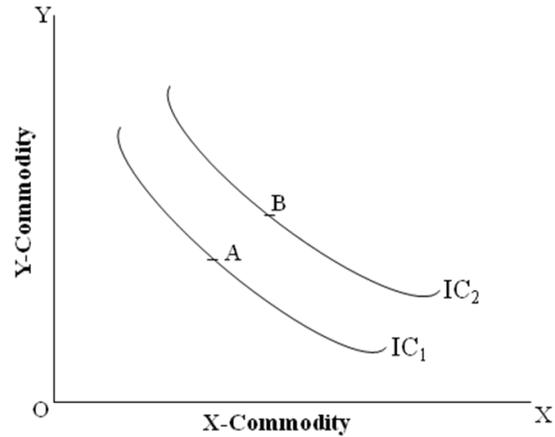


Figure 6.8

6.4.4 Indifference Curve will not Touch either X-axis or Y-axis

It means consumer is having only commodity X or Y, which is not feasible under indifference curve analysis.

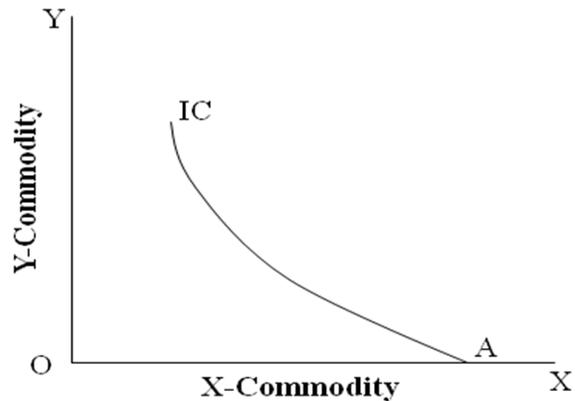


Figure 6.9(a)

The Figure 6.9(a) reveals that consumer is having only X commodity at point A. The Figure 6.9(b) highlights that consumer is having only Y commodity at point B.

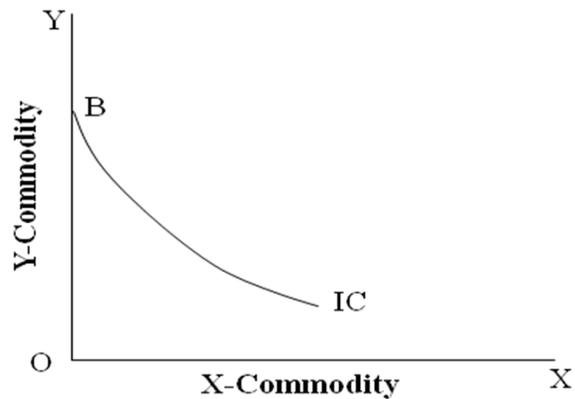


Figure 6.9(b)

6.4.5 Indifference Curve need not be Parallel to Each Other

Indifference curve need not be parallel to each other. It means different indifference curves can have different MRS. They can be parallel but should not cut each other. It has been shown in fig. 6.10.

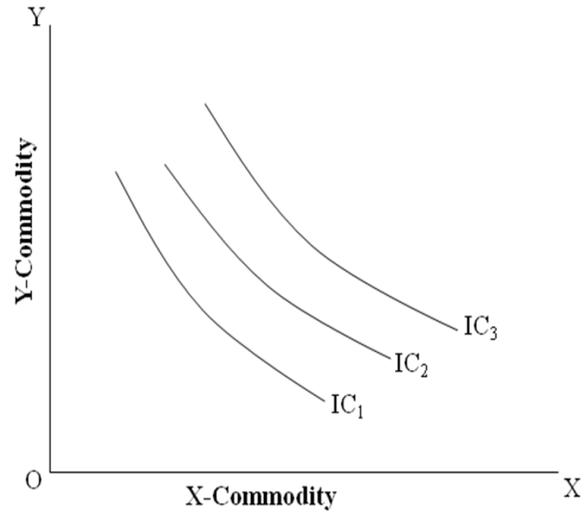


Figure 6.10

6.4.6 Indifference Curves are Convex to Origin

Indifference curves are convex to origin. This property of indifference curve is based on diminishing marginal rate of substitution. It means marginal rate of substitution of commodity X for Y will go on diminishing as consumer wants more units of commodity X. It has been shown in the Fig. 6.11.

The Figure reveals that if consumer wants to have more unit of commodity X, he will leave less and less units of commodity Y.

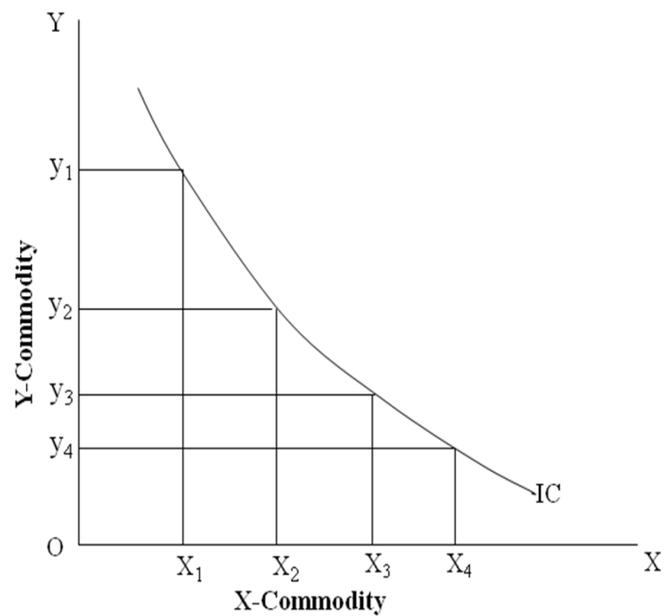


Figure 6.11

Indifference curves can not be concave to origin, it means the marginal rate of substitution of commodity X for Y will go on increasing. It is not feasible under the indifference curve analysis. It means, if consumer wants to have more units of X commodity, he will leave more and more units of commodity Y. It has been shown in the Fig. 6.12, as the shaded areas.

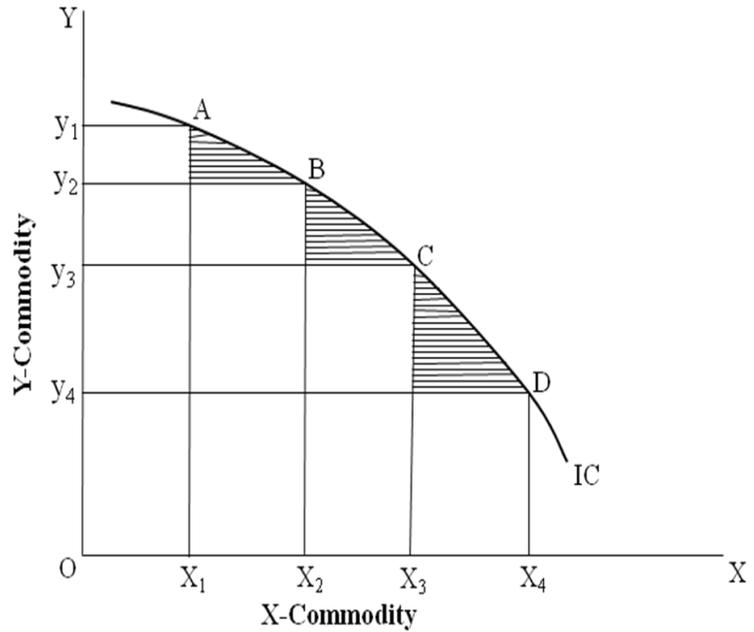


Figure 6.12

Indifference curve can be straight line only in case of substitutes. In this case, marginal rate of substitution for commodity X for Y will be constant. It means if consumer wants to have one more unit of X, he will leave one unit of Y. It has been shown in the Figure 6.13.

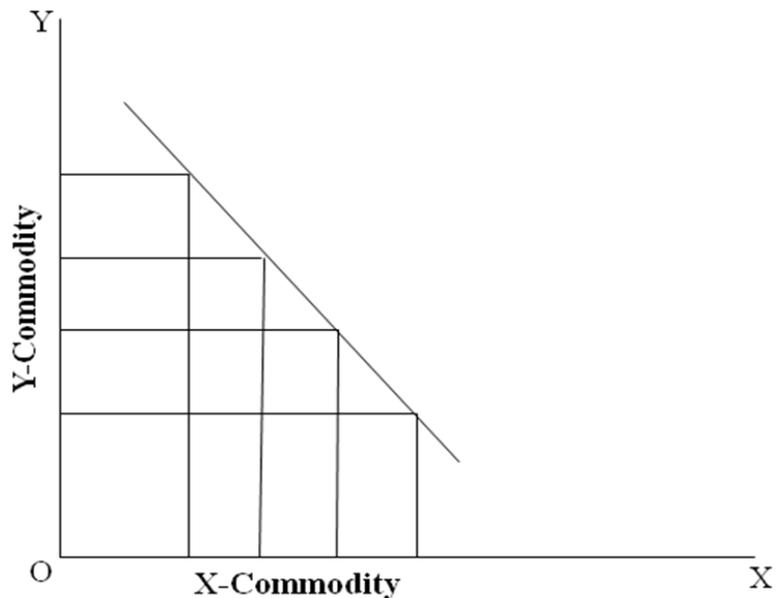


Figure 6.13

Indifference curve can be right-angled in case of complementary goods. Complementary goods are those goods in which both goods are to be consumed simultaneously. For example, paper and pen, etc. In this case, indifference curve will be right-angled. It has been shown in the Figure 6.14.

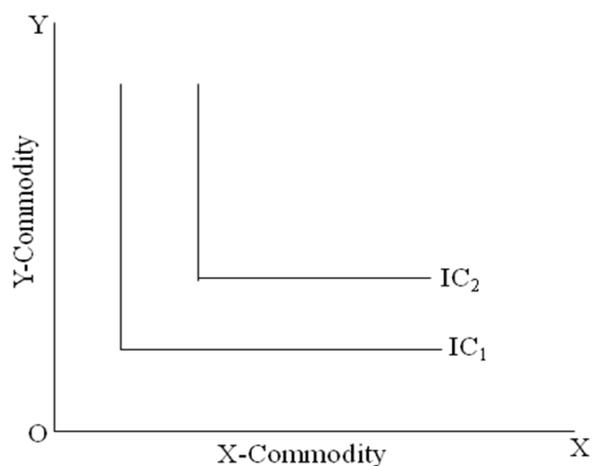


Figure 6.14

6.5 BUDGET LINE

Budget line shows different combinations of two commodities which the consumer can purchase with his given income. Let us suppose that consumer has to buy different combinations of both X and Y commodities, while in the market, he finds that :

$$P_x = \text{Rs. 5 each unit}$$

$$P_y = \text{Rs. 1 each unit}$$

Assume that money (i.e. Rs. 100) is expressed as M, the budget line can be drawn as follows :

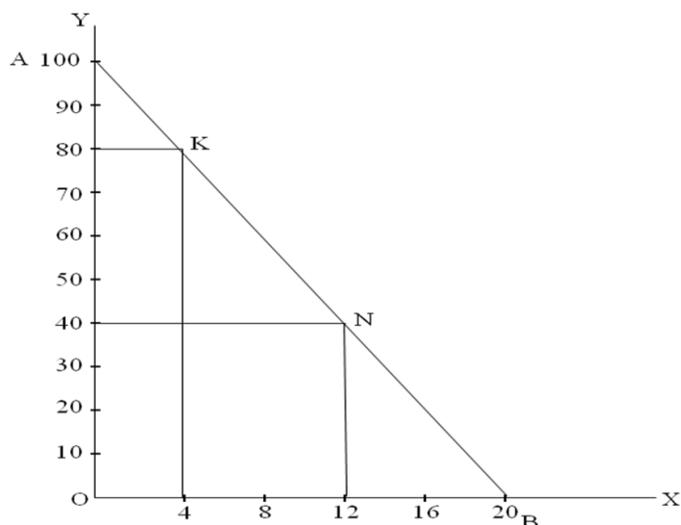


Figure 6.15 : Showing budget line

If the consumer spends whole of his income to purchase commodity X, he can purchase 20 units of the commodity X. On the other hand, consumer spends whole of his income to purchase commodity Y, he can purchase 100 units. In between these two extremes, consumer can buy different combinations of commodity X and Y. You can see that when the consumer is on K, he buys 80 units of Y with 4 units of X and thus spends Rs. 100 (i.e. $80 \times P_x = \text{Rs. } 80 / 4 \times P_y = 4 \times 5 = 20 \text{ M} = 80 + 20 = 100$). At point NY he purchases 40 units of Y and 12 units of X spending Rs. 100. It follows that he can use several other combinations of both X and Y with the money (i.e. M) that he has with him.

In the Figure 6.15, on X-axis commodity X has been taken and on Y-axis commodity Y. In this Figure, AB is the budget line. It shows that consumer can purchase two combinations of commodities within the given budget line. The above Figure shows that consumer can buy OA units of commodity Y or OB units of commodity X. The above budget line shows that consumer can buy any two combinations on the budget line AB.

Budget line also known as price line can also be expressed as the following equation :

$$M = q_x P_x + q_y \cdot P_y$$

Where M is the monetary income of the consumer which is constant

q_x is the quantity of commodity x

P_x is the price of commodity x

q_y is the quantity of commodity y

P_y is the price of commodity y

Now since $M = q_x \cdot P_x + q_y \cdot P_y$

$$- q_y \cdot P_y = - M + q_x \cdot P_x$$

$$- q_y = \frac{-1}{P_y} M + q_x \cdot \frac{P_x}{P_y}$$

$$q_y = \frac{1}{P_y} M - q_x \frac{P_x}{P_y}$$

Now if the consumer spends his entire income (M) on Y only, then $Q_x = 0$ and then we will have a straight line.

$$q_y = \frac{1}{P_y} \cdot M - 0 \left(\frac{P_x}{P_y} \right)$$

$$q_y = \frac{M}{P_y}$$

Wherever, if $q_y = 0$ i.e. no money is spent on y, we will find the other point :

$$q_x = \frac{M}{P_x}$$

Making both these points meet each other, we will get the budget line or the price line. The slope of this line will show the ratio between the prices of x and y. Taking reference to the figure given earlier, the slope of the budget line may be geometrically expressed as

$$\frac{OA}{OB} = \frac{\frac{M}{P_y}}{\frac{M}{P_x}}$$

$$= \frac{M}{P_y} \times \frac{P_x}{M},$$

Since M is common, the ratio will be $= \frac{P_x}{P_y}$

6.5.1 Change in Prices

If the income of the consumer remains constant, with the change in price, the budget line will shift right or left to the original budget line. If price of the commodity X falls, the budget line will shift to right to the original budget line. It has been shown in the Figure 6.16. In the following Figure, AB is the original budget line. If price of the commodity X falls, budget line will shift from AB to AB₁.

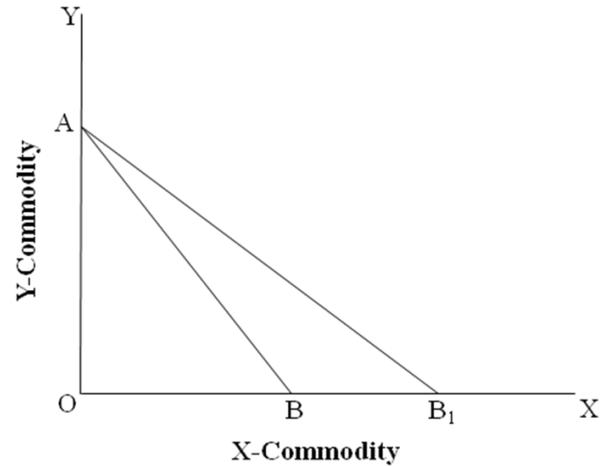


Figure 6.16

On the other hand, if price of the commodity Y increases, the budget line will shift left to the original price line. In the following Figure, AB is the original budget line, If price of the commodity Y increases budget line will shift from AB to BA₁, i.e., left to original budget line. It has been shown in fig.6.17.

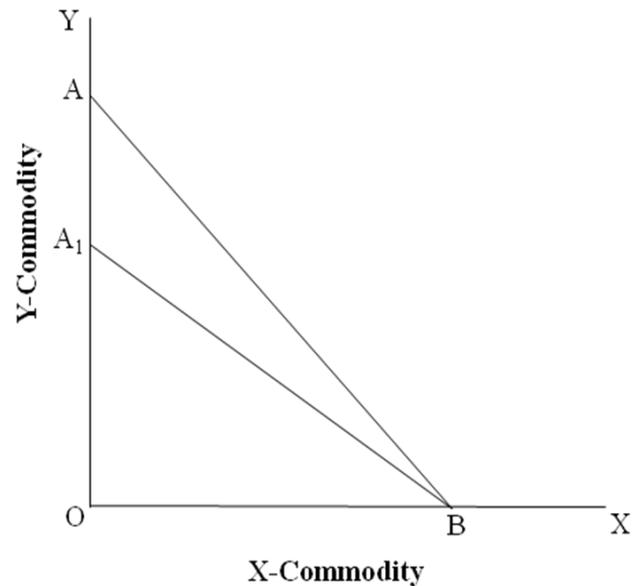


Figure 6.17

6.5.2 Change in Income

There are situations in which the income of the consumer changes and prices of the commodities remain constant. Supposing that the income of the consumer increases, the budget line shifts right to original budget line. It has been shown in Figure 6.18, where AB is the original budget line. With increase in income the budget line AB will shift right to original budget line, which is shown as A_1B_1 in the figure. It means consumer will buy more units of both commodities.

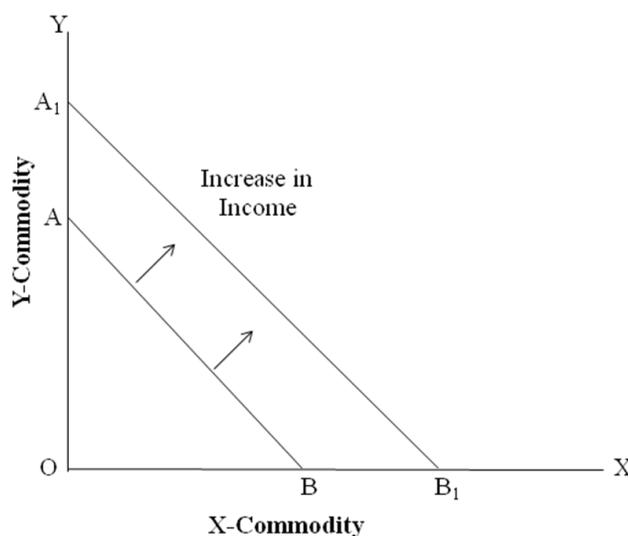


Figure 6.18

On the other hand with decrease in income of consumer, the budget line will shift to the left of original budget line. In Figure 6.19, AB is the original budget line. With decrease in income the budget line AB will shift from its original place and the new budget line will be A_2B_2 . It means consumer will buy less units of both commodities.

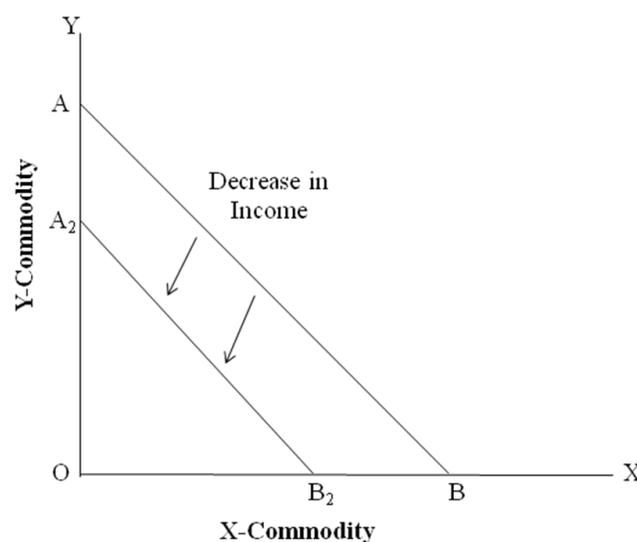


Figure 6.19

6.6 INCOME EFFECT

Income effect is the effect on the quantity demanded of a commodity due to change in the income of the consumer while the prices of the other commodities remain the same. In other words, the income effect, reflects the effect on the consumer equilibrium due to the change in money income. In the following paragraph, we will study the effect of change in income on consumer's equilibrium.

Let us suppose, the prices of both commodities remain constant, scale of preference is given, income of the consumer changes.

Income effect can be illustrated with the help of the Figure 6.20.

Figure shows that initially with the price line AB the consumer is in equilibrium at point E and he buys OQ amount of commodity X and ON amount of commodity Y. Now, assume that the income of the consumer increases. As a result the price line shifts to A_1B_1 is the new equilibrium point on higher indifference curve IC_1 where he buys OQ_1 units of commodity X and ON_1 units of commodity Y. Here, consumer is better as he moves to a higher indifference curve which represents a higher level of satisfaction. Thus, as a result of increase in income the consumer will get a higher level of satisfaction. If his income increases still further, his price line will shift to A_2B_2 and A_3B_3 . At A_2B_2 he buys OQ_2 of X commodity and ON_2 of Y commodity. In the same way, A_3B_3 , he buys OQ_3 of commodity X and ON_3 of commodity Y. Thus, we get various points of equilibrium such as E, E_1 , E_2 , E_3 . If we joint these points we get a curve known as *Income Consumption Curve*, i.e., ICC. Therefore, income consumption curve is the locus of points showing the equilibrium of the consumer at different levels of income, when the prices of two goods are given and constant.

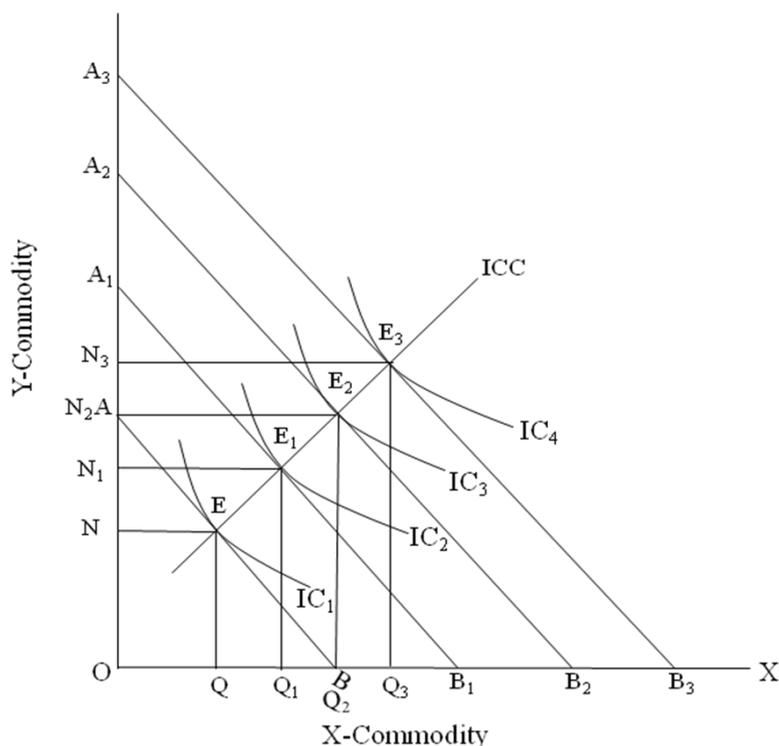


Figure 6.20

Therefore, income consumption curve is the locus of points showing the equilibrium of the consumer at different levels of income, when the prices of two goods are given and constant.

Income Effect in Case of Superior or Inferior Goods

Normally, in case of superior goods (normal goods), as the level of income increases, the demand for such commodities also increases and vice-versa. On the contrary, the demand of inferior goods falls with the increase in income and vice-versa. Thus both type of cases can be discussed in terms of X and Y goods.

X-commodity as an Inferior good and Y-commodity as Superior good

You would notice in the figure given further, that X commodity is shown on the OX axis, Y is shown on OY axis. Considering X-commodity inferior and Y commodity as superior, consumer will purchase more of Y and less of X as income rises. On the other hand, if there is fall in income, consumer will prefer X commodity (more demand for X commodity) to Y commodity (less demand for Y commodity). Thus, in case of X commodity as inferior, indifference map would be such as to yield income consumption curve slopes backward towards Y commodity (left side).

Y commodity as an Inferior good and X-commodity as Superior good

In the Figure 6.22, at given level of income and prices of two goods, the price line is A_1B_1 . In this case, consumer buys more of X good and less of Y good. The equilibrium is E. Therefore, at different budget lines like A_2B_2 , A_3B_3 , A_4B_4 , the consumer gets E_2 , E_3 and E_4 where IC curve touches. By joining different points of equilibrium (E_1 , E_2 , E_3 and E_4) we get ICC curve which is backward bending towards X-axis. The slope ofr ICC moves downward to the right beyond point E_2 , i.e., bends towards X-axis. It signifies that good Y is inferior because beyond E income effect is negative for commodity Y (quantity demanded falls as income increases).

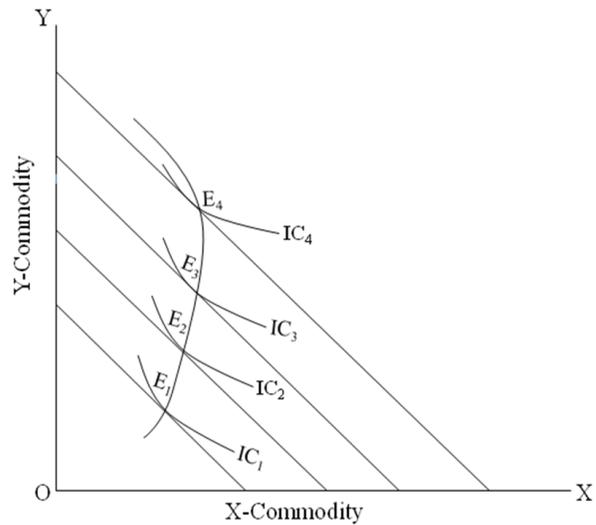


Figure 6.21

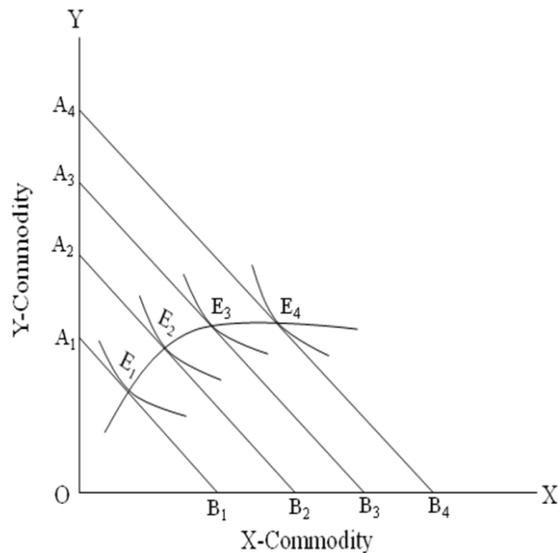


Figure 6.22

Substitution Effect

Substitution effect can be explained through the following diagram :

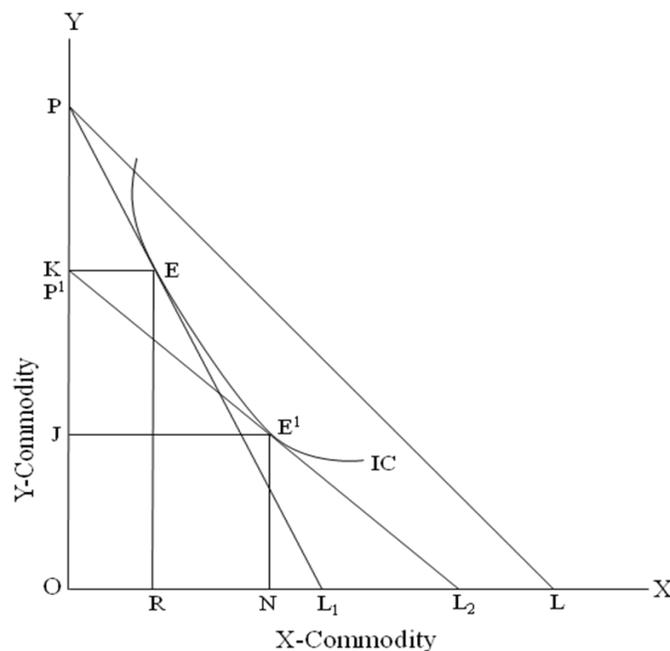


Figure 6.23

The ratio between money income of the consumer and the prices of X and Y are expressed through PL_1 line. The consumer is at equilibrium when he purchases OR of X. Assume that the price of X has fallen and the new price line is PL. Now due to the fall in the price of X, consumer's real income increases and with this added real income (or purchasing power) he can buy OL quantity of X in phase of OL. In order to identify substitution effect, this extra money income should be deducted from this swollen purchasing power so that the consumer remains on the same level of satisfaction. For this, we will have to consider two factors : first, the Indifference Curve should remain the same i.e. point of equilibrium could be any point on this Indifference Curve, but the price to be taken should be the one which is reflected by the new Price Line (PL). For the line parallel to this new price line (PL) should be drawn (which is P^1L_2 in this diagram) which is tangent to the IC at any point, P^1L_2 in this diagram is the line which is parallel to PL (i.e. $\frac{OP}{OL} = \frac{OP^1}{OL_2}$). Now the shift of the consumer from point E to E1 or the increase of

RN in the quantity of X may be called as the Substitution Effect.

6.7 CONSUMER EQUILIBRIUM

Consumer's equilibrium refers to a situation in which consumer buys different combinations of two commodities with his limited money income which gives maximum satisfaction and the consumer does not want to make any change. Thus, it refers to a situation when there is no tendency on the part of the consumer to buy more or less of the commodity which has already been consumed.

Assumptions

The following are the assumptions of the consumer's equilibrium through indifference curve analysis.

1. Income of the consumer is given.
2. Prices of goods and services are constant.
3. Consumer is rational and wants to get maximum satisfaction from his income.
4. Consumer is aware of the indifference map.
5. All goods are homogeneous and divisible.
6. The condition of transitivity is satisfied. If combination $A > B$ and $B > C$ then $A > C$.
7. The condition of non-satiety holds. The consumer prefers more of one commodity or of the other or of both.

Conditions of Consumer's Equilibrium

The following are the conditions of consumer's equilibrium.

1. Price line must be tangent to indifference curve, i.e., $MRS_{XY} = P_x/P_y$

In the Figure 6.24, commodity X has been shown on OX axis and Y on OY axis. AB is the budget line, it shows different combinations of two commodities, which consumer can purchase with his given income.

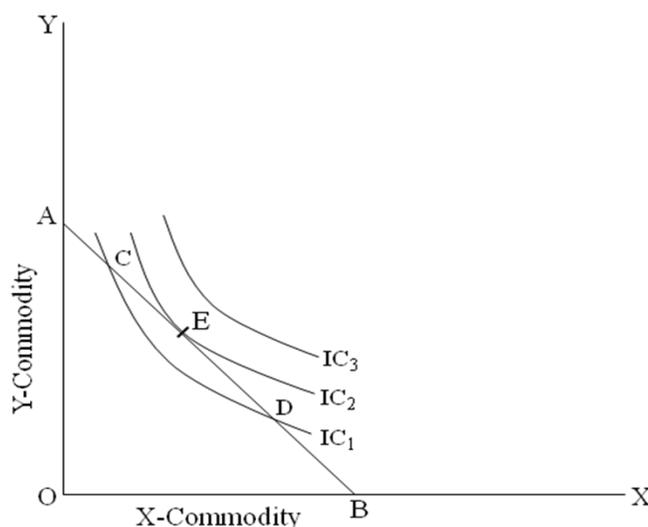


Figure 6.24

The indifference map in the figure has the indifference curves IC_1 , IC_2 and IC_3 . The consumer will be in equilibrium at point E. The reason being, the highest attainable indifference curve, i.e., IC_2 is tangent to budget line AB. The point C and D can not be the equilibrium of the consumer, because at both these points can not give maximum satisfaction to the consumer, consumer can move to higher point E. Similarly, consumer can not be equilibrium at indifference curve IC_3 because he doesn't have adequate money to reach indifference curve IC_3 .

Tangency between indifference curves and the price line is necessary but not a sufficient condition for consumer's equilibrium. A second condition must also be satisfied which suggests that at the point of equilibrium, indifference curve must be convex to the origin. To put it in another way, the MRS of X for Y must be falling at the point of equilibrium. It has been observed in the previous Figure that IC is convex to the origin. Thus, at point E, both the conditions of equilibrium are fulfilled. The indifference

curve is tangent to the price line and is also convex to the origin. Therefore, E is the point of stable equilibrium for the consumer.

It is possible that while the price line is tangent to the indifference curve at a point, the indifference curve, instead of being convex, is concave to the origin. In the Figure 6.25, at point E, the price line is tangent to the indifference curve is concave to the origin. It does not represent point of maximum satisfaction because, by moving along the price line AB, consumer shifts to higher and higher indifference curves. For example, if consumer moves higher IC Here, it must be noted that at point B on IC the consumer purchases only X commodity and no unit of commodity Y. It means that the consumer is having only one commodity.

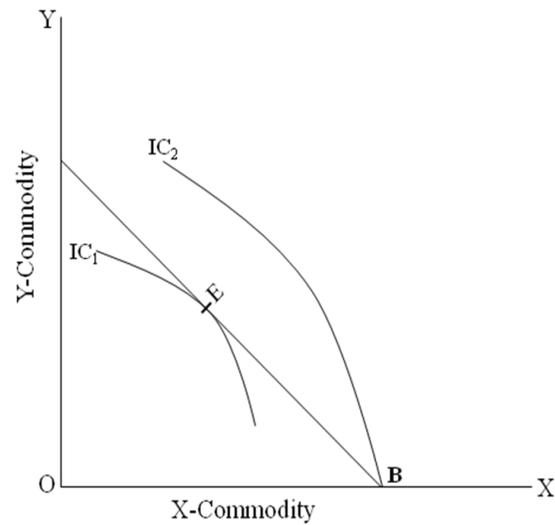


Figure 6.25

Therefore, if indifference curves are not convex to the origin, the consumer is bound to suffer.

6.8 RELATIONSHIP BETWEEN PRICE EFFECT, INCOME EFFECT AND SUBSTITUTION EFFECT

The effect of change in price is known as Price Effect. But Price effect is not a single phenomenon. It is the composite form of both income and substitution effect.

When price of the commodity falls, real income of the consumer increases. It means consumer can buy more units of commodity with his given income. It is termed as income effect. Similarly when price of the commodity

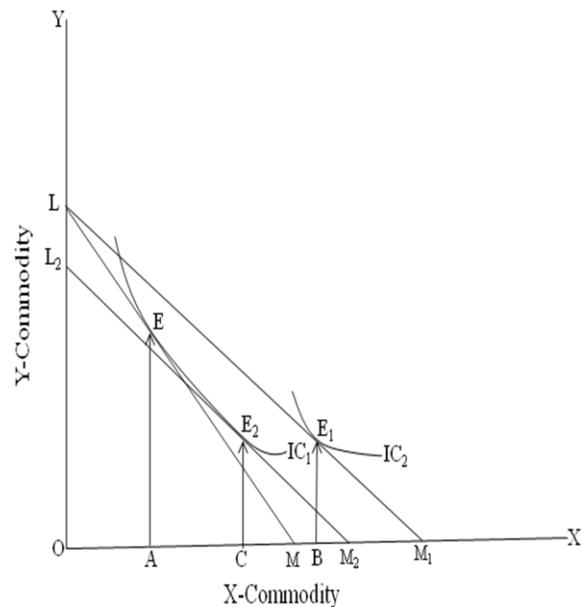


Figure 6.26

falls, consumer substitutes relatively cheaper commodity for relatively dearer/costly commodity, it is known as substitution effects, It means price effect is a combination of income and substitution effect. It can be explained with the-help of Figure 6.26.

Let us suppose LM is the budget line, which shows the different combinations of two commodities, which the consumer can purchase with his given money income. IC_1 is indifference curve which is tangent to budget line LM at point E. Consumer is having OA amount of commodity X. Let us suppose price of X falls, the commodity X becomes relatively cheaper. Given his money income, the new budget line will shift from LM to LM_1 i.e., right of original budget line LM. The indifference curve (IC_2) will shift to new budget line and it will be tangent to budget line LM_1 at point E_1 . Now consumer is consuming OB units of commodity X. The difference between OA and OB, i.e., AB is known as *price effect*. It comprises of income and substitution effect. The reason being, the real mean of the consumer increases with fall in the price of the commodity X. The commodity X becomes cheaper relative to commodity Y. The consumer substitute commodity X for Y. How much amount of commodity X has been substituted for Y, when money income changes. To know the substitution effect and price effect the real income of the consumer should be reduced in such a manner that consumer comes to original indifference curve IC_1 . Thus, consumer real income is reduced to that extent that consumer returns on the indifference curve IC_1 . The budget line (L_2M_2) parallel to left of new budget line LM_1 is drawn in such a manner that it touches the indifference curve IC_1 at point E_2 . At this new equilibrium point E_2 , the consumer will buy OC amount of commodity X. Thus, AC is substitution effect. It means AC amount of commodity X has been substituted, when price of X falls. CB is the income effect. Thus,

Price Effect = Substitution effect + Income effect.

$$AB = AC + CB$$

$$\text{Price Effect} = EE^1$$

$$\text{Income Effect} = E^2E^1$$

$$\text{Substitution Effect} = E^1E^2$$

Thus EE^1 is the sum total of E^2E^1 and E^1E^2

6.9 DERIVATION OF DEMAND CURVE WITH THE HELP OF INDIFFERENCE CURVE ANALYSIS

The demand curve shows the relation between price and quantity demanded. In other words, it shows different quantities of commodities which the consumer purchases at different prices at given point of time, other things remaining constant. Demand curve can also be derived with the help of indifference curve analysis.

Demand curve can be derived with the help of price consumption curve. The curve highlights that, if income of the consumer is given, how much demand for the commodity is affected by change in prices. It shows that both the price consumption

curve (PCC) and demand curve show different quantities of the commodities demanded by consumer at different prices.

It has been shown in part A of the Figure 6.27, on X-axis commodity X has been taken and on Y-axis income. Similarly in part B of the Figure, price is taken on Y-axis and quantity demanded on X-axis.

Part A of the Figure shows the budget line LM and indifference curve IC_1 is tangent at point E_1 . With the fall in the price of the commodity X, the new budget line LM_1 will shift right to original budget line LM_2 . E_2 will be the new equilibrium point because at this point indifference curves are touching new budget line LM_1 . Similarly with further fall in price, the budget line LM_2 will shift to right of new budget line LM_1 . E_3 will be the point of equilibrium. By joining the points E_1 , E_2 and E_3 we get price consumption curve (PCC). At point E_1 , a consumer is willing to buy OA amount of commodity X. Price of the commodity can be calculated with the help of slope of the budget line, i.e., OL/OM .

Now suppose the price works out to be OP_1 and the demand for the commodity is ON_1 . Similarly when the price of the commodity further falls, the new budget line is LM_1 and the quantity demanded is OB. Price of the commodity has been calculated by the slope of the budget line LM_1 , i.e., OL/OM_1 the quantity demanded in this case is ON_2 . Further fall in price, price of commodity X can be calculated by the slope of the price line LM_2 , i.e., OL/OM_2 .

In Part B of the Figure, price has been taken on Y-axis and quantity demanded on X-axis. By joining the different prices i.e. OP , OP_1 and OP_2 corresponding to quantity demanded ON_1 , ON_2 and ON_3 , the demand curve DD has been derived.

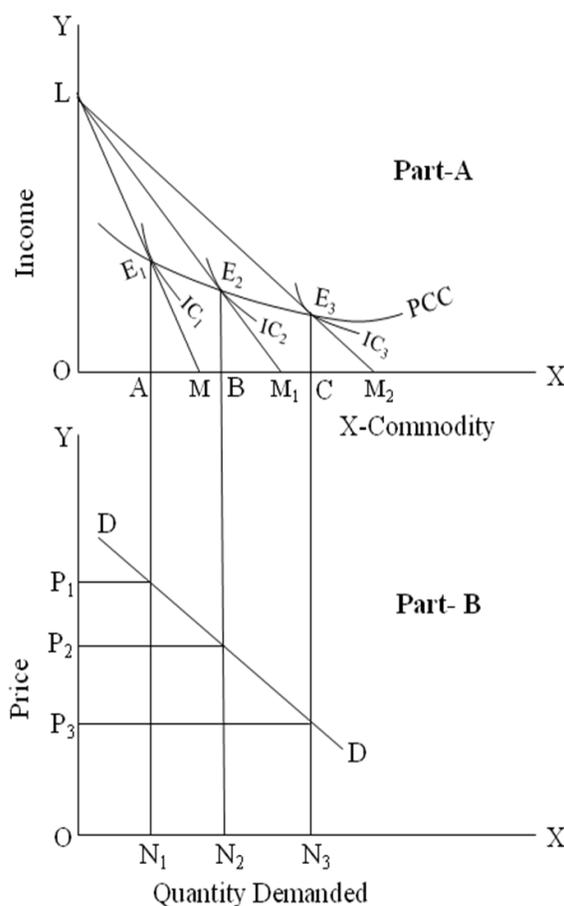


Figure 6.27

6.10 APPLICATIONS OF INDIFFERENCE CURVE ANALYSIS IN BUSINESS

Indifference curve analysis is applied to many dimensions of business, some of these have been discussed in the following paragraphs.

(a) Consumption

Indifference curve analysis is more useful in the field of consumption. The consumer tries to achieve maximum satisfaction given his money income and different combinations of two commodities. Consumer achieves maximum satisfaction when budget line is tangent to indifference curve.

(b) Consumer's Surplus

Through indifference curve analysis consumer surplus can be measured easily. It signifies the difference in the price which the consumer is willing to pay and price actually prevailing in the market. Suppose a consumer is willing to pay Rs. 10 for the commodity and that particular commodity is available at Rs. 8, the difference of Rs. 2 is consumer's surplus. It can be estimated more easily through indifference curve analysis.

(c) Production

Producer's equilibrium can be best explained with the help of indifference curve analysis. Iso-product lines are similar to indifference curve. Iso-cost curve is like the budget line. In simple words, iso-product lines mean different combinations of two inputs yielding equal level of output and iso-cost line represents the different combinations of two inputs which producer can buy with his given income. The producer will be in equilibrium when iso-cost line is tangent to iso-product line. This point gives best combination of two inputs, which yields maximum production.

(d) Explanation of Law of Demand

Indifference curve analysis explains the linkages between price effect, substitution effect and income effect in a comprehensive way. It provides complete examination of law of demand.

6.11 SUMMARY

The indifference curve shows the different combinations of two commodities which gives equal satisfaction to the consumers. The indifference curves are convex to origin. The convexity of the curve has been due to diminishing marginal rate of substitution. The marginal rate of substitution is the rate at which consumer substitutes one commodity for another. The budget line shows the different combinations of two commodities which the consumer can buy with his given income and prices. The consumer attains maximum satisfaction when his budget line touches his highest attainable indifference curve. The indifference curve has several practical applications in real life. It is used in the area of consumption, production and consumer welfare. When consumer reaches the higher indifference curve, it means consumer welfare has enhanced substantially. The law of demand can better be explained with the help of indifference curve analysis.

6.12 Glossary

- **Indifference Curve:** Represents the combinations of goods that provide the consumer with the same level of satisfaction.
- **Marginal Rate of Substitution (MRS):** According to this rule, if a consumer wants to obtain an additional unit of good X, then they must give up some amount of good Y or some other good.

6.13 Check your Progress

(A) Fill in the blanks :

- (i) Indifference Curve is sloped.
- (ii) Indifference Curve cannot be parallel to
- (iii) An indifference curve cannot be
- (iv) With an increase in income, demand of an inferior good..... .
- (v) Indifference Curve follows the
- (vi) When price of any commodity rises, the real income of the consumer

(B) Point out whether the following statements are true or false :

- (i) Indifference Curve is convex to the origin.
- (ii) Indifference Curve shows that the consumer is ready to sacrifice lesser number of units of Y for each additional unit of X.
- (iii) A consumer can move beyond the price line.
- (iv) A consumer attains equilibrium where the indifference curve cuts the budget line.
- (v) The substitution effect is a part of the price effect.
- (vi) A demand curve can be depicted through price price-consumption curve.

(C) Multiple choice questions:

1. Given the budget line, if income of consumer increases with no change in price of X and Y.
 - (a) Budget line will shift right of Original budget line.
 - (b) Budget line will shift left of original budget line.
 - (c) Budget line becomes parallel to X-axis.
 - (d) Budget line becomes parallel to Y-axis.
2. Price effect is the combination of:
 - (a) Income effect and-substitution effect:
 - (b) Difference between income effect and substitution effect.
 - (c) Both a and b.
 - (d) None of the above.
3. For the consumer to be in equilibrium under indifference curve, indifference curve should be:
 - (a) Concave to origin
 - (b) Convex to origin.
 - (c) Parallel to X-axis.
 - (d) Parallel to Y-axis.
4. If indifference curve is convex to origin, marginal rate of substitution should:

- (a) Decrease. (b) Increase
(c) Constant. (d) None of the above

6.14 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Negatively (ii) any of the axes (iii) concave (iv) Falls
(v) Ordinal (iii) Decreases
(B) (i) True (ii) True (iii) False (iv) False
(v) True
(vi) True
(C) 1. (a) 2. (a) 3. (b) 4. (a)

6.15 TERMINAL QUESTIONS

(A) Short Answer Questions:

1. What is indifference curve ?
2. Define budget line.
3. What is meant by income effect ?
4. Explain the concept of marginal rate of substitution.
5. What are the assumptions of indifference curve ?
6. State the condition of consumer's equilibrium.

(B) Long Answer Questions :

1. What are the properties of indifference curve ?
2. Explain consumer's equilibrium with the help of indifference curve analysis.
3. Show how price effect is the combination of income affect and substitution effect.
4. How do you derive demand curve with the help of price consumption curve ?

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UNIT-7-REVEALED PREFERENCE E THEORY AND HICKSIAN REVISION

Structure

- 7.1 Introduction**
- 7.2 Choice Reveals Preference**
- 7.3 The Law of Demand**
- 7.4 Derivation of Demand Curve from Revealed Preference**
- 7.5 Hicksian Approach to Law of Demand**
- 7.6 Superiority of Revealed Preference Theory**
- 7.7 Limitations of the Revealed Preference Theory**
- 7.8 Summary**
- 7.9 Glossary**
- 7.10 Check your Progress**
- 7.11 Answers to check your Progress**
- 7.12 Terminal Questions**
- 7.13 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to –

- Understand the behavior of consumers under the strong ordering hypotheses.
- Derive demand curve from Revealed Preference.
- Identify the superiority of Revealed Preference Theory.
- Understand the Hicksian Approach to the derivation of Law of Demand.
- Understand the limitations of the Revealed Preference Theory.

7.1 INTRODUCTION

Revealed Preference theory was developed by Paul A. Samuelson in 1938. Samuelson has criticised the marginal utility and indifference curve theories on the basis of weak ordering hypothesis given by Hicks and built up his theory on 'strong ordering' hypothesis. The theory derives the law of demand in a direct and simple manner. It also separates the price effect from income and substitution effects in a manner different from indifference curve theory. The revealed preference theory is regarded as “scientific” (meaning behaviouristic) explanation of consumer’s behaviour as against the psychological explanation provided by Marshallian and

Hicks-Allen theories of demand. This shift from psychological to behavioural explanation of consumer's behaviour is a landmark in the development of the theory of demand.

7.2 CHOICE REVEALS PREFERENCE

Professor Samuelson's theory of demand is based on the revealed preference axiom or hypothesis which states that choice reveals preference. Keeping this fact into view, a consumer buys a combination of two goods either because he likes this combination in relation to others or this is cheaper than others. Suppose a consumer buys combination A rather than combination B, C or D. It means that he

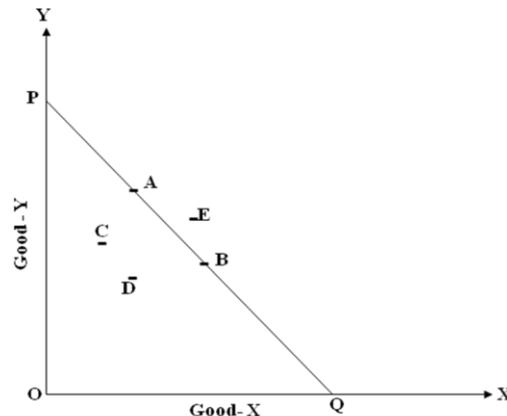


Fig. 7.1

reveals his preference for combination A. He can do this for two reasons; first, combination A may be cheaper than the other combinations B, C, D. Second, combination A may be dearer than others and even then he likes it more than other combinations. In such a situation, it can be said that A is revealed preferred to B, C, D. or B, C, D are revealed inferior to A. This is explained in Figure. 7.1 Given the income and prices of the two goods X and Y, PQ is the price-income line of the consumer. The triangle OPQ, Good X is the area of choice for the consumer which shows the various combinations of X and Y on the given price-income situation PQ. In other words, the consumer can choose any combination between A and B on the line PQ or between C and D below this line. If he chooses A, it is revealed preferred to B. Combinations are revealed inferior to A because they are below the price-income line PQ. But combination E is beyond the reach of the consumer being dearer for him because it lies above his price-income line PQ. Therefore, A is revealed preferred to other combinations.

According to Prof. Hicks when a consumer reveals his preference for a definite combination on the basis of observed market behavior, he does so under strong ordering when the chosen position is shown to be preferred to all other positions within or on the triangle OPQ. So when the consumer reveals his definite preference for combination A within and on the OPQ triangle, he rejects all other combinations such as B, C and D. Thus the choice of A is strongly ordered.

7.3 THE LAW OF DEMAND

Prof. Samuelson establishes the law of demand directly on the basis of his revealed preference hypothesis without use of indifference curves and its assumptions.

Assumption of the theory:

It is based on the following assumptions:

1. Rationality

The consumer is assumed to behave rationally. He always prefers that bundle of goods which include more quantities of the commodities to less. Like the utility analysis as also the indifference curve analysis, the consumer is not assumed to maximise satisfaction from his purchases.

2. Strong Ordering

Strong ordering implies that there is definite ordering of various combinations in consumer's scale of preferences and therefore, the choice of a combination by a consumer reveals his definite preference for that over all other alternatives open to him. Thus, under strong ordering, relation of indifference between various alternative combinations is ruled out.

3. Consistency

Consumer is consistent in his choice. If he prefers bundle A over B then he will not choose B over A in another situation. In other words, if A is preferred to B then, B is not preferred to A. If A is preferred over B and B is preferred over C then A is preferred over C, (or If $A > B$ and $B > C$, then $A > C$) violation of transitivity is an indication of irrationality.

4. Assumption of Positive Income-elasticity

Another assumption of the approach is that given any basket of goods, there exists some budget (Constraint) line which will induce the consumer to buy it. This means consumer has positive income elasticity.

Fundamental Demand Theorem :

According to the Marshallian Law of Demand, there is an inverse relationship between price and quantity demanded of a good. Samuelson assumes that when income elasticity demand is positive, price elasticity of demand is negative. This can be explained in case of rise and fall of price of a commodity. This is what he calls the fundamental theory of consumption. The following details will explain this concept further.

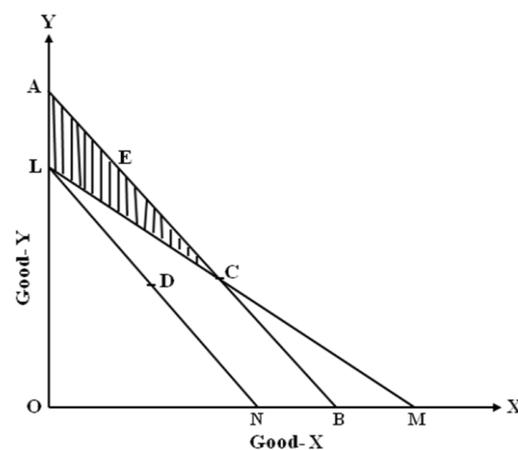


Fig. 7.2

Rise in Price

First, Let us first assume that a consumer spends his entire income on two goods X and Y. LM is his original price-income line where the consumer has chosen the combination represented by C in Figure 7.2 The triangle OLM is the consumer's area of choice for the different combinations of X and Y available to him, as given by his price-income line LM. By choosing only the combination C, the consumer is revealed to have preferred this combination to all others in or on the triangle OLM.

Now suppose the price of X rises while the price of Y remains constant so that the new price-income line is LN. Now he chooses a new combination, say, point D which shows that the consumer will buy less of X than before as the price of X has risen. In order to compensate the consumer for the loss in his real income as a result of rise in the price of X, let us give him AL amount of money in terms of good Y. As a result, AB becomes his new price-income line which is parallel to the LN line Good X and passes through point C. Prof. Samuelson calls it over compensation effect. Now the triangle OAB becomes his area of choice. Since C was revealed preferred to any other point on the original price-income line LM, all points lying below C on the CB

segment of AB line will be inconsistent with consumer behaviour. This is because he cannot have more of X when its price has risen. The consumer will, therefore, reject all combinations below C and choose either combination C or any other combination, say, E in the shaded area ALC on the segment AC of the price-income line AB. If he chooses the combination C, he will buy the same quantities of X and Y which he was buying before the rise in the price of X. On the other hand, if he chooses the combination E, he will buy less of X and more of Y than before.

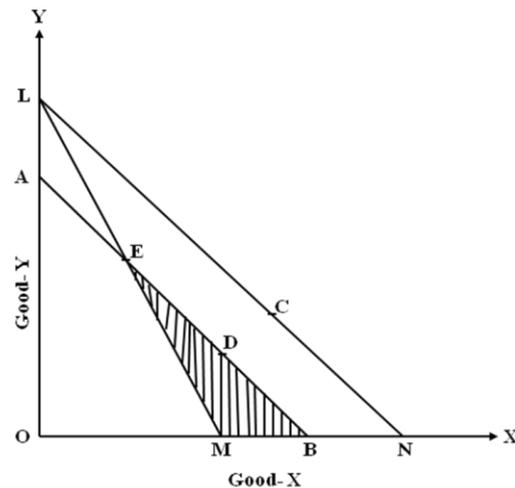


Fig. 7.3

In the second stage, if the packet of extra money AL given to the consumer is taken back, he will be to the left of C at point D on the price-income line LN where he will buy less of X, if the income elasticity of demand for X is positive. Since with rise in the price of X, its demand has fallen (when the consumer is at point D), it is proved when income elasticity is positive, price elasticity is negative.

A Case of Fall in Price

Let us suppose that LM represents original price-income situation that the consumer reveals his preference for E over all other combinations..... or on the triangle OLM shown in the figure 7.3. With the fall in the price of X, the price of Y remaining constant, his new price-income line is LN. The consumer reveals his preference on this line at, say, combination C which shows that he buys more of X than before. The movement from point E to C is the price effect as a result of fall in the price of X which has led to increase in its demand.

Suppose the increase in the real income of the consumer as a result of fall in the price of X is taken away from him in the form of AL quantity of Y. Now AB becomes his new price-income line which is parallel to LN and passes through E. The new triangle OAB becomes his area of choice. Since the consumer was revealing his preference at point E on the line LM, all points lying above E on the segment AE of line AB will be inconsistent with his choice. This is because on the AE segment he will have less of good X when its price has fallen. But this is not possible. The consumer will, therefore, reject all combinations above E. He will either choose combination E or any other combination, say, D on the segment EB of the line AB in the shaded area MEB. If he chooses the combination E, he will buy the same quantities of X and Y which he was buying before the fall in the price of X. And if he chooses the combination D, he will buy more of X and less of Y than before. The movement from E to D is the substitution effect of a fall in the price of X. If the money taken from the consumer in the form of AL is returned to him, he will be at the old combination C on the price-income line LN where he will buy more of X with the fall in its price. The movement from D to C is the income effect. So the demand theorem is again proved that positive income elasticity means negative price elasticity of demand.

It is to be noted that Samuelson's explanation of the substitution effect is different from that of the indifference curve analysis. In the case of indifference curve analysis, the consumer moves from one combination to another on the same indifference curve and his real income remains constant, but in the revealed preference theory, indifference curves are not assumed and the substitution effect is a movement along the price-income line arising from changing relative prices.

7.4 DERIVATION OF THE DEMAND CURVE FROM REVEALED PREFERENCE

We can also derive the demand curve of an individual from the revealed preference hypothesis. This is explained in Figure 7.4 In Part- (A) of the figure, LM is the original price-income line on which the consumer reveals his preference at point S and buys OA of good X. Suppose that the price of X falls. As a result, his new price-income line is LN. On this line, the consumer reveals his preference at point where he buys a larger quantity OB of X than before. The movement from S to R is the price effect of the fall in the price of X which has resulted in its increased demand from OA to OB. Now take away the increase in the real income of the consumer as a result of the fall in the price of X equal to CL.

Thus CD is the new price-income line which is drawn parallel Quantity to LN and passes through point S. The new triangle OCD becomes his area of choice. Since the consumer was revealing his preference at point S on the original price-income line LM, therefore all points above S on the SC segment of the line CD are inconsistent with his choice. This is because he cannot have less quantity of good X when its price has fallen. He will, therefore, reject all combinations above S and either choose combination R or any other combination in the shaded triangle MSD. If the CL amount of money taken from the consumer is returned to him, he will again be at point R on the price-income line LN where he buys larger quantity OB of X than before. The movement from S to R traces out the demand curves in Part- (B) of the figure 7.4

As we have taken money on the vertical axis in Part-(A), the price of good X can be calculated by dividing the total money income by the number of units of X bought. When the price of X is OL/OM (OP), the quantity demanded is OA. When the price of X falls to OL/ON ($=OP_1$), the quantity demanded increases to OB. In Part- (B) of the figure, we measure price on the vertical axis and units of good X on the horizontal axis and draw E and E_1 price-quantity combinations. By joining these points with a smooth line, we get the demand curve DD_1 . This curve shows that as price falls from OP to OP_1 , the consumer buys AB quantity more of X.

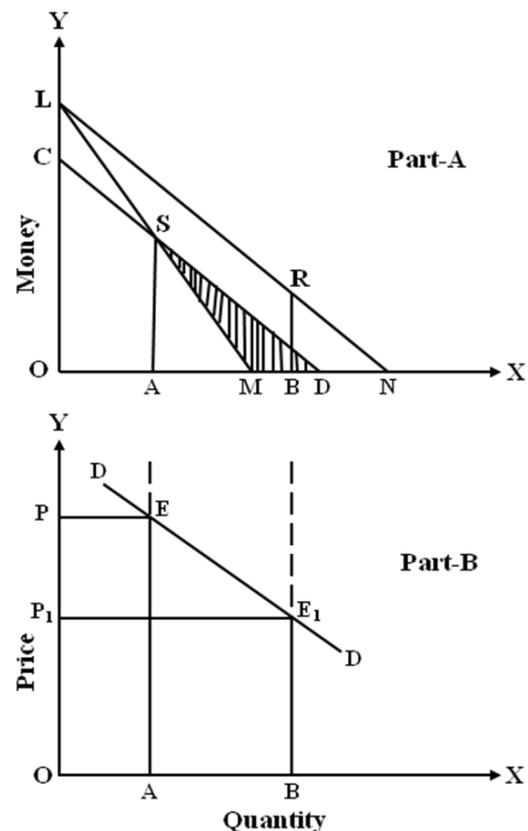


Fig. 7.4

7.5 HICKSIAN APPROACH TO DERIVATION OF LAW OF DEMAND

Hicks derives the law of demand on the basis of the weak ordering hypothesis and the direct consistency test and for this he denotes the effect of change in price into two segments- income effect and substitution effect. The substitution effect is derived from the consistency theory while the income effect is drawn from the real life observation and experience. Now, as income effect is traced through empirical evidences. The task left to be

carried out is breaking the effect, in which according to Hick may be done in two ways : (i) by the compensatory method, (ii) by the cost difference method.

Breaking Up Price Effect into Substitution Effect And Income Effect:

We will explain this by considering the case of fall in price of a commodity. In Figure 7.5 where, to begin with, price income situation faced by a consumer is given by the budget line LM. With price income situation represented by the budget line LM, suppose the consumer chooses combination A and buys OD quantity of commodity X. Now, suppose price of commodity X falls and as a result budget line shifts to the new position LN. Now, income of the consumer is reduced so much that the new budget line PQ passes through the original chosen combination A. That is, income is reduced equal to the cost difference so that gain in real income caused by the fall in price of commodity X is cancelled out. As seen above, with the new budget line PQ, to be consistent in his behaviour the consumer can either choose the original combination A or any combination lying on the segment AE of the budget line PQ or from within the shaded area AMQ. If he chooses again the original combination A, the Slutsky substitution effect will be zero. However, suppose that the consumer actually chooses combination B on the segment AQ of new budget line PQ. Now, choice of the combination B shows that there will be substitution effect due to which the consumer will buy DE more of good X. Substitution effect is negative in the sense that the relative fall in price of good X has led to the increase in quantity demanded of X, that is, change in quantity demanded is in opposite direction to the change in price. It should be noted that choice of combination B on segment AQ in preference to combination A of the line PQ is not inconsistent because combinations on AQ segment and in the shaded area AMQ were not available before when combination A was earlier chosen in price-income situation LM. Thus, with the new budget line PQ after consumer's income has been adjusted to cancel out the gain in real income resulting from a relative fall in price of X, the consumer chooses either A (when substitution effect is zero or a combination such as B on segment AQ when substitution effect leads to the increase in quantity demanded of good X by DE. This is generally known as Slutsky theorem which states that if income effect is ignored substitution effect will lead to the increase in quantity demanded of the good whose price has fallen and therefore the Marshallian law of demand describing inverse relationship between quantity demanded and price of a good will hold good, that is, due to substitution effect alone demand curve slopes downward.

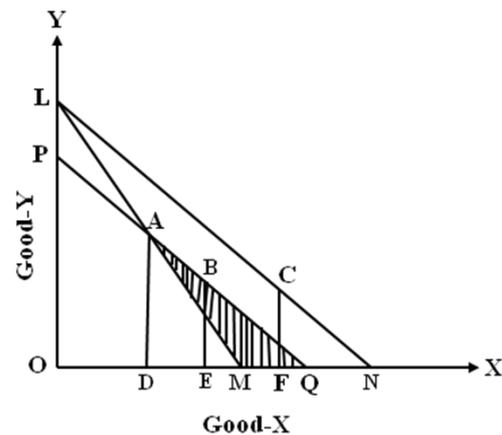


Fig. 7.5

Now, if the consumer chooses the combination B on the line segment AQ of budget line PQ, it means that he buys DE more due to the substitution effect. Thus he prefers combination B to combination A. In other words, his choice of B instead of A reveals that he will be better off at B as compared to A. Now, if money income withdrawn from him is restored to him so that he is faced with the budget line LN. If income effect is positive, he will choose a combination, say C, on the budget line LN to the right of point B indicating that as a result of income effect he buys EF more of the commodity X. Thus quantity demanded of commodity X increases by DE as a result of substitution effect and by EF as a result of income effect. This proves the law of demand stating inverse relationship between price and quantity demanded.

On budget line PQ, if the consumer chooses combination A and consequently substitution effect is zero, the whole increase in quantity demanded DE as a result of decline in price of good X will be due to positive income effect. However, the substitution effect may lead to the choice by a consumer a combination such as B that lies to the right of A on the line segment AQ and will therefore cause increase in quantity demanded. This substitution effect is reinforced by the positive income effect and as result we get a downward-sloping demand curve.

It needs to be emphasised that in Revealed Preference theory it is not possible to locate exact positions of points B and C obtained as a result of substitution effect and income effect respectively. As explained above, Revealed Preference theory is based on the assumption that all points on or below the budget line are strongly ordered and relation of indifference of a consumer between some combinations of goods is therefore ruled out. In Revealed Preference theory, choice of a consumer reveals his preference for a chosen position; it cannot reveal indifference of the consumer between combinations. Therefore, in Revealed Preference theory we can locate the direction of substitution effect through logical ordering but cannot measure the exact size of it, nor we can measure the exact amount of income effect of the change in price.

Besides, the substitution effect obtained through variation in income through cost difference method, does not represent pure substitution effect in the Hicksian sense in which the consumer's satisfaction remains constant. In substitution effect obtained by the Revealed Preference theory through Slutskian method of cost difference, the consumer moves from point A to point B on budget line PQ. His choice of B on budget line PQ instead of A under the influence of substitution effect shows that he prefers B to A. That is, he is better off in position B as compared to the position A. Therefore, it is maintained by some economists that the substitution effect obtained in revealed preference theory is not a pure one and contains also some income effect.

However, the two types of substitution effect (Hicksian and the one obtained in Revealed Preference Theory) differ with regard to the concept of real income used by them. In indifference curve analysis the term real income is used in the sense of level of satisfaction obtained by the consumer, whereas in Revealed Preference theory real income is used in the sense of purchasing power. Thus, Hicksian substitution effect involves the change in the quantity demanded of a good when its relative price alone changes, level of his satisfaction remaining the same. On the other hand, revealed preference theory considers substitution effect as the result of change in relative price of a good on its quantity demanded, consumer's purchasing power remaining the same. In Fig. 7.5 when we obtain budget line PQ after reduction in income by the cost difference so that it passes through the original combination A chosen by the

consumer before the fall in price. This implies that with budget line PQ, he can buy, if he so desires, the original combination A, that is, the gain in purchasing power or real income caused by fall in price of X has been cancelled out by the reduction in his money income.

7.6 SUPERIORITY OF REVEALED PREFERENCE THEORY

The Revealed Preference approach may be considered superior to the Hicksian ordinal utility approach to consumer behavior on the basis of the following arguments:

- (i) The Revealed Preference Theory does not involve any psychological introspective information about the behaviour of the consumer. Rather, it presents a behaviouristic analysis based on observed consumer behaviour in the market. This approach has helped, according to Samuelson, to divest the theory of demand of the “last vestiges” of the psychological analysis. Thus the revealed preference hypothesis is more realistic, objective and scientific than the earlier demand theorems.
- (ii) It avoids the “continuity” assumption of the utility and indifference curve approaches. An indifference curve is a continuous curve on which the consumer can have any combination of the two goods. Samuelson believes that there is discontinuity because the consumer can have only one combination. Following Samuelson, Hicks in his Revision of Demand Theory drops the assumption of continuity and replaces it by ‘strong and weak ordering’.
- (iii) The Hicksian demand analysis is based on the assumption that the consumer always behaves rationally to maximise his satisfaction from a given income. Samuelson’s demand theorem is superior because it completely dispenses with the assumption that the consumer always maximises his satisfaction, and makes no use of the dubious hypothesis like the Law of Diminishing Marginal Utility of the Marshallian analysis or the Law of Diminishing Marginal Rate of Substitution of the Hicksian approach.
- (iv) In the first stage of Samuelson’s demand theorem the ‘over compensation effect’ like the Slutsky substitution effect is more realistic as an explanation of consumer behaviour than the Hicksian substitution effect. It permits the consumer to shift to a higher price income situation in case of rise in the price of X and vice versa. It is an improvement over Hick’s “compensating variation”. Hicks again borrows Samuelson’s idea, drops the compensating variation principle and calls the ‘over-compensation effect’ as the ‘cost-difference’ in his Revision of Demand Theory. Similarly, the second stage of the Samuelsonian Theroem explains the Hicksian ‘income effect’ in a much simpler way. Hicks himself admits the superiority of Samuelson’s theory when he writes that as a clear alternative to the indifference technique its presentation is the newest and important contribution of Samuelson to the theroy of demand.
- (v) This theory provides the basis for welfare economics in terms of observable behaviour based on consistent choice.

7.7 LIMITATIONS OF THE REVEALED PREFERENCE THEORY

There are however, certain weaknesses in Samuelson's behavioural ordinal theory which are being discussed in the following paragraphs:

1. Neglects Indifference.

It neglects "indifference" in the consumer behaviour altogether. It is of course, true that the consumer does not reveal his indifference in a single-valued demand function in or on the budget line when he chooses a particular set of goods at point R on the budget line LM. But it is possible that there are points like A and B on every side of a given point R shown within the circle in Figure 7.6 towards which the consumer is indifferent. If this criticism by Armstrong is accepted, then Samuelson's fundamental theorem breaks clown. Suppose the price of X rises. As a result, his new budget line is LS. Now give the consumer some extra money to enable him to buy the same combination R on the line PQ. In this new price-income situation, suppose he chooses point B below R towards which he is indifferent. This is based on Armstrong's assumption that the consumer is indifferent between points around the chosen point. But the choice of B on the PQ line means that the consumer buys more of X when its price has risen. This breaks down the Samuelson theorem because with the rise in the price of X, its demand has expanded instead of shrinking.

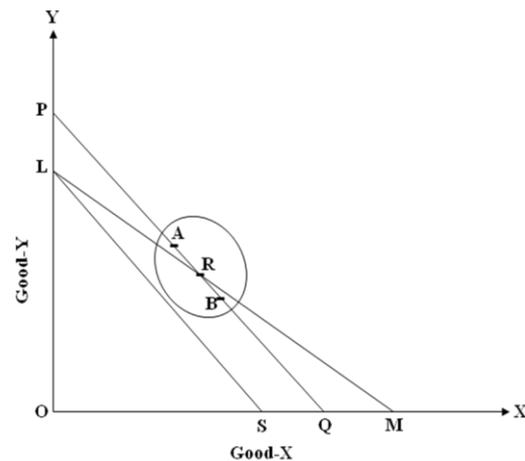


Fig. 7.6

2. Conditional Not Universal.

Samuelson's Fundamental Theorem is conditional and not universal. It is based on the notion that positive income implies negative price elasticities. Since the price effect consists of the income and substitution effects, it is not possible to isolate the substitution effect from the income effect on the level of observation. If the income effect is not positive, price elasticity of demand is indeterminate. On the other hand, if the income elasticity of demand is positive the substitution effect following a change in price cannot be established. Thus, the substitution effect cannot be distinguished from the income effect in the Samuelsonian Theorem.

3. Neglects Giffen's Paradox.

Samuelson's Revealed Preference hypothesis excludes the study of the Giffen's Paradox, for it considers only positive income elasticity of demand. The Giffen case, on the other hand, relates to negative income elasticity of demand. Like the Marshallian law of demand, the Samuelsonian Theorem fails to distinguish between negative income effect of a Giffen good combined with a weak substitution effect and a negative income effect with a powerful substitution effect. Samuelson's Fundamental Theorem is, therefore, inferior to and less integrated than the Hicks-Allen price effect which provides an all inclusive explanation of the income effect, the substitution effect and of Giffen's Paradox.

4. Consumer Does Not Choose Only One Combination.

The assumption that the consumer chooses only one combination on a given price-income situation is incorrect. It implies that the consumer chooses something of

(everything of) both the goods. But it is seldom that anybody purchases something of everything.

5. Choice does not reveal preference.

The assumption that “choice reveals preference” has also been criticised. Choice always does not reveal preference. Choice requires rational consumer behaviour. Since a consumer does not act rationally at all times, his choice for a particular set of goods may not reveal his preference for that. Thus, the theorem is not based on observed consumer behaviour in the market, rather it is an academic exercise like all other economic theories.

6. Applicable to an Individual Consumer.

The Revealed Preference approach is applicable only to an individual consumer. Negatively inclined demand curves can be drawn for each consumer with the help of this approach by assuming ‘other things remaining the same.’ But this technique fails to help in drawing market demand schedules. For, when the price of X falls in the market, prices of other goods, are likely to be affected which will alter the distribution of real income in the community. Though each individual has a downward sloping demand curve for good X, redistribution of real income can lead to an upward sloping demand curve for the market for some ranges of prices. The Hicks-Allen approach is superior to the revealed preference hypothesis for it can derive both the individual and market demand curves from the price-consumption curves.

7. Invalid for Game Theory.

According to Tapas Majumdar, the Revealed Preference hypothesis ‘is invalid for situations where the individual choosers are known to be capable of employing strategies of a game theory type.

8. Ignores Uncertainty Behaviour.

The revealed preference theory fails to analyse consumer’s behaviour in choices involving risk or uncertainty. If there are three situations, A, B and C, the consumer prefers A to B and C to A. Out of these, A is certain but chances of occurring B or C are 50- 50. In such a situation, the consumer’s preference for C over A cannot be said to be based on his observed market behaviour.

7.8 SUMMARY

This unit discusses the actual behavior of consumer in the market. The Revealed Preference Theory is based on the strong ordering. It does not involve any psychological introspective information about the behaviour of the consumer. Rather, it presents a behaviouristic analysis based on observed consumer behaviour in the market. It avoids the “continuity” assumption of the utility and indifference curve approaches. An indifference curve is a continuous curve on which the consumer can have any combination of the two goods. Samuelson believes that there is discontinuity because the consumer can have only one combination. Samuelsonian Theorem explains the Hicksian ‘income effect’ in a much simpler way. This theory provides the basis for welfare economics in terms of observable behavior based on consistent choice. But the fact is that in a single-valued demand function. The indifferent behaviour is replaced by the observed market behaviour of the consumer which makes the revealed preference hypothesis somewhat more realistic than the indifference

curve technique. Thus the Samuelsonian behaviourist ordinal utility analysis is a distinct alternative to Hicks-Allen introspective ordinal utility theory.

7.9 GLOSSARY

- **Revealed Preference Theory:** The Revealed Preference Theory does not involve any psychological introspective information about the behaviour of the consumer. Rather, it presents a behavioristic analysis based on observed consumer behaviour in the market.

7.10 CHECK YOUR PROGRESS

(A) Fill in the blanks:

- A consumer reveals his preference for any combination which may be than others.
- The Revealed Preference Theory rules out the assumption of
- When income elasticity of demand is
- The Size of substitution effect can't be measured through Revealed Preference Theory.
- In Revealed Preference Theory, real income implies of a consumer.
- Revealed Preference Hypothesis is more realistic than

(B) State whether the following statements are true or false:

- A consumer reveals his preference for a specific combination under strong ordering.
- Substitution effect in Revealed Preference Theory is a movement through the price income line arising from a constant price.
- Income effect is derived from some assumed conditions.
- Hicksian substitution effect reflects relative change in the quantity of a commodity demanded.
- The assumption that a consumer always acts rationally to maximize satisfaction is a part of Hicksian demand analysis.
- If income effect is positive, price elasticity of demand is indeterminate.

7.11 ANSWERS TO CHECK YOUR PROGRESS

- (A)** (i) Cheaper (ii) Maximization of satisfaction (iii) negative
 (iv) Exact (v) Purchasing power (vi) Earlier demand theorems
- (B)** (i) True (ii) False (iii) False
 (iv) True (v) True (vi) False

7.12 TERMINAL QUESTIONS

(A) Short Answer Questions:

1. What are the basic assumptions of Revealed Preference Theory ?
2. What are the shortcomings of Revealed Preference Theory ?
3. Discuss the superiority of Revealed Preference Theory.

(B) Long Answer Type Questions :

1. Examine Samuelson's Revealed Preference Theory.
2. Explain the demand theorem with the help of Revealed Preference Theory.

7.13 SUGGESTED READINGS

Jhingan, M. L. Advanced Economic Theory, Vrinda Publications (P) Ltd., New Delhi.

Dr. D.M. Mithani, Managerial Economics- Theory and Applications: Himalaya Publishing House.

Mehta, P. L., Managerial Economics – Analysis, Problem and Cases, Sultan Chand & Sons, New Delhi.

H. L. Ahuja, Business Economics Micro- S. Chand & Co. Ltd., New Delhi, 1999.

S. K., Mishra and V. K. Puri, Advanced Microeconomic Theory, Himalaya Publishing House, Mumbai, 2001.

Unit 8-DEMAND ESTIMATION AND DEMAND FORECASTING

Structure

- 8.1 Introduction**
- 8.2 Demand Estimation**
- 8.3 Method of demand estimation**
- 8.4 Concepts of demand Forecasting**
- 8.5 Methods of demand Forecasting**
- 8.6 Summary**
- 8.7 Glossary**
- 8.8 Check Your Progress**
- 8.9 Answers to Check Your Progress**
- 8.10 Terminal Questions**
- 8.11 Suggested Readings**

OBJECTIVES

After reading this unit, you should be able to

- Understand the concepts of demand estimation
- Forecasting their various techniques along with their application.

8.1 INTRODUCTION

The present business environment is characterized by huge uncertainties which make business decisions increasingly more complex. Success of any business organisation depends to a large extent, on expansion of sales, maximisation of profit and minimisation of costs. Managers now have to be quipped with the latest techniques of making predictions about these variables with maximum possible accuracy and precision. This unit would explain the various methods and techniques of demand estimation and forecasting and their respective features.

8.2 DEMAND ESTIMATION

With a view to obtaining information regarding the directions and proportion of change in demand, business managers need to focus on estimating demand in the empirical form

so that they could have an adequate amount of control over the different variables of environment.

8.3 METHODS OF DEMAND ESTIMATION

Following methods are used for demand estimation:

Market Experimentation Method

Survey of Consumer's Intentions

MARKET EXPERIMENT METHOD

Market experimentation involves the estimation of demand on the basis of market behavior of consumers. Market experiment methods are of two types:

1. Actual Market Method

2, Market Simulation Method.

Actual Market Method

Under this method first sales outlets are opened in different localities chosen with a mix of consumers or customers with different levels of income, age, education level etc. Then the reactions of consumers are observed by varying controllable variables affecting demand such as prices, advertisement, quality of products etc.

Limitations

Although this method gives fairly accurate picture of the market, yet it has some serious shortcomings such as:

It is an expensive method usually when undertaken on a small scale.

It is applicable in a short run.

There are certain variables which are non-controllable. It is difficult to reduce the effect of these variables.

Market Simulation Method

This method is also known as Consumer clinic method or Laboratory Experiment method In this method each consumer is given a sum of money and he is asked to shop around in two simulated markets. Then the consumer behavior is studied by varying the price and quality of good, its packaging, advertisement etc.

Limitations

This method is subject to the following limitations:

Distortion of consumer behavior: consumers being the part of the experiment, there is likely possibility of distortion of shopping behavior.

Costly: These types of experiments are costly and firms having limited resources cannot go for this type of experimentation. It is also very difficult to take decisions on

the basis of this information.

Between the two methods of market experimentation, the actual experiment method seems to be more reliable because consumers do not often take the simulation method seriously. On the other hand, the actual experiment method is relatively costly than the simulation method. Which of the two methods is actually chosen by a firm, depends upon how the firm views the relative advantages of the two methods.

SURVEY OF CONSUMER'S INTENTIONS

In this method consumers are contacted personally to disclose their future purchase plans. For survey of consumers' intentions, the following methods are applied.

- 1. Census Survey Method**
- 2. Sample Survey Method**
- 3. Test Marketing.**

1. Census Survey Method

This method is also known as Complete Enumeration Method. In this method all consumers are contacted through interviews which are conducted either orally or through questionnaire. The probable demand so collected from all the consumers is summed up. The advantage of this method is that the information collected is first hand and is free from bias.

Limitations

This method has the following disadvantages:

(i) Costly:

To contact a large number of consumers, scattered all over the market, is a costly exercise.

(ii) Secrecy:

Consumers may not want to share their purchase plans because of personal secrecy. It becomes difficult to draw the conclusion on the basis of this information.

(iii) Uncertainty:

The customers may not provide information on their future purchase intentions on account of unexpected changes in market conditions.

2. Sample Survey Method

In this method, only a few consumers out of the population are selected for study through interviews which are conducted either orally or through questionnaire. Under this method, the forecasted demand for the sample unit is used to find the total demand in the market by multiplying the sample results by the ratio of the size of population to the size of the sample. For example, if the sample consists of one person out of a hundred then the forecasted sales of the sample are multiplied by 100 to get the total demand in the market.

Sample Survey Method is less costly, easier and straighter than the census method. However, the reliability of results of this method depends upon the representativeness of the samples taken from the population. If the sample is taken from the population in such a manner

that it includes basic character of population (like education, income, sex, etc.) there is likely to be no significant difference in the results obtained by the survey and the census methods.

3. Test Marketing

This method is a variant of the survey technique. This is done mainly for estimating demand of new products or estimating sales potential of existing products in new geographical *areas*. In this method a test area is selected which *truly* represents the market. The product is launched in this area exactly in the manner in which it is intended to be launched in the market. If the product is found successful in the test area then the sales are taken as a basis for estimating sales in the market as a whole.

Limitations

Though this method is reliable yet it is not quite often used because of the following limitations:

- (i) **More costly:** It is very costly method of estimating demand, because it needs a significant quantity of the product already in hand but only a portion to be sold in the test area. It also needs a full-scale marketing effort in the same manner as would be done when production is in full swing. Both these factors make such experiments highly costly.
- (ii) **Applicable in long period:** These experiments are reliable only if they are continued over a long period. A repeat purchasing by the consumer is the only reliable index of future sales.
- (iii) **Less representatives:** To find a representative test area is not always possible.
- (iv) **Entry of rivals:** Company has test marketed its product; its rivals imitate the product and start selling it thereby saving the cost of demand estimating exercise.

8.4 CONCEPT OF DEMAND FORECASTING

Broadly speaking, forecasting concerns itself with two areas – first, which belongs to the forms, intensity and variation of future events (like recession or boom) known as prediction and second, which are linked to certain future variables like, new markets, demand, cost, price, sale and profit etc. known as projection.

Proper strategic planning rests on the foundation of sound forecasting. It is forward projection of data a firm has to operate under dynamic conditions, where buyer's tastes and preferences may change over time, new products may enter the market, and new technology may develop, and so on. Under dynamic business conditions demand forecasting is very difficult. It is all the more difficult in case of new products about which no information is available about consumer's preferences. In this section, we shall study the purposes, the methods and criteria of a good forecasting method of demand forecasting.

(a) Meaning of Demand Forecasting

Demand forecasting for a product is the technique of estimating its demand in the

immediate or distant future. Demand forecast is important basis for formulating inventory policy, production policy, marketing policy, sales strategy etc., by a production unit or a selling organisation. Demand forecasts are also used to plan personnel requirements of a firm.

Forecasts can broadly be classified into two categories:

1. **Passive forecasts:** Where prediction about future is based on the assumption that the firm does not change the course of its action: and
2. **Active forecasts:** Where forecasting is done under the condition of likely future changes in the actions by the firm.

For example, if Maruti does not intend to initiate any action (like advertisement, quality control, etc.) to influence its sales in near future, the prediction of sales by its marketing department may be called a passive.

(b) Purposes of Demand Forecasting

Usually there are two types of forecasts: Short-period forecast and long-period forecast. The purpose of demand forecasting differs according to the type of forecasts, i.e., (a) short-term forecasting (b) long-term forecasting:

(I) Purpose of Short-term Forecasting: It is difficult to define short-run for a firm because its duration may differ according to the nature of the commodity. For a highly sophisticated automatic plant 3 months time may be considered as short-run, while for another plant the duration may extend to 6 months or one year. Time-duration may be set for demand forecasting depending upon how frequent the fluctuations in demand are.

Short term forecasting can be undertaken by a firm for the following purposes:

- (i) **Production policy:** To avoid problems of over-production and under production.
- (ii) **Management of inventories:** It purchasing raw materials at appropriate time, when their prices are low, and avoiding over-stocking.
- (iii) **Sales targets:** It means to fix the sale targets of the firm.
- (iv) **Suitable sales strategy:** Strategy for sales is formulated in accordance with the changing pattern of demand and extent of competition among the firms.
- (v) **Financial requirements for the short period:** Cash requirements depend largely on sales level and production operations and hence, by forecasting sales and production level, financial requirements can be appropriately assessed.

(II) Purposes of Long-term Forecasting: The concept of demand forecasting is more relevant to the long-run than in the short-run. It is comparatively easy to forecast the immediate future than to forecast the distant future. Fluctuations of a larger magnitude may take place in the distant future. It is again difficult to give a precise definition of long-run. In a fast developing economy the duration may go up to 5 or 10 years, one in a stagnant economy it may go up to 20 years. Moreover, the time duration also depends upon the nature of the product for which demand forecasting is to be made

The purposes of long-run demand forecasting are as follows:

- (i) **For a new project:** It is used for the expansion and modernisation of an existing

unit, diversification and technology up gradation. *A firm which can easily forecast* the demand for a new product can better compete as compared to its rival firms and consolidate its position.

- (ii) **Long-term financial needs.** It takes time to raise financial resources, more particularly when the size of finances needed for expansion, modernization and diversification is very large. Forecasting helps in solving the financial requirements of the organizations.
- (iii) **For suitable manpower.** In the long-run, techniques of production may change. Trained and skilled labour and business executives may be needed for the new type of job responsibilities. Demand forecasting can help a firm to arrange for specialised labour force and personnel.
- (iv) **To analyse the changing pattern of consumption.** The emerging pattern of industrialisation, urbanisation, education, degree of contact with the rest of the world could be closely studied by a firm for forecasting demand, and this may help it to formulate a suitable strategy to produce goods in accordance with the changing needs of the community.

(c) Steps Involved In Demand Forecasting

Demand forecasting to be efficient, accurate and meaningful should proceed according to a systematic plan. Various steps involved in demand forecasting are as follows:

1. **Setting the Objective:** Clarity of objective makes the process of demand forecasting easier. The firm should be clear as to the purpose of demand forecasting. The firm may use demand forecasting for determining the rise of output, fixation of price, allocation of funds for sales promotion, mode of raising capital resources, inventory control change in product-mix, up gradation of technology etc. The approach for forecasting will differ accordingly:
2. **Selection of Goods:** Categorisation of goods facilitates the selection of approach for demand forecasting. Broadly speaking, 'two-fold classification of goods may be resorted to for forecasting, viz., (i) consumer goods and capital goods, (ii) existing goods and new goods. Method of demand forecasting will differ according to the nature of goods.
3. **Determinants of Demand:** Depending on the nature of product and nature of forecast different determinants will assume different degree of importance in different demand function, in addition, it is important to consider socio-psychological determinants, specially demand. Sociological and psychological factors also affect the demand forecasting.
4. **Selection of method:** For demand forecasting different types of methods are used. The scope of method depends upon the resources, area covered and availability of time. For short and long term forecasting, different types of techniques are used.
5. **Testing accuracy:** testing is done to avoid error in demand forecasting. It helps the business to take decision more effectively.
6. **Interpretation of results:** the results obtained from forecasting to carefully analysed before drawing any conclusion. Forecasting is based on number of assumptions. If

there is change in these assumptions, the results drawn will have a different interpretation.

(d) Levels of Forecasting

Demand forecasting can be undertaken at different levels, viz., (i) Macro-economic level, (ii) Industry level, (iii) Firm level, and (iv) Product line level.

- (i) Macro-economic level:** It covers the whole of the economy. Macroeconomic indicators such as national income, aggregate expenditure, industrial production, wholesale price index, etc., help in the measurement of the level of business activity. Business firms have to base their forecasting on these macro-economic indicators. It will help the organizations in formulating policies at national as well as at international level.
- (ii) Industry level:** Firms operating in an industry have to forecast demand at the industry level. Data relating to the trend in a particular industry is provided by trade association to its members. For example, firm producing electronic components maybe interested to know as to how electronic industry will behave in future. The firm, on the basis of available data, can formulate its plan as regards output, sale, capacity expansion, etc.
- (iii) Firm level:** A firm can independently undertake demand forecasting of its own products. For example, Tata Oil Mills Ltd. may undertake forecasting of its own products to assess its position vis-a-vis its competitors in the market.
- (iv) Product line level:** A firm engaged in the production of diversified products may undertake forecasting at the product line level so as to decide which product or products should get large allocation of funds to maximise firm's overall profits.

8.5 METHODS OF DEMAND FORECASTING

Making estimates of demand for future under the changing conditions is a difficult exercise. Consumers' behavior is the most unpredictable thing in the world because it is motivated and influenced by multiplicity of forces. Moreover, economists and statisticians over the years have developed several methods of demand forecasting. Each of these methods has its relative merits and demerits. Selection of the right method is essential to make demand forecasting accurate and credible. In demand forecasting a judicious mixture of statistical skill and rational judgment is needed.

Through the use of statistical and mathematical techniques; data can be collected, classified, tabulated, analyzed and interpreted. But, statistics do not speak for themselves, they need the skill of a talented analyst to give it meaningful manifestation. Sound judgment is a prime requisite for good forecasting. The judgment should be based upon facts and the personal bias of the investigator should not prevail upon the facts. Thus, an efficient demand forecasting should strike a balance between mathematical techniques and sound judgment.

The methods of demand forecasting have been discussed the following paragraphs:

(A) Opinion Poll Methods

In the opinion poll, the opinion of the buyers, sales force and experts could be sought to determine the emerging trend in market demand. The opinion is sought through the following methods:

(1) Consumer's Survey Method

In this method, the representatives of the firm approach buyers personally to know their views about a particular product and also their intentions for the likely purchases at a given price in the future-usually a year. The firm may go in for complete enumeration or for sample surveys.

(a) Complete Enumeration Method: Under the complete enumeration survey, the probable demands of all the consumers for the forecast period (as given by the consumers themselves) are summed up to have the sales forecast for the forecast period. Though this method has an advantage of first-hand unbiased information, yet it has its share of disadvantages too. *First*, to contact a large number of customers, scattered all over the market, is a costly exercise. *Secondly*, consumers may be hesitant to provide information about their purchase plans because of personal privacy or commercial secrecy. *Thirdly*, *Due* to unexpected changes in conditions, consumer may not be able to provide adequate information.

(b) Sample Survey Method: Under the sample survey method, the probable demand expressed by each selected unit is summed up to get the total demand of sample units in the forecast period. It is then blown up to find the total demand in the market. That is, the total sample demand is multiplied by the ratio of number of consuming units in the population to the number of consuming units in the sample. If the sample is properly chosen to be a representative of the population, there is no difference between the results obtained by the survey and complete enumeration methods. Moreover, survey method is less difficult and less costly than the complete enumeration method.

(c) End-use (or Input-Output) Survey: In this method, the sale of the product under consideration is projected on the basis of demand survey of the industries using this product as an intermediate product. In other words, demand for the final product is the end-use demand of the intermediate product used in the production of this final product. However, two facts must be mentioned at the outset. First, an intermediate product may have many end-uses (like steel can be used for various types of agricultural and industrial machinery, for construction, for transportation, etc.) Secondly, an intermediate good may have demand both in the domestic as well as international markets. Thus, end-use demand estimation of an intermediate product may involve many final goods industries using this product at home and abroad. Once we know the demand for final consumption goods including their exports net of imports, we can estimate the demand for the product used as intermediate good in the production of these final consumption goods with the help of input-output coefficients. The input-output tables containing input-output coefficients for particular periods are made available in every country either by the government or by research organisations there.

Except in case of intermediate products, demand forecasting through end-use method is neither desirable nor feasible. Further, as the number of end-uses of a product increases it

becomes more and more inconvenient to use this method. This method is quite useful for industries which are largely producers' goods, e.g. Aluminum. This method is discussed in further detail in the chapter on 'Input-Output Analysis', given later in the book.

2. Collective Opinion Method:

This is also known as '*sales force opinion method*', In this method,, instead of consumers, the opinion of the salesmen who are in close contact with buyers is sought, It is presumed *that* salesmen, being the closest to the customers, have the most accurate information about their liking, disliking, consumption pattern, consumers' reaction, to the firms', product, etc. The firm collects information from the salesmen, and on the basis of their response it forecasts demand. Sometimes the firm does not take the opinion of the individual salesman for granted. It may revise the estimates taking into account over-optimism and pessimism on the part of salesman, The firm may also take into account the likely changes in the prices, changes in *designs* and packing, changes in income distribution, employment, etc. The chief merit of this method lies in the collective wisdom of salesmen.

Besides, this method does not require the use of intricate statistical techniques. Forecasts may be more authentic because these are based on the direct contacts and first-hand knowledge of the salesmen. This method is particularly more useful in forecasting sales of new products.,

The method has certain demerits.

First, the results of the forecasts depend exclusively on the opinion of the salesmen. At times salesmen can use their personal bias. Consequently, the whole investigation is becomes useless.

Second, this method is suitable only for the short-term forecasting. However, most firms have to plan for future which is most uncertain, and forecasting by this method may not serve that purpose.

Third, salesmen lack vision and may not foresee the influence o: several unknown factors that may affect the demand pattern in the market.-.

3. Experts' Opinion Method: Instead of depending upon the opinion poll of buyers, firms can obtain views of the specialists on the demand estimation. The main practical advantage of this method is that here we need to estimate the future values of only predetermined variables, unlike regression equation where the value of both exogenous and endogenous variable have to be predicted. It, however, suffers from all the other limitations of the regression method. The reason for unpopularity of this method is mainly its complexity.

4. Delphi Method:

Delphi method of demand forecasting is an extension of the simple expert opinion method. This method is used to consolidate the divergent expert opinions and to arrive at a compromise estimate of future demand. The process is simple. Under the Delphi method, the experts are provided information on estimates of forecasts of other experts along with the underlying assumptions. The experts may revise their own estimates in the

light of forecasts made by other experts. The consensus of experts about the forecasts constitutes the final forecast. It may be noted that the empirical studies conducted in the USA have shown that unstructured opinions of the experts is the most widely used forecast technique. This may appear a bit unusual in as much as this gives the impression that sophisticated techniques, e.g., simultaneous equations model and statistical method, are not the techniques which are used most often. However, the unstructured opinions of the experts may conceal the fact that information used by experts in expressing their forecasts may be based on sophisticated techniques. The Delphi technique can be used for cross- checking information on forecasts.

5. Statistical methods:

In the foregoing sections of this unit, we have described survey and experimental methods of estimating demand for a product on the basis of information supplied by the consumers themselves and on-the-spot observation of consumer behaviour. In this part, we will explain statistical methods which utilize historical (time-series) and cross-sectional data for estimating long-term demand. Statistical methods are considered to be superior techniques of demand estimation for the following reasons.

- (i) In the statistical methods, the element of subjectivity is minimum,
- (ii) Method of estimation is scientific as it is based on the theoretical relationship between the dependent and independent variables,
- (iii) Estimates are relatively more reliable, and secondly, being a costly affair, experiments are usually carried out on a scale too small to permit generalization with a high degree of reliability.

Thirdly, experimental methods are based on short-term and controlled conditions which may not exist in an uncontrolled market. Hence the results may not be applicable to the uncontrolled long-term conditions of the market.

- (iv) Estimation involves smaller cost.

Two kinds of statistical methods are used for demand projection.

- (1) Trend Projection Methods and
- (2) Barometric Methods.

These statistical methods are described here briefly :

1. Trend Projection Methods Trend projection method is a 'classical method' of business forecasting. This method is essentially concerned with the study of movement of variables through time. The use of this method requires a long and reliable time-series data. The trend projection method is used under the assumption that the factors responsible for the past trends in the variable to be projected (e.g., sales and demand) will continue to play their part in future in the same manner and to the same extent as they did in the past in determining the magnitude and direction of the variable. This assumption may be quite justified in many cases. However, since cause - and- effect relationship is

not revealed by this method, the projections made on the trend basis are considered by many as a mechanical or a 'naïve' approach. Nevertheless, there is nothing uncomplimentary in the adoption of such an approach. It merely represents one of the several means to obtain an insight of what the future may possibly be and whether or not the projections made using these means are to be considered as most appropriate will depend very much on the reliability of past data and on the judgment that is to be exercised in the ultimate analysis.

In projecting demand for a product, the trend method is applied to time-series data on sales. Long standing firms may obtain time-series- data on. sales from their own sales department and books of account. New firms can obtain the necessary data from the older firms belonging to the same industry.

There are two types techniques of trend projection based on time-series data.

- (a) Graphical method,
- (b) Least square method,

(a) Graphical Method. Under this method, annual sales data are plotted on a graph paper. Simple example has been explained with the help of data contained in the table 8.1 and figure 8.1. All values of sales for the different years are plotted on a graph and a smooth free hand curve is drawn passing through as many points as possible. The direction of this free hand curve shows the trend. Line MN is the trend line which has been drawn as free hand curve passing the various points representing the actual sales data.

Table 8.1

Year	Sales (Rs. Crores)
2006	41
2007	51
2008	45
2009	60
2010	54
2011	62

Although this method is very simple and least expensive, the projections made through this method are not very reliable. The reason is that the extension of the trend line involves subjectivity and personal bias of the analyst.

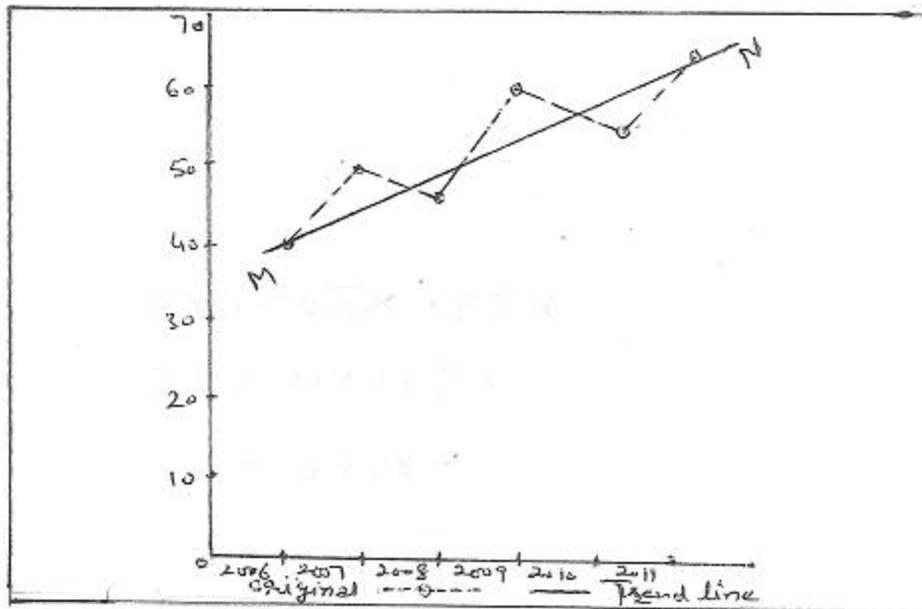


Figure 8.1

(b) Least Square Method:

It is a statistical technique used for finding equation of a specified type of curve that best fits a given set of data relating to two variables. The concept of the best-fitting curve is based on the principle that the sum of the squares of the deviations of the actual and the corresponding estimated value Y should be the least. In mathematical terms, $\sum (y - y_c)^2$ shall be the least. This will happen when the sum of deviation of the actual values of y from the computed values is zero i.e., $\sum (y - y_c) = 0$. Based on the parameter of $\sum (y - y_c)^2$ being the least it is called as the method of least squares' and the line obtained by this method is called as the line of best fit'.

The straight line trend is computed by the following equation

$$y = a + bx \quad \dots(i)$$

Where y represents the estimated value of a and b are constants where a is the intercept of the line at the point of origin i.e., when $X = 0$; and b represents the slope of the line indicating the rate of change in y corresponding to the per unit change in X . The value of both constants a and b are estimated with the help of following two equations

$$\sum y = Na + b \sum x \quad \dots(ii)$$

$$\sum xy = a \sum x + b \sum x^2 \quad \dots(iii)$$

Where N represents number of years for which data are given. If the values of x i.e. length of time in units of year / month/ day are equidistant, the calculation of the value of a and b shall become very simple if the mid-point of time is taken as point of origin making $\sum x = 0$. Under this situation equations (ii) and (iii) shall take the following form

$$\Sigma y = Na = a = \frac{\Sigma y}{N} = \text{Mean } y \quad \dots(\text{iv})$$

$$\Sigma xy = b \Sigma x^2 = b \frac{\Sigma xy}{\Sigma x^2} \quad \dots(\text{v})$$

Example : Fit a straight line trend by method of least squares and estimate the trend for 2013.

Year	2008	2009	2010	2011	2012
Demand (Rs. In lakh)	70	75	90	98	107

Solution

Solution : Computation of Trend Value

Year (X)	Demand (y) Rs. In lakh	X = X - 2010	X ²	Xy	Trend value = (y = 88 + 9.7x) (Rs. In lakh)
2008	70	-2	4	-140	68.6
2009	75	-1	1	-75	78.3
2010	90	0	0	0	88.0
2011	98	+1	1	+98	97.7
2012	107	+2	4	+214	107.4
N= 5	$\Sigma y = 440$	$\Sigma x = 0$	$\Sigma x^2 = 10$	$\Sigma xy = +97$	

$$y = a + bx \quad (\text{i})$$

$$\Sigma y = Na \quad a = \frac{\Sigma y}{N} = \bar{y} \quad (\text{ii})$$

$$\Sigma xy = b \Sigma x^2$$

$$b = \frac{\Sigma xy}{\Sigma x^2} \quad (\text{iii})$$

Putting the figures in equation (ii) and (iii) we get the following values of a and b

$$a = \frac{440}{5} = 88; \quad \text{and} \quad b \frac{97}{10} = 9.7$$

Now putting the values of a and b in equation (i), we get the following equation

$$y = 88 + 9.7x$$

Now trend values for various years will be as under :

When $x = -2$ for 2008, $y = 88 + (9.7x - 2) = 88 - 19.4 = 68.6$

$x = -1$ for 2009, $y = 88 + (9.7x - 1) = 88 - 9.7 = 78.3$

$x = 0$ for 2010, $y = 88 + (9.7x 0) = 88 - 0 = 88.0$

$x = +1$ for 2011, $y = 88 + (9.7 x 1) = 88 + 9.7 = 97.7$

$x = +2$ for 2012, $y = 88 + (9.7 x 2) = 88 + 19.4 = 107.4$

Estimated trend value for 2013 shall be calculated as under :

$$\begin{aligned} y &= 88 + 8.7 (2013 - 2010) \\ &= 88 + 9.7 \times 3 \\ &= 88 + 29.1 = 117.1 \text{ lakh rupees} \end{aligned}$$

Thus it is clear that this method is a suitable for computing the trend values of all the given period and the results are free from subjectivity. On the basis of trend values, predictions can be made for future period. However, this method ignores the impact of seasonal, cyclical and irregular fluctuations in making forecast for the result of the future.

(2) Barometric Method of Forecasting:

The barometric method of forecasting follows the method meteorologists use in weather forecasting. Meteorologists use the barometer to forecast weather conditions on the basis of movements of mercury in the barometer. Following the logic of this method, many economists use economic indicators as a barometer to forecast trends in business activities. This method was first developed and used in the 1920s by the Harvard Economic Service. It was, however, abandoned as it had failed to predict the Great Depression of the 1930s² The barometric technique was however revived, refined and developed further in the late 1930s by the National Bureau of Economic Research (NBER) of the US. It has since then been used often to forecast business cycles in the US.

It may be noted at the outset that the barometric technique was developed to forecast the general trend in overall economic activities. This method can nevertheless be used to forecast demand prospects for a product, not the actual quantity expected to be demanded. For example, allotment of land by the Delhi Development Authority (DDA) to the Group Housing Societies (a lead indicator) indicates higher demand prospects for building materials—cement, steel, bricks, etc.

The basic approach of barometric technique is to construct an index of relevant economic indicators and to forecast future trends on the basis of movements in the index of economic indicators. The indicators used in this method are classified as:

- (a) Leading indicators,
- (b) Coincidental indicators, and
- (c) Lagging indicators.

The leading series consists of indicators which move up or down ahead of some other series. Some examples of leading indicators are: (i) index of net business investment; (ii) new orders for durable goods; (iii) change in the value of inventories; (iv) index of the

prices of the materials; and (v) corporate profits after tax.

The coincidental series on the other hand, are the ones that move up or down simultaneously with the level of general economic activities. Some examples of the coincidental series are: (i) number of employees in the non-agricultural sector; (ii) rate of unemployment; (iii) gross national product at constant prices; and (iv) sales recorded by the manufacturing, trading and the retail sectors.

The lagging series consist of those indicators that follow a change after some time-lag. Some of the indices that have been identified-as lagging series by the NBER are: (i) labour cost per unit of manufactured output, (ii) outstanding loans, and (iii) lending rate for short-term loans.

The various indicators are chosen on the basis of the following criteria:

- (i) Economic significance of the indicator: the greater the significance, the greater the score of the indicator,
- (ii) Statistical adequacy of time-series indicators: a higher score is given to an indicator provided with adequate statistics,
- (iii) Conformity with overall movement in economic activities,
- (iv) Consistency of series to the turning points in overall economic activity,
- (v) Immediate availability of the series, and
- (vi) Smoothness of the series.

8.6 SUMMARY

Forecasting is required in every field of business in many ways. Business needs forecasting to set up new businesses and to modernize the existing one. Forecasting is required for short and long term and is done at both macro and micro levels. There are two types of techniques used for demand forecasting opinion-based methods seek to explain the views of experts, sales force and population of a given area on the various issues relating to demand forecasting. On the other hand, statistical methods use time series data to forecast the demand for the different commodities. Statistical methods are more useful on account of facts-based information. Econometric methods are used to develop models for demand forecasting. Least square method tries to develop the cause-and-effect relationship between dependent and independent variables. Barometric techniques are used to find the general trend of the economy. Barometric technique develops relevant economic indicators to forecast the future trends of the economy.

8.7 GLOSSARY

- **Census Survey Method:** This method is also known as Complete Enumeration Method. In this method all consumers contacted through interviews which are conducted either orally or through questionnaire.
- **Demand forecasting:** Demand forecasting for a product is the technique of estimating its demand in the immediate or distant future

8.8 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- (i) Test marketing is application in the ----- period.
- (ii) It is easy to forecast demand for the -----.
- (iii) Data about the trend in an industry are usually supplied through -----.
- (iv) A firm forecasts its demand on the basis of information collected from
- (v) The method in which the experts forecast demand on the basis of forecasts of other experts is called.....
- (vi) Rate of unemployment is an example of series.

(B) State the following statements are true or false :

- (i) The actual market method of demand estimation is expensive if it is undertaken at a large scale.
- (ii) For appropriate assessment of financial requirements forecasting of sales and production level is important.
- (iii) Profits earned by a firm for long period are a macro economic indicator.
- (iv) End use demand of the intermediate product is the demand of the fixed product.
- (v) Under graphical method annual figures of sales are plotted on a plan sheet of paper.
- (vi) Demand forecasts based on least square method is free from subjectivity.

8.9 ANSWERS TO CHECK YOUR PROGRESS

- (A)** (i) Long (ii) Short run (iii) Trade Associations (iv) Salesmen (v) Delphi Method
(vi) Coincidental
- (B)** (i) False (ii) True (iii) False (iv) True (v) False (vi) True

8.10 TERMINAL QUESTIONS

(A) Short Answer questions :

1. Explain the various methods of demand estimation.
2. Define demand forecasting and discuss its purposes.
3. Explain the various levels of demand forecasting

(B) Long Answer questions :

1. Explain the various Opinion Poll Methods of forecasting demand.
2. Explain the Graphical Method of Demand Forecasting.

3. Explain the Barometric method of forecasting demand.

8.11 SUGGESTED READINGS

Hanke, J. E. and A. R. Reltsch, Business Forecasting, Boston, Aley and Bacon, (1981).

Mehta, P. L., Managerial Economics – Analysis, Problem and Cases, Sultan Chand & Sons, New Delhi.

R. L. Varshneya and K. L. Maheshwari, Managerial Economics, Sultan Chand & Sons, New Delhi, 1970.

Unit 9-THEORY OF PRODUCTION

Structure

- 9.1 Introduction
- 9.2 Concept of Production
- 9.3 Concept of Production Function
- 9.4 Types of Production Function
- 9.5 Law of Variable Proportions
- 9.6 Economies of Scale
- 9.7 Production Function with two Variables
- 9.8 Return to Scale
- 9.9 Optimal Combination of factors
- 9.10 Summary
- 9.11 Glossary
- 9.12 Check Your Progress
- 9.13 Answer to Check Your Progress
- 9.14 Terminal Questions
- 9.15 Suggested Readings

OBJECTIVES

After studying this unit, you should be able to :

- Understand the concept of production.
- Be aware of the law of variable proportions.
- Understand the Economies of scale.
- Get acquainted with the concept of production function with two variable inputs.
- Understand the concept of Returns to Scale.

9.1 INTRODUCTION

Resources used for producing a commodity are traditionally known as factors of production, now they are popularly called inputs, which include land, labour, capital, organization and entrepreneurship. The term output refers to the commodity produced by these inputs. The theory of production is associated with the problem of combining various inputs, given the state of technology in order to produce a targeted quantity of the commodity. The unit is meant to explain the various dimensions of traditional as well as modern theory of production.

9.2 CONCEPT OF PRODUCTION

In common parlance, production refers to the functional relationship between the quantity of a good produced (output) and factors of production (inputs). Thus, production means transformation of inputs into outputs. In other words, production means provision of goods and services. The production activity is carried out by a firm which is a business unit that transforms the input into output. Production is a flow concept and is measured in terms of rate of output per unit of time. A firm tries to frame and adopt combinations of the different inputs in such a way that a given output is produced with the minimum possible amount of factors of production or a given quantity of resources results into the maximum production. A manager is expected to have the understanding of the process of production coupled with the knowledge of how costs and production influence each other in the short as well long run, and how the factors of production basically labour and capital vary according to the scale of time.

9.3 PRODUCTION FUNCTION

In the words of Prof. Koutsoyiannis, "The production function is purely a technical relation which connects factor inputs and output."

Production function has been defined by Prof. L. R. Klein in a rather better way when he says, "The production function is a technical or engineering relationship between input and output. As long as the natural laws of technology remain unchanged, the production function remains unchanged."

Mathematically, such a basic relationship between inputs and outputs may be expressed as :

$$Q = f(L, C, N)$$

where Q	=	Quantity of output
L	=	Labour
C	=	Capital
N	=	Land

Hence, the level of output (Q), depends on the quantities of different inputs (L, C, N.....) available to the firm. In the simplest case, where there are only two inputs, labour (L) and capital (C) and one output (Q), the production function becomes.

$$Q = f(L, C)$$

Thus, production function shows a given the relation between physical quantities of inputs and outputs achieved per period of time in a given state of technological knowledge.

9.4 TYPES OF PRODUCTION FUNCTION

In economic analysis two types of production functions are taken up. These are :

1. Short run production function
2. Long run production function

In the following paragraphs both the types of production function have been discussed:

1. Short run production function

Short period is that period in which some factors of production cannot be changed. In other words, some factors are fixed and some are variable. In short period, it is not possible to replace the machines, and expand the use of factory building etc. So in short period only variable factors such as labour, raw material, etc. can be altered. In other words, production in short period has to be carried out with given state of technology i.e. with no change in machinery etc.

2. Long run production function

Long period is that period of time, in which all the factors can be changed. In other words, no factor is fixed. New machinery can be installed, new factory can be setup. It means every type of change is feasible in the long period. In this period, the state of technology can be changed. Production can be carried out as per the requirements of the market. There is no distinction between fixed and variable factors. In other words, all factors are variable in the long period.

Fixed and Variable Inputs

Inputs can be classified into two categories :

- **Fixed inputs** : Fixed inputs are those inputs which cannot be changed. In other words supply of these inputs are constant. Equipments, plants and machinery, building etc. are the examples of fixed inputs.
- **Variable inputs** : Variable inputs are those inputs, whose supply can be changed in the short period. In other words, in short period, supply of some of the factors can be varied. Raw material, labour etc. are the variable factors in the short period.

Time Period

In the theory of production, time period can be classified into two categories i.e. short period and long period. the explanation of both these periods has been given in the following paragraphs:

1. **Short period** : Short period is that period of time in which some of the factors can be changed and some remain fixed. For example building, plant and machinery etc. cannot be expanded in the short period. If entrepreneur wants to increase the level of production in the short period, the building and plant and machinery supply cannot be increased. What an entrepreneur can do is to increase the production with the help of more use of raw material, labour and increase in the shifts of plants. If plant is working in one shift, at the most production can be increased by increasing the number of shifts in the factory.
2. **Long period** : Long period is that period of time in which all the factors of production viz. land, labour, capital etc. can be changed as per the requirements. In the long run, if the entrepreneur wants to increase the production, he can install new machinery, build new factory building or can hire more skilled labour. In other words, capacity of the plant can be increased in the long period in order to increase the level of production.

9.5 LAW OF VARIABLE PROPORTIONS

Law of variable proportions occupies an important place in economic theory. This law is also known as Law of Proportionality. It refers to the input output relation when the output is increased by varying the quantity of one input. When the quantity of one factor is altered, keeping the quantity of other factors constant, the proportion between

the variable factor and the fixed factor is changed, the ratio of employment of the variable factor to that of fixed factor goes on increasing as the quantity of the variable factor is increased. The Law of variable Proportions is given the new name to the Law of Diminishing Returns of the classical economists.

Assumptions

Law of variable proportions is based on following assumptions :

- (i) **Constant technology.** The state of technology is assumed to be given and constant. If there is an improvement in technology the production function will move upward. In other words there should not be any change in the state of technology.
- (ii) **Factor proportions are variable.** The law assumes that factor proportions are variable. If factors of production are to be combined in a fixed proportion, the law has no validity.
- (iii) **Homogenous factor units.** The units of variable factor are homogenous. Each unit is identical in quality and amount with every other unit.
- (iv) **Short-run.** The law operates in the short-run when it is not possible to vary all factor inputs. In other words, this law is applicable in the short period. It means, some of the factors of production will remain constant. It is not feasible to change all the factors of production in the short run.

Explanation of law

In order to explain this law, it is assumed that there are some factors which are fixed and other are variable. Let us assume that there are two factors of production, land and labour. Land is given to us and we can apply more labour only in order to increase production. The behaviour of total product, average product and marginal product has been explained in table 9.1

Table 9.1 : Behaviour of production

Land	Labour	Total product	Average Product	Marginal Production	Stage of Production
1	1	3	3	3	1st stage
1	2	8	4	5	
1	3	12	4	4	
1	4	14	3.5	2	2nd stage
1	5	14	2.8	0	
1	6	12	2	-2	3rd stage

The table 9.1 highlights that there are two factors of production, land and labour. When we applied more units of labour on land total product first increases at increasing rate after applying more units of labour total product increases at diminishing rate upto a certain limit. Thereafter, total product starts declining when more units of labour is applied. In the first stage, total production first increases at increasing rate when more units of labour are applied to the fixed factors. Average product first increases when more units of labour are employed. Similarly marginal product reflects the increase in total product. When we apply more units of labour. MP increases in the first stage. The rate of increase in marginal product is more than increase in average product at the initial stage. It means marginal product (MP) first

increases and then declines when third unit of labour is applied. First stage comes to an end when AP becomes equal to MP.

The second stage commences when first stage ends i.e. when $AP = MP$. In this stage total product increases at diminishing rate when more units of labour are applied to a given piece of land. Average product (AP) declines in the second stage. Similarly, MP also declines but rate of decline is more than AP. It reveals that total product increases at diminishing rate. Second stage comes to an end when marginal product (MP) becomes zero. Total product reaches at its highest point.

The third stage starts when second stage ends. In this stage, average product starts declining. Total product (TP) further increases at diminishing rate. MP becomes negative at this stage. At this stage, application of additional unit of labour causes decline in total and average product. Average product never

becomes negative, whereas marginal product becomes negative, during this stage. The process has also been explained with the help of the figure 9.1.

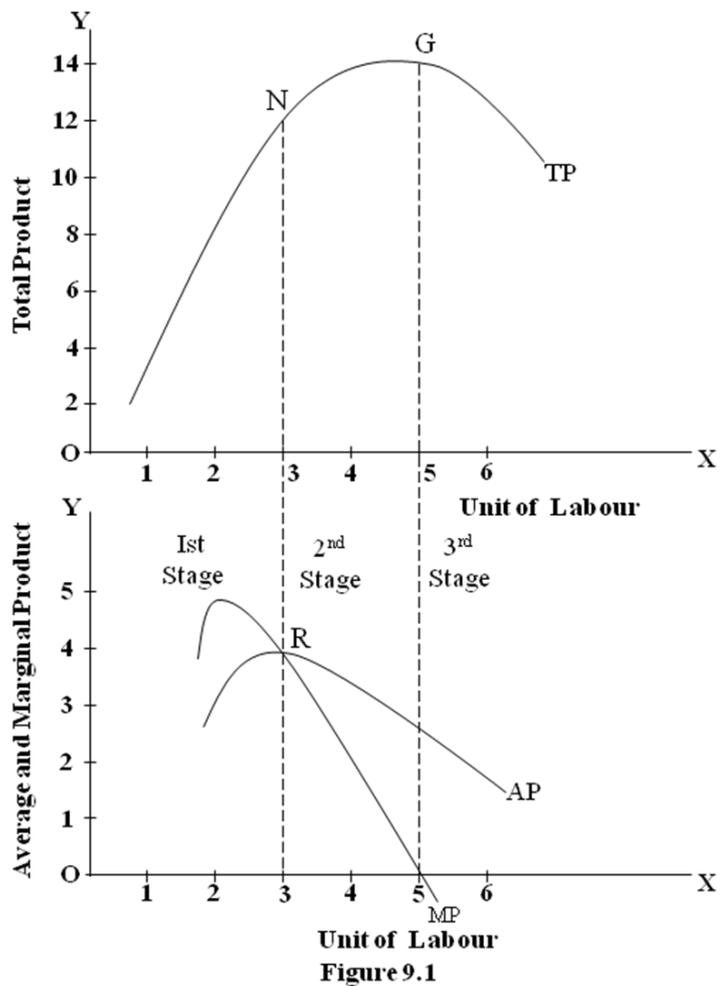


Figure 9.1

The part A of diagram 9.1 highlights behaviour of total product and Part B of diagram shows behaviour of AP and MP. In part A of diagram, total product (TP) curve has been derived. The total product curve initially increases at increasing rate and becomes constant and thereafter, starts declining. In part B of diagram, AP and MP curve have been derived. AP curve first increases and then starts declining when additional units of labour are employed. Marginal product of labour increases initially faster than AP and then starts declining. At one stage, AP is equal to MP and after that MP of labour starts declining and becomes negative. When total product becomes highest, marginal product of labour becomes zero. When total product declines MP becomes negative. In this diagram, at first stage, AP is equal to MP and during second stage MP becomes zero and at third stage MP becomes negative.

The three stages of the law of variable proportions have been discussed in the following paragraphs :

First Stage : In the first stage, TP rises at the increasing rate. Average product of labour also rises at the increasing rate. MP rises at higher rate than AP. First stage comes to an end at this stage, average product reaches at its highest point during first stage and MP becomes equal to AP.

Second stage: The second stage commences when AP is equal to MP. In the second stage, total product increases at diminishing rate. In other words, total product increases up to second stage but at diminishing rate. Similarly, AP and MP of labour, continue to decline. The rate of decline in MP is faster than rate of decline in AP. It means additional contribution of variable input declines continuously during this stage. The second stage comes to an end when total product reaches its maximum level which is shown at point G. Marginal product becomes zero. This stage is termed as the stage of diminishing returns in the economic literature. In this stage, although both AP and MP decline, AP remains positive. The second stage comes to an end when MP of labour becomes negative.

Third stage: This stage starts when MP of labour becomes negative, it means additional units of variable factor is not contributing positively in the production. AP of labour continues to decline during this stage on account of continued decline in total product. On account of the MP of labour being negative at this stage, this stage is termed as the stage of economic absurdity. A brief description of these three stages has been shown in the table 9.2

Table 9.2 : Stages of law of variable proportions

Total Product	Average Product	Marginal product
Ist Stage :		
Total product increases at increasing rate initially, then at diminishing rate	AP increases at increasing rate reaches highest level.	Initially increases at increasing rate and reaches highest level then start declining.
IInd Stage:		
Total product increases at diminishing rate become maximum.	Average product start declining	MP starts declining at increasing rate then become zero.
IIIrd Stage :		
Total product starts declining	Continue to decline but never becomes negative	Becomes negative at this stage.

Now question arises, what is the technical limit of production with which a firm would prefer to operate ?

According to this law, in short run, initially total product increases. It means various inputs are being used affectively by management. It means productivity of inputs is

increasing. At second stage, total product increases at diminishing rate. Both AP and MP start declining. It means efficiency of variable factors are declining.

At IIIrd stage, total product starts diminishing. AP starts declining and MP becomes negative. It means efficiency of various inputs are at its minimum level. Analysis of information vividly reveals that management should not operate at first and third stages. The reason being that at first stage, factors of production are efficiently utilized, and there is further scope for efficiency level to rise, whereas at third stage efficiency of inputs is minimum. Stage IInd becomes more relevant to decision makers in the organization. The organization is more concerned where additional contribution of variable factors start diminishing. In other words, managers want to utilize resources more efficiently and stage second is ideal for them.

Causes of Application of This Law

The following are the causes of application of this law:

- **Indivisibility of factors of production**

One of the factors responsible for increasing returns to scale are the indivisibility of factors of production. It means that to produce one unit of output, certain level of plant and machinery is required. One may produce one unit or ten units of product daily, certain amount of factors of production are essentially required. It means that there always exists some capacity in the plant. When production is increased to a certain level, the capacity utilization of plant reaches its optimum level. In other words, more can be produced initially at low cost. When more production takes place, the firm experiences increasing returns or diminishing cost at the initial level.

- **Division of labour**

When more units of output is to be produced, it becomes easy to divide work into various parts. Each work is assigned according to knowledge and skill of worker. It leads to increase in efficiency of workers. In this process, more is produced at minimum cost and factors of production are put to optimum use.

- **Economies of scale**

When bulk is produced, firm gets a lot of benefits which are termed as economies of scale. Economies of scale reduce the cost of production. In this process, initially we get increasing returns and then diminishing returns at latest stages.

9.6 ECONOMIES OF SCALE

It refers to benefits associated with mass production of goods and services. For example, when bulk of commodities are transported the cost of transportation of commodities declines. Suppose you hire a truck for transportation of commodities from Delhi to Mumbai, the owner of truck will charge Rs. 20,000. If you utilise full capacity or half capacity, the charges will be same. If you purchase raw material in bulk, firm supplying raw material may reduce price of the raw material.

There are two types of economies of scale: -

1. Internal economies.
2. External economies.

1. Internal Economies

It refers to benefits accrued to the firm, when firm increases its level of output. Some of these are:

(a) Labour Economies

When bulk of commodities are produced it becomes feasible to divide the work among workers according to their skill and knowledge. In this process efficiency of workers also increases and cost per unit declines.

(b) Financial Economies

When firm tries to raise money in large amounts from the markets the firm gets funds at low rate of interest. Similarly, financial institutions do not hesitate to provide more loans to large firms due to more risk bearing capacity of these firms. Large firms can easily raise money by selling its stocks or shares in the market.

(c) Managerial Economies

Firms going for large scale production can hire experts to deal with different departments. It ensures better management of plants at different levels.

(d) Marketing Economies

It becomes easy for the firms to market its products in an easy manner when they produce commodities in bulk. Moreover, advertisement costs decline when the firm advertises its products in more than one newspaper owned by single firm. Experts appointed by the firm to deal with marketing of the product manage the advertisement of their product in an effective manner. Moreover, advertisements increase the awareness of the consumers about these products.

2. External Economies

These economies accrue to firms when industry grows over the period of time. The benefits are shared by all the firms of the industry. In a particular area having advantage of cotton growing, the textile industry will start flourishing in this area over the period of time. It will also be easy for farmers to sell its products and people get employment. Some of the important external economies have been discussed in the following paragraphs :

(a) Economies of the use of by-products

When a firm increases its scale of production, it starts using its byproducts and in this way, income of the firm increases. For example, sugar mills make power alcohol out of molasses.

(b) Economies of linked process

When the firm increases its scale of plant, a firm may create its own distribution channel or even its own marketing centre. For example, a textile firm may have its own farm to produce high quality cotton and its own showrooms for garments to be directly sold to the customers. Dairy industry might be having its own dairy farms to ensure the timely supply of milk to production unit. In this process, firm's cost of production reduces.

(c) Inventory economies

A large firm can purchase bulk of raw materials, inputs and maintain big inventory. This inventory proves useful when raw materials and other inputs are not available due to break down of machinery during the production process. Similarly, in case of shortage, firms do not have to pay extra prices to purchase raw materials and other inputs. Thus, the production process continues without any disturbance, thereby reducing the cost of production of the firm.

(d) Economies of localisation

When a large number of firms are established in a particular area, they get a large number of benefits in the form of better transportation facilities, training centers for skilled manpower and technical development, supply of raw material etc. All these facilities reduce the cost of firm.

(e) Economies of information

As the industry grows, research and development relating information are shared by industry through the various publications. Industry jointly conduct the research relating to reduction in cost and in other areas. All this information is available to industry in an easy manner. In this process, when goal of the industry utilizes its research, cost of production falls.

(f) Economies of disintegration

As the industry grows, it specializes in the production of particular commodity. Firm in the industry try to have access to either raw material or distribution of goods directly to the consumers. For example, a textile firm may have its own farms to produce high quality cotton. A dairy firm may have its own dairy farms. Firm may open its distribution channel to provide goods directly to people in order to reduce the prices.

Diseconomies of Scale

When the scale of production increases beyond a certain point, firm faces the increase in the cost of production and essential inputs become costly. It raises the average cost of production. The following paragraphs discuss some of the diseconomies which cause the cost to increase.

(i) Increase in cost of factor inputs

As industry grows, the demand for skilled or semi-skilled workers increases. In other words, division of labour leads to more demand for different kinds of jobs. The workers also demand more wages. As a result of this, cost of labour increases so is the cost of production. Similarly, raw material and other goods are not easily available. Firms have to pay higher prices to purchase the various inputs.

(ii) Difficulties in decision making

As the scale of production enhances, the gap between top management and lower management increases. Due to increase in gap, it becomes difficult to take decisions independently. Important matters relating to day to day functioning get delayed. It causes a lot of losses to the firm. Moreover, problem of supervision at various stages also increases. It leads to increase in the cost of production.

(iii) Financial problems

Large firms require more capital and when the industry grows, finance is not easily available to them. Due to lack of availability of finances, firms face the problem of management of business enterprises. It prevents the firms in introducing the innovations and expansions and leads to decline in further growth of the firms.

(iv) Marketing diseconomies

In order to survive, firms in the highly competitive markets have to resort to heavy advertisements and sales promotion schemes. The cost of marketing of the product increases in this process. This situation is faced frequently by the firms working under monopolistic competition. It ultimately increases the cost of production.

9.7 PRODUCTION FUNCTION WITH TWO VARIABLE INPUTS

A firm may increase its output by using more of two variable inputs that are substitutes to each other, e.g., labour and capital. There may be various technical possibilities of producing a given output by using different factor combinations. Which particular factor combination will be actually selected by the firm depends both on the technical possibilities of factor substitution as well as on the prices of the factors of production. The technical possibilities of producing an output level by various combinations of the two factors can be graphically represented in terms of an isoquant (also called iso-product curve, equal product curve or production indifference curve).

Isoquants

Isoquants are a geometric representation of the production function. The same level of output can be produced by various combinations of factor inputs. Assuming continuous variation in the possible combinations of labour and capital, we can draw a curve by plotting all these alternative combinations for a given level of output. This curve which is the locus of all possible combinations is called the 'isoquant'.

Any quantity of a good can be produced by using many different combinations of labour and capital (assuming both can be substituted for each other). An isoquant or an iso-product curve is the line which joins together different combinations of the factors of production (L, K) that are physically able to produce a given amount of output.

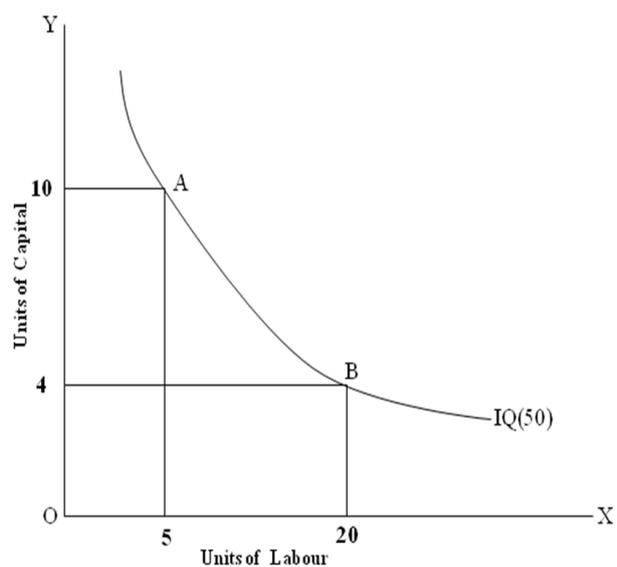


Figure 9.2

Suppose isoquant refers to 50 Kg. of output. This output can be produced by a large number of different combinations of labour and capital. All the different combinations for the same amount of output would lie on the same isoquant. For example (Figure 9.2), 10 units of capital and 5 units of labour (A) provide the same output as 4 units of capital and 20 units of labour input (B). The firm can choose any one of these

combinations (A or B) or any other combination which lies on the same isoquant to get 50 Kg. of output.

Points like A which require more capital and less labour represent capital intensive methods of production. Points like B, which require less capital and more labour represent labour intensive methods of production.

For movements along an isoquant, the level of output remains constant and the ratio of capital to labour changes continuously.

Distinction between Indifference Curve and the Isoquants

Like Indifference Curve, isoquants also represent combinations but while the former shows different combinations of two goods, the latter shows combinations of two factors of production (labour and capital). Though higher indifference curves show higher level of satisfaction than that of the lower ones, but the information as to how much a particular level of satisfaction is greater than the other cannot be identified. On the other hand, one can compare isoquants in the physical units of output quite easily. This may be explained through the following diagram.

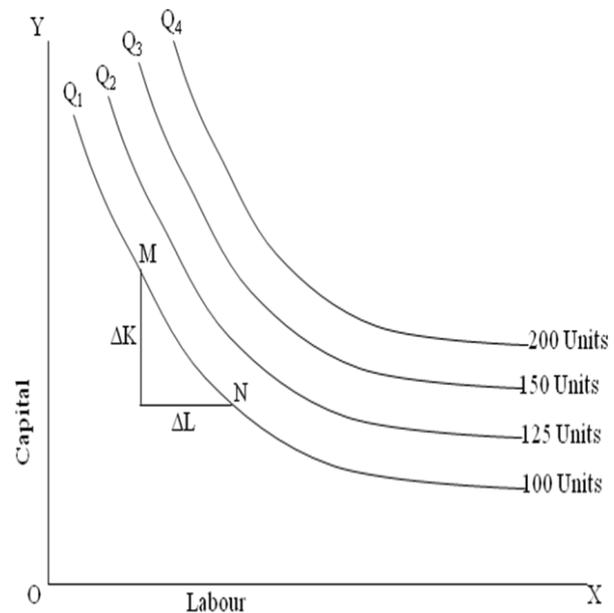


Figure 9.3

You can observe in the figure 9.3, that there are 4 isoquants indicating 100, 125, 150 and 200 units of production respectively. Thus, the higher the isoquants, the greater the level of output. Another similarity of indifference curve analysis with that of isoquants is that in both the cases there is a marginal rate of substitution, in case of the latter, it is termed as Marginal Rate of Technical Substitution (MRTS) rather than Marginal Rate of Substitution (MRS). The Marginal Rate of Technical Substitution indicates the rate at which factors can be substituted at the margin without changing the level of output. We may put it more conveniently as the number of units of capital which can be replaced by one unit of labour, the level of output being the same. The Marginal Rate of Technical Substitution (MRTS) at a point on an iso-quant can be traced from the slope of the iso-quant at that point. You will notice that a small movement down the iso-quant from M to N in the figure given earlier where a small amount of capital say ΔK is replaced by a quantity of labour (ΔL), there is no loss of output the slope of iso quant curve Q_1 at point M is therefore equal to $\frac{\Delta K}{\Delta L}$. Thus the

Marginal Rate of Technical Substitution of labour for capital ($MRTS_{LK}$) would be $\frac{\Delta K}{\Delta L}$.

9.8 RETURNS TO SCALE

If all inputs are changed simultaneously (possible only in the long run), and scale is increased proportionately, then the concept of returns to scale has to be used to understand the behaviour of output. The behaviour of output is studied when all factors of production are changed in the same direction and proportion.

The laws of returns to scale always refer to the long run because only in the long run are all the factors of production variable. In other words, only in the long run is it possible to change all the factors of production. Thus the laws of returns to scale refer to that time in the future when changes in output are brought about by increasing all inputs at the same time and in same proportion.

Returns to scale are classified as follows:

a. *Increasing Returns to Scale (IRS):*

b. *Constant Returns to Scale (CRS):*

c. *Decreasing Returns to Scale (DRS):*

The following paragraphs would explain all the three stages:

Increasing returns to scale: When output increases more than increases in factor inputs, it is called increasing returns to scale. This process can be explained with the help of Figure 9.4

The figure 9.4 highlights that when more units of labour and capital are used output increases more than increase in inputs. Initially 100 units of outputs are produced, with increase in factor inputs. 300 units are produced.

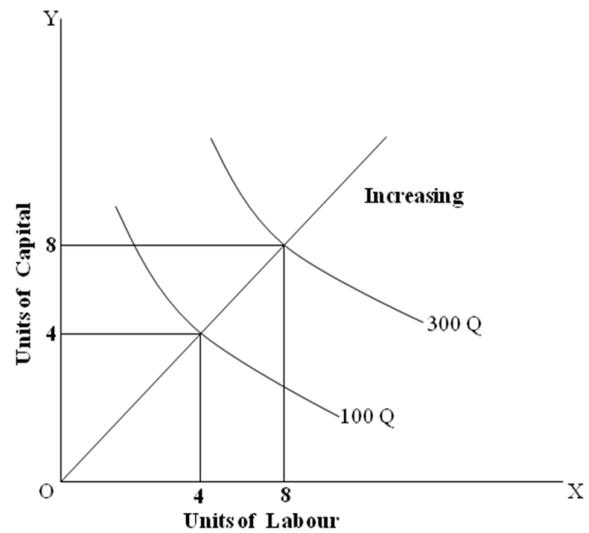


Figure 9.4

Constant returns to scale: It implies that the change in input is exactly equal to the proportionate change in input. In other words, if inputs are doubled, output also becomes double. It means that economies and diseconomies of scale balance each other.

The figure 9.5 highlights that proportionate change in input causes the equal proportionate change in output. It means doubling of inputs

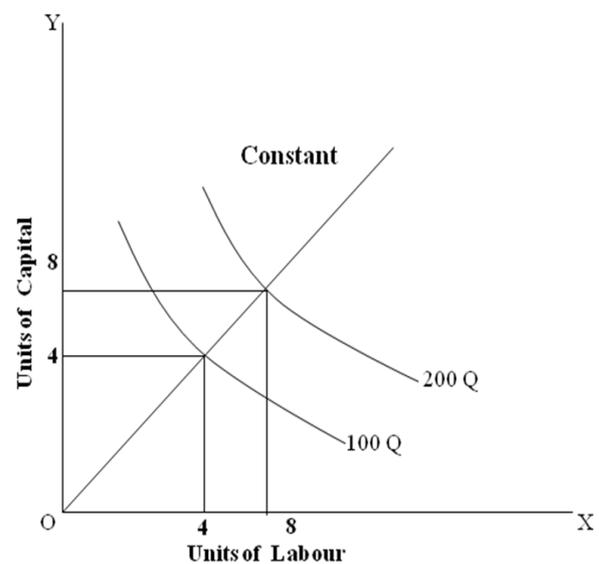


Figure 9.5

causes the double increase in output. Initially 100 units of outputs are produced, with an increase in factor inputs, 200 units are produced.

Diminishing returns to scale :

It refers to the situation, in which output increases less than increase in factor inputs. In other words, if, for example, inputs increase by 50 % output would increase by less than 50 %.

The figure 9.6 highlights that with increase in factor inputs, outputs fails to increase in the same proportion. Suppose, when inputs are doubled, output fails to increase in the same proportion. Thus, if the firm produces 100 units with the given quantity of inputs, it would produce less than 200 units even if the quantity of the inputs are doubled.

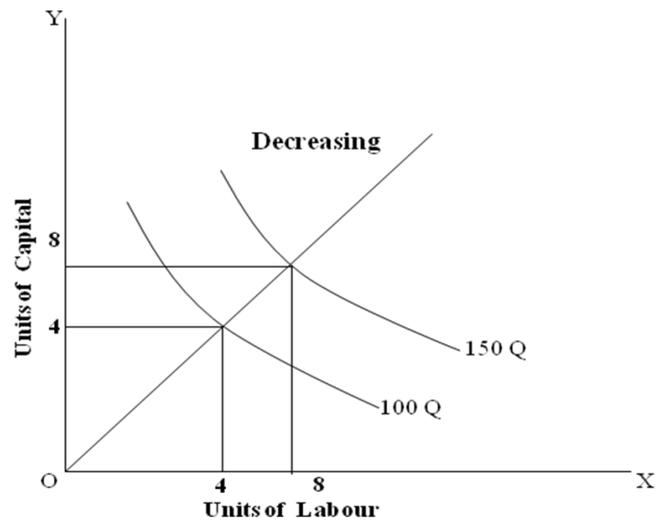


Figure 9.6

Causes of Increasing Returns to Scale: Increasing returns to scale are realized due to technical and/or managerial indivisibilities. One of the basic characteristics of advanced industrial technology is the existence of mass production methods. Mass production methods (like the assembly line car industry) are processes available only when the level of output is large. They are more efficient than the best available processes for producing small levels of output. For example, increasing returns of scale may occur because each worker has specialised in performing a simple repetitive task rather than many different tasks. As a result, labour productivity increases. In addition, a larger scale of operation may permit the use of more productive specialised machinery, which was not feasible on a lower scale of operation.

Cause of Diminishing Returns to Scale The most common causes of Diminishing Returns to scale are 'diminishing returns to management'. The management is responsible for the coordination of the activities of the various sections of the firm. Even when authority is delegated to individual managers (production manager, sales manager, etc.) the final decisions have to be taken by the board of directors. As the output grows, top management becomes eventually overburdened and hence less efficient in its role as coordinator and ultimate decision-maker. Although advances in management science have developed numerous management techniques, it is still a commonly observed fact that as firms grow beyond the appropriate optimal, management diseconomies creep in. These may result because as the scale of operations increases, communication difficulties make it more and more difficult to run the business effectively.

Another cause for diminishing returns may be found in the exhaustible natural resources: doubling the fishing fleet *may* not lead to a doubling of the catch of

fish; or doubling the plant in mining or an oil extraction field may not lead to a doubling of output.

9.9 OPTIMAL COMBINATION OF FACTORS

Every firm chooses the option of producing a commodity at the least possible cost and from this it can take any of the following two courses of action.

(i) Production of given quantity of production at minimum cost

You can understand the application of this option with the help of the figure given further.

Suppose that the firm chooses one of the output level shown by the isoquant P_1 in the figure. Assuming that prices of capital and labour are shown by the iso cost lines K_1L_1 , K_2L_2 and K_3L_3 , the firm will like to produce the desired level of output (P_1) at the lowest possible isocost curve. In the figure, P_1 level of output is best produced at the cost represented by K_2L_2 . Any expenditure below this level is not possible. The factor combinations represented by K_1L_1 or K_3L_3 are suboptimal as they do not produce the given level of output at the minimum cost.

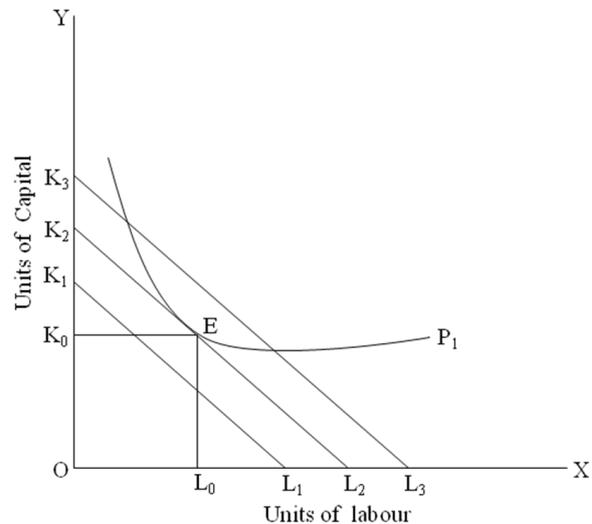


Figure 9.7

The firm's equilibrium point is E where isoquant P_1 is tangent to the isocost line which signifies that the slope of the isoquant i.e. the Marginal Rate of Technical Substitution (MRTS) equals the slope of the isocost (i.e. the ratio of price of labour to the price of capital) at that point. The price ratio indicates the rate at which one input can be substituted for another in purchasing while Marginal Rate of Technical Substitution (MRTS) points to the rate at which these inputs can be substituted for the production. Thus, to minimize costs with given level of output, a firm must purchase the two inputs which equalize the $MRTS_{Lk}$ of the inputs to that relative prices (w/r). Since $MRTS_{Lk}$ also equals the ratio of Marginal productivities of the two inputs (viz. $\frac{MP_L}{MP_K}$), equilibrium would be at the point where :

$$MRTS_{Lk} = \frac{w}{r} = \frac{MP_L}{MP_K}$$

(ii) Maximising Output with given level of cost

Another option available to the firm is to maximize production with the given amount of expenditure. You can analyse the option with the help of the figure given further.

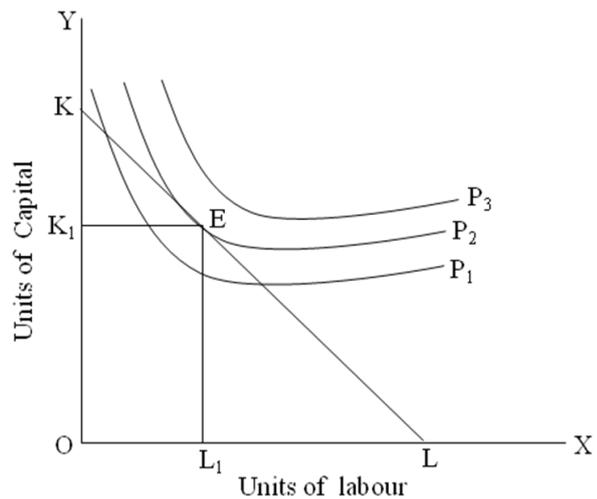


Figure 9.8 Maximizing output given resources

In the figure 9.8, KL is the isocost line (given cost of inputs) of the firm. It can achieve its goal of maximizing its production only when its isoquant is tangent to its isocost line. While the isoquant P₃ is possible to obtain as it is beyond the isocost line, P₀ output will not be chosen because a higher level of output P₂ can be reached with the same level of cost. Thus the firm is at equilibrium where it uses OK₁ of capital and OL₁ of labour and is at the point E. Hence, the firm, in order to maximize its output with the given level of cost has to equate the Marginal Rate of Technical Substitution and the ratio of input prices. Therefore at equilibrium point -

$$MRTS_{LK} = \frac{w}{r}$$

Expansion Path reflecting Change in firm’s inputs and output

The Expansion Path with no change in the prices of inputs, an increase in the expenditure on them would result in a parallel shift in the budget line. Each budget line will give a new tangency point and, therefore, a new equilibrium point. Thus the Expansion Path is the locus of the different equilibrium points under the condition of changes in expenditure on production prices of inputs remaining the same. As it is formed through a linkage between the various points of least cost combination of the inputs, the Expansion Path exhibits the many the factor proportions change when expenditure and output change, while the prices of inputs remain stationary. The figure given further would show you how the expansion path can be constructed taking into consideration different isocost lines which are parallel to each other with the input prices remaining unchanged. You can notice that each isocost line in the figure will have a corresponding isoquant tangent to it. Here, these

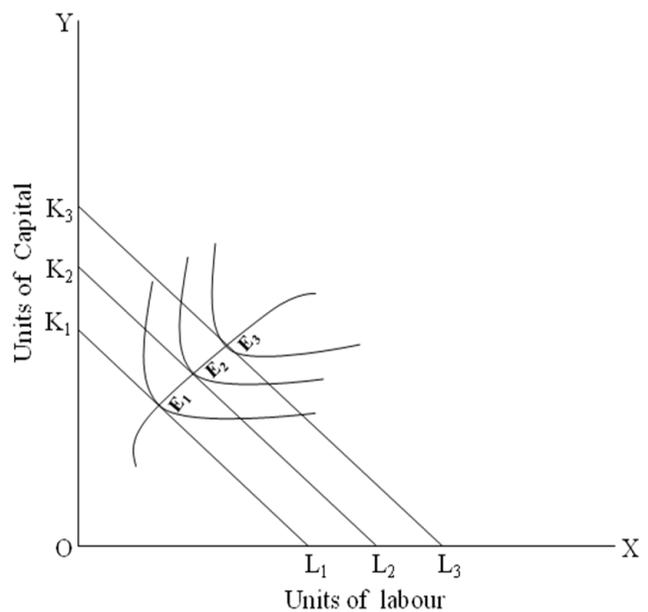


Figure 9.9 The Expansion Path

As it is formed through a linkage between the various points of least cost combination of the inputs, the Expansion Path exhibits the many the factor proportions change when expenditure and output change, while the prices of inputs remain stationary. The figure given further would show you how the expansion path can be constructed taking into consideration different isocost lines which are parallel to each other with the input prices remaining unchanged. You can notice that each isocost line in the figure will have a corresponding isoquant tangent to it. Here, these

tangency points are E_1 , E_2 and E_3 implying optimal combination of inputs with optimal level of production.

P in the figure given earlier, is the expansion path which is derived through joining all the three equilibrium point E_1 , E_2 and E_3 . The budget lines K_1L_1 , K_2L_2 and K_3L_3 are parallel to each other which follows that the $MRTS_{LK}$ i.e. $\frac{MP_L}{MP_K}$

would also be equal at each equilibrium point.

Optimal Product Mix

In general practice today, firms tend to produce more than one product and in such a case, the problem before a firm producing, say, two products, as how it would choose the proportions in which the two goods are to be produced. The solution to this problem can be provided along the same lines as we follow in case of the choice of the proportions of inputs.

The Production Possibility Curve

Assume that a firm produces X and Y commodities and the resources of the firms (i.e. machinery and labour) are given. With these inputs the firm can produce X and Y in different proportions because if more of X is produced, less of Y can be produced and vice-versa. It also explains that it is not possible for the firm to produce both X and Y in larger quantity with technology remaining unchanged. We can explain this situation with the help of an illustration given in the table charted further.

Table 9.3
Monthly Production Possibilities of a Firm

Possibility	Output of X (Units)	Output of Y (Units)
A	0	1200
B	4000	1160
C	1000	1000
D	1800	400
E	2000	0

On the basis of the data given in the Table 9.3, we can draw figure 9.10 showing monthly production possibilities of the firm.

The curve AE is the firm's production possibility curve which shows the possible levels of output of commodities X and Y in a month with given resources. As you can observe, the firm has a different production possibility curve for each

quantity of resources. This curve is concave to the origin which implies that as the output of X is increased, larger and larger output of Y has to be sacrificed to

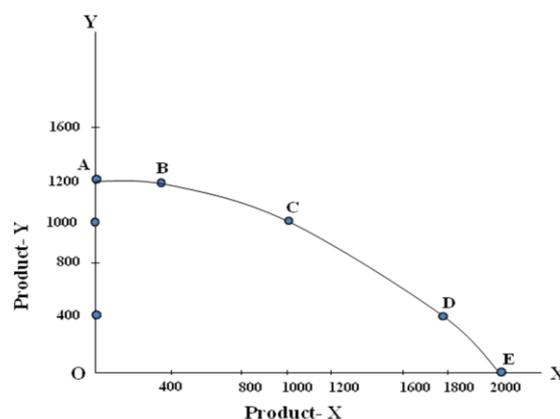


Figure 9.10 Production Possibility Curve of the firm

obtain an additional unit of X. Similarly, increases in the quantity of Y require increasing sacrifices of X. The firm's resources are not equally suitable to produce X and Y. The concavity of the curve signifies diminishing returns. For each additional unit of product Y abandoned, the output increase of X becomes smaller and smaller. Similarly at point B, the output gain of Y becomes smaller for each unit of product X sacrificed.

Iso-Revenue Lines

The firm in this example, would attempt to maximize its revenue from the sale of these products. Assuming that the demand curve of the firm for X and Y is perfectly elastic, we consider that the prices at which the firm sells its products remain unaffected by the quantities sold by it. The figure 9.11 given further shows the iso-revenue lines indicating the revenues of the firm obtained by it by selling X and Y.

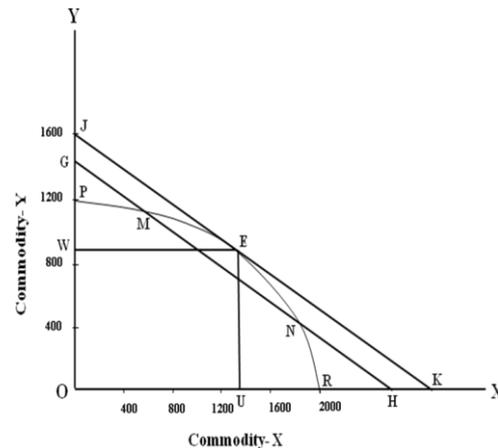


Figure 9.11 Optimum Combination of outputs

In the figure given earlier, the slope of the iso-revenue line is $\frac{P_X}{P_Y}$ since the

slope $= \frac{OJ}{OK} = \frac{Y}{X}$, because:

$$Y P_Y = X P_X$$

$$\text{or } \frac{Y}{X} = \frac{P_X}{P_Y}$$

The farther this line lies from the point of origin (O), the greater is the total revenue shown by the iso-revenue line.

Optimum Combination of Output

The optimum combination of output of X and Y is at point E in the figure 9.11. The firm produces OU quantity of X and OW of Y. If the firm decides to produce elsewhere on the production possibility curve PR, at points such as M or N, it will be on a lower iso-revenue line (GH line in the figure). At point E, JK line is tangent to the production possibility curve and therefore, slopes of the iso-revenue line and the production possibility curve are equal. This implies that the ratio of the prices is equal to the rate of substitution or transformation of the two products which may be expressed as :

$$\frac{P_X}{P_Y} = MRS_{XY}$$

9.10 SUMMARY

Production refers to transformation of inputs into output. Production function shows the relationship between input and output. In economics two types of production functions are discussed. The short period and long period production function. The short period production function refers to Law of Variable Proportions and long term production function refers to Law of Returns to Scale. The law of variable proportions states that if the inputs one of resource is increased by equal increment per unit of time while the inputs of other resources are held constant, total output will increase, but beyond some point the resulting output increases will become smaller and smaller. Under this law, in the first stage both AP and MP increase First stage comes to an end when $AP=MP$. In second stage AP and MP declines. But the rate of decline in MP is faster than AP. Second stage comes to an end when MP becomes zero. In the third stage MP becomes negative. Second stage is more important to producers. In long period Law of Returns to scale operates. In long period all the factors of production are variable. In long period, three types of returns to scale operates i.e. increasing returns to scale, constant returns to scale and diminishing returns to scale. The increasing returns to scale occurs due to economies of scale and better management practices. On the other hand, diseconomies of scale and difficulty in management of resources causes diminishing returns to scale.

9.11 GLOSSARY

- **Production:** Production refers to the functional relationship between the quantity of a good produced (output) and factors of production (inputs).
- **The production function:** The production function is purely a technical relation which connects factor inputs and output.
- **External Economies:** These economies accrue to firms when industry grows over the period of time. The benefits are shared by all the firms of the industry

9.12 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- (i) A is a unit of business which converts input into output.
- (ii) Production function undergoes a change with the change in
- (iii) The period in which some factors of production are fixed while others are variable, is known as
- (iv) Isoquants are representation of the production function.
- (v) The factors of production can be changed only in the
- (vi) Inputs and output move in the same direction in case of

(B) State whether the following statements are true or false:

- (i) Production function embodies a relationship between capital and labour.
- (ii) Variable inputs are the inputs which don't vary with change in the quantum of output.
- (iii) Law of Variable Proportions assumes that each unit of variable factor is identical in quality and quantity.
- (iv) Different quantities of production can be shown on a particular iso-quant.
- (v) Increased application of modern technology is one of the causes of increasing returns to scale.
- (vi) Diminishing returns to scale is caused by inefficiency of labour.

9.13 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Firm (ii) Technology (iii) short run (iv) geometric (v) long run
(vi) constant returns to scale
- (B) (i) False (ii) False (iii) True (iv) False (v) True (vi) False

9.14 TERMINAL QUESTIONS

(A) **Short Answer Questions:**

1. What is production function?
2. Distinguish between law of variable proportions and returns to scale.

(B) **Long Answer Questions:**

1. Explain the Law of Variable Proportions.
2. Discuss the Law of Returns to Scale.
3. Explain economies and diseconomies of scale.
4. Explain the Production Possibility Curve.

9.15 SUGGESTED READINGS

- Alfred W. Stonier and Douglas C. Hague, A Text Book of Economic Theory, Longman, 1990.
- Spencer, M. H. and L. Sieglemen, Managerial Economics Richard Irwin, 1964.
- Samuelson, P.A. and W. D. Wordhans, Economics – McGraw Hill, 1985.
- Cobb, C. W. and P. H. Douglas, A Theory of Production, American Economic Review, March (Sppl.), 1928.
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UNIT 10-THEORY OF COSTS

Structure

- 10.1 Introduction
- 10.2 Important Cost Concepts
- 10.3 Types of Costs – Short run and Long run
- 10.4 Average Cost and Marginal Cost
- 10.5 Relationship between Average Cost and Marginal Cost
- 10.6 Long Run Cost Curves
- 10.7 Modern Approaches to Cost Curves
- 10.8 Summary
- 10.9 Glossary
- 10.10 Check your Progress
- 10.11 Answers to check your Progress
- 10.12 Terminal Questions
- 10.13 Suggested Readings

OBJECTIVES

After studying this unit you should be able to :

- Understand the concept of cost.
- Be aware of the basic differences between the various cost concepts.
- Analyse the behavior of costs

10.1 INTRODUCTION

In common parlance, cost refers to the amount of money spent by producers to purchase various inputs to produce final goods and services. Cost is one of the main factors determining the efficiency of the plant. A plant is said to be working efficiently when it is able to produce maximum output at the minimum cost, and therefore, every producer desires to produce goods at the minimum cost. Cost is also one of the important determinants of profitability of the firm, the reason being, with increase in competition large number of goods and services are produced and made available to consumers at low price. If a firm wants to sell still more, it will have to apply various methods to reduce cost of production of the commodity. In this unit, various cost concepts have been discussed alongwith the significance of these concepts for business.

10.2 IMPORTANT CONCEPTS OF COSTS

The following paragraphs would bring before you an explanation of important cost

concepts.

(i) Opportunity Cost

Resources available to society are limited and these resources have alternative uses. When we use these resources for the production of one commodity, we cannot use them for some other use. For example, energy/electricity can be used for industry and domestic purposes. When we decide to use electricity for industry, the society has to forego the use of electricity in domestic purpose. What is not used is the opportunity cost of what is produced. The electricity not used in domestic sector is the opportunity cost of its use in manufacturing sector. Similarly, factors of production must be paid atleast the price which the factor can earn in its next best use. For example, in a business is managed by a group of persons, the person who is assigned the duty of managing the firm must get at least what the person could earn in his next best use. For example, a person can earn Rs. 10,000 in some other occupation and this is the minimum amount of salary that should be paid to the person managing the firm. Now this is the opportunity cost for the person in question.

(ii) Explicit Cost

Explicit cost means the payment made to the suppliers of the factors of production which are hired by the firm to produce goods and services. For example, payment to the supplier of raw materials, and wages to hired labour, etc. are covered under this category. These costs are also known as accounting cost.

(iii) Implicit Cost

Implicit cost is the cost of self employed resources. For example, if a person works as a manager of his own firm and charges no remuneration for this, the money he would have earned for the same work elsewhere would be termed as implicit cost is an example of implicit cost. Similarly, if an entrepreneur uses his own building to manage his business, he doesn't have to pay rent of the building used for the business. The amount equal to this rent would be called as implicit cost

(iv) Real Cost

In ordinary sense, cost refers to expenditure incurred on the purchase of various inputs. This is simply termed as money cost. But real cost is much broader a term than money cost. Real cost involves sacrifice, or discomfort in the production process. It cannot be measured in monetary terms. Modern compensation packages is formulated while taking into the real cost.

(v) Money Cost

Money cost is the monetary expenditure spent on various inputs used in the production of a commodity. It is obviously the payment made to the owners of the various factors of production which is also known as the outlay cost because it covers the actual financial expenditure of the firm.

(vi) Social cost

It denotes the cost which the society has to bear in the form of increase in pollution, degradation of soil, water and other natural resources. It is primarily caused by industrial wastes etc. Social cost is borne by the society. For example, if a chemical manufacturing unit throws its waste in to the rivers, the people living around the river will get polluted water. It will lead to increase in water borne diseases among the people who are living near the river and using its water. Similarly, the farmers who

are using this water for irrigation purposes their crops will get damaged and consequently productivity of land will decline thereby leading to decline in availability of food grains to the people. It is termed as social cost.

(vii) Replacement cost

Replacement cost is the cost of replacing the current assets in use. In other words, during the production process, life of machinery declines due to its wear and tear. Similarly, due to rapid improvement in technology, the existing machinery becomes obsolete. In order to compete in the market, firms have to replace the existing machinery. The expenditure, which is incurred to buy new machine in place of the old one or for up gradation of technology is termed as replacement cost.

(viii) Accounting Cost and Economic Cost

Accounting costs are direct monetary costs that are entered in the books of accounts of a firm viz. costs on wages, salaries, stationery, raw materials etc. On the other hand, economic cost is a broader term which includes both implicit and explicit costs.

(ix) Sunk Costs and Outlay Cost

Sunk costs are the costs which are not altered by a change in quantity and cannot be recovered. An example of such cost is depreciation. Outlay costs mean actual expenditure incurred in producing or acquiring a good or services. These are also known as actual costs and are recorded in the books of accounts. Money paid to the labour as wages is an example of such a cost.

(x) Business costs and Full Costs

While business costs include all the payments and contractual obligations made by the firm together with the book cost of depreciation on plant and equipments, full costs are the sum of opportunity costs and normal profit.

10.3 TYPES OF COSTS

On the basis of time period, costs may be divided into two parts :

I. Costs in the short-run, II. Costs in the long-run

I. Costs in the Short-run : Short-run refers to that period of time in which some factors of production are fixed and others are variable. The short-run costs are divided into following two types :

(1) Fixed Costs, (2) Variable Costs

1. Fixed Costs : In the short period the expenses incurred on fixed factors are called the fixed costs. These costs do not change with changes in the quantity of output production, no production or whatever may be the level of output, fixed costs remain constant. Even if the production is zero, fixed costs remain the same. Fixed costs include the following expenses.

(i) Rent of land and buildings, (ii) Salary of permanent staff, (iii) Licence fee, (vi) Insurance premium, (vi) Normal profits.

Fixed costs are also called 'Supplementary Costs' or 'Indirect Costs' or 'Overhead Costs'. Fixed costs can be explained with the help of the table and diagram given further :

Table 10.1 Fixed Cost

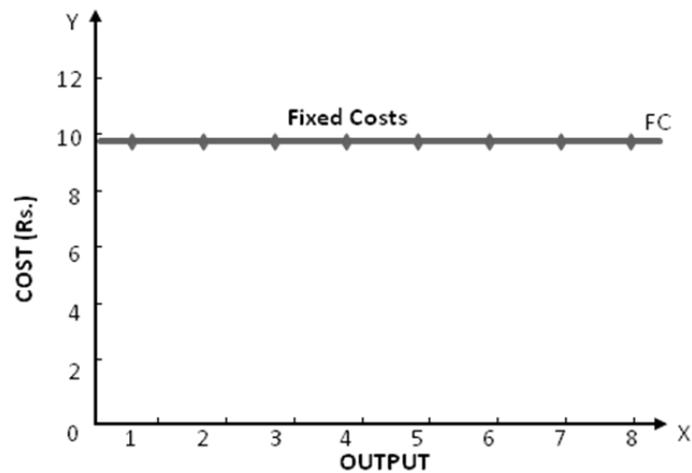


Fig. 10.1 Fixed cost

Quantity of Output	Fixed Cost (Rs.)
0	10
1	10
2	10
3	10
4	10
5	10
6	10
7	10
8	10

Table 10.1 indicates that change in the quantity of output causes no change in fixed cost. When output is zero, fixed cost is Rs. 10, and even if output increases to 2, 4, 6 and 8 units, fixed cost remains the same i.e. Rs. 10.

Graphically, total fixed cost will be represented as a straight line parallel to x-axis as shown in Fig. 10.1. This line shows that fixed costs remains constant at different levels of output.

2. Variable Costs : *Variable costs are those costs which vary as the level of output varies.* It implies that these costs undergo a change with the change in output. It also indicates that when production is zero, variable cost is zero.

The rate of increases in total variable costs is determined by the **laws of returns**.

There are three stages of returns, viz. increasing returns, constant returns and decreasing returns. In a production unit, at the initial stage, when the level output increases, every additional unit of the variable factor brings in more than proportionate returns. At the point of optimum capacity, the additional returns remain constant. Ultimately, every additional unit of the variable factor yields only less than proportionate returns.

Corresponding to these stages of returns, we can also go through three stages of variable costs. Initially total variable costs increase at a falling rate, in the intermediate stage, these increase at a constant rate and finally these increase at a rising rate.

These are also called '**Prime Costs**', '**Direct Costs**' or '**Special Costs**'. Variable costs include (i) Expenses on raw materials, (ii) Fuel and power (Electricity)

charges (iii) Wages for casual and Temporary labour, (iv) Transport costs etc. These are all direct costs linked with actual production.

Variable costs can be explained with the help of table given further.

Table 10.2 Variable Costs

Output	Variable Cost (Rs.)	Change in Variable Costs (ΔVC)
0	0	0
1	10	10
2	18	8
3	24	6
4	28	4
5	32	4
6	38	6
7	46	8
8	62	16

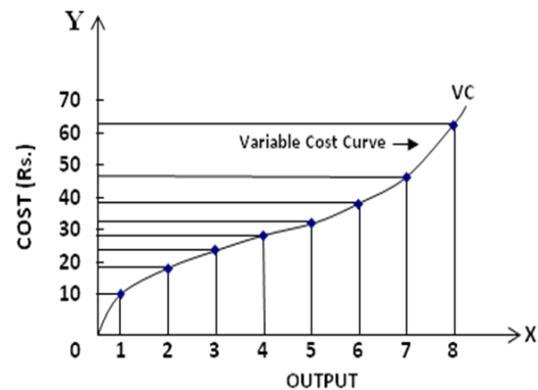


Fig. 10.2 Variable Costs

Table 10.2 shows that as the quantity of output is increasing, variable costs are also increasing. At zero level of output variable costs are also zero. But the rate of increase in the total variable costs is different at different levels of output. Initially, first unit is produced at Rs. 10.00. The next unit is produced only at Rs. 8.00. In this stage, the law of decreasing costs operate.

In the intermediate stage, when the law of constant returns (or the law of constant costs) sets in the units 4th and 5th are produced at the same additional cost i.e. Rs.4.00.

In the ultimate stage, the law of diminishing returns (or the law of increasing costs) sets in, the next 6th, 7th and 8th units of output are produced at higher cost of Rs. 6, 8 and 16.

In other words, total variable costs increase at a decreasing, constant and increasing rates corresponding to the three stages of the laws of returns.

Variable costs are illustrated diagrammatically in Fig. 10.2 VC curve represents, total variable costs curve upward sloping. VC curve represents that as output increases, variable costs also increase. VC curve is sloping upwards at diminishing, constant and increasing rate.

Total Costs

Total costs of a firm for various levels of output are the sum of total fixed costs and total variable costs. Symbolically,

$$TC = TFC + TVC$$

Arithmetically, total costs, as a sum of total fixed costs and total variable costs have been calculated at different levels of output in the Table 10.3.

Table 10.3 Total Costs

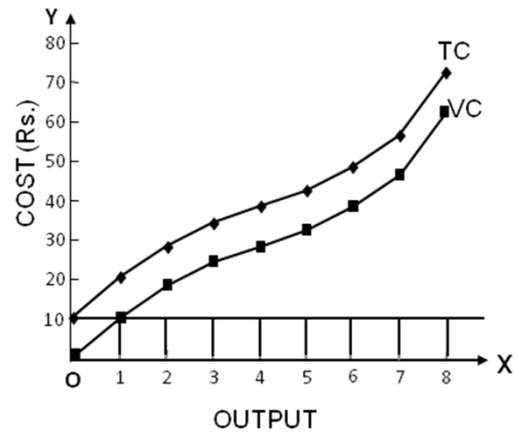


Fig. 10.3 Total Costs

Output	Fixed Costs (Rs.)	Variable Costs (Rs.)	Total Costs (Rs.)
0	10	0	10
1	10	10	20
2	10	18	28
3	10	24	34
4	10	28	38
5	10	32	42
6	10	38	48
7	10	46	56
8	10	62	72

In the table given above total costs are calculated by aggregating fixed costs and variable cost. It is clear from the table that the total costs of production increases with an increase in the level of output. At different levels of output total costs follow total variable costs, because total fixed costs always remain constant.

Total costs can also be shown diagrammatically in Fig. 10.3. Units of output are shown on x-axis and costs on y-axis. FC line represents fixed costs and VC is variable costs curve and TC is total cost curve. The total cost curve represents the aggregate of FC and VC curves. TC curve begins from the starting point of FC curve. At point 'O', output is zero, but fixed cost is Rs. 10, so total cost is also Rs. 10. The difference between total cost and variable cost is uniform throughout their length. In other words, TC and VC curves are always parallel. It is evident from the Table 10.3 and Fig. 10.3 TVC and TC is rising.

Difference between Fixed Costs and Variable Costs

- 1. Relation with Quantity of Production :** Fixed costs have nothing to do with the quantity of output, production may be more or less, fixed cost remains fixed. Conversely variable costs are directly related to quantity of output. Variable costs vary as directly as the level of output varies.
- 2. To become Zero :** Even if production is zero, fixed cost remains the same. But in case the production is stopped, variable cost will come down to zero.
- 3. Average Fixed Cost and Average Variable Cost :** Average fixed costs fall with increase in the quantum of output, but average variable costs fall at lower rate

than average fixed costs with increase in production. However, the AFC goes on falling with the increase in output, whereas after a point AVC starts rising with the increase in production.

4. **Determinants of Factors** : Fixed costs include rent of buildings and premises, interest on capital, wages paid to permanent employees, licence fee etc. Variable costs include cost of raw material coal, power and electricity charges, wages of casual and temporary staff etc.

10.4 Check Your Progress I

(A) Fill in the blank :

- (i) Accounting costs include the costs only.
- (ii) Real cost cannot be measured in terms.
- (iii) When production is nil,cost is also nil.

(B) State whether the following statements are true or false.

- (i) Opportunity cost is a term which describes cost related to an optimum level of production.
- (ii) Full costs is a sum of opportunity cost and normal profit.
- (iii) Fixed costs are also known as overhead costs.

10.4 AVERAGE COST AND MARGINAL COST CURVES

1. Average Cost : The average cost of production is the total cost per unit of output. Average cost of a commodity can also be found by dividing total costs by the number of units produced. You may also put it as Average Cost is equal to total cost divided by output.

$$AC = \frac{TC}{Q}$$

(Here, AC stands for average cost; TC for Total cost and Q stands for quantity of output)

The average cost of production can also be obtained by adding average fixed cost and average variable cost Or,

$$AC = AFC + AVC$$

(Here, AFC stands for average fixed cost and AVC for average variable cost)

(i) Average Fixed Cost

Average Fixed cost is total fixed cost divided by total output. Average fixed cost is the per unit cost of the fixed factor of production. Symbolically,

$$AFC = \frac{TFC}{TQ}$$

(Here, TFC stands for total fixed cost and TQ for total output)

As the level of output increases, the average fixed cost falls, since the total fixed costs remain unchanged at different levels of output) as is shown in the Table 10.4.

Table 10.4

Output	Total Fixed Cost (Rs.)	Average Fixed Cost (Rs.)
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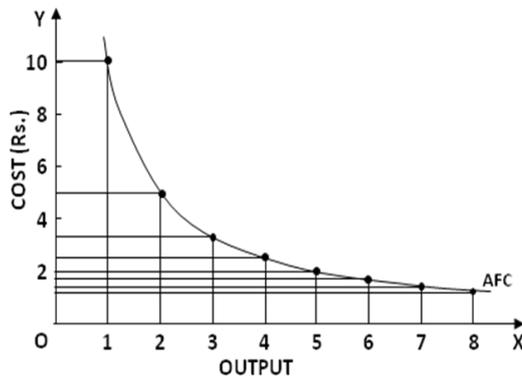


Fig. 10.4 Average Fixed Cost

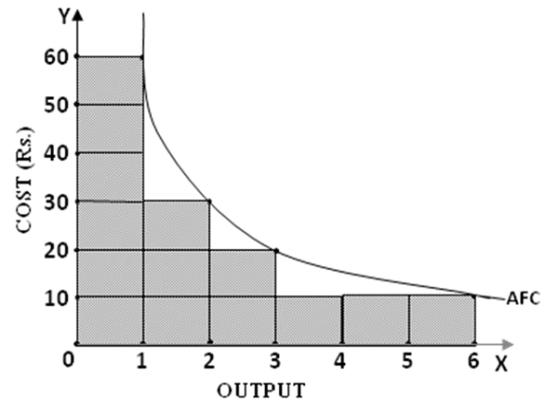


Fig. 10.5 Average fixed Cost

0	10	∞
1	10	10.00
2	10	5.00
3	10	3.3
4	10	2.5
5	10	2.0
6	10	1.7
7	10	1.4
8	10	1.2

It is clear from the Table that as output increases, average fixed costs fall, because more units are being produced now at the same fixed expenses.

Graphically, the average fixed cost curve will be a downwards sloping curve as shown in Fig. 10.4. This curve will never touch the x-axis, because average fixed cost cannot be zero, however large the level of output may be.

AFC curve never touches y-axis because TFC as in Table 10.4 is a positive value at zero level of output and any positive value divided by zero will provide infinite value.

Average fixed cost curve is a rectangular hyperbola, the total area under the curve at different points will be the same. The total area at a given point will show the total fixed cost of production for the specified output. In Fig. 10.5 we have marked four different levels of output viz. 1, 2, 3, and 6. For each of these total fixed costs equal six squares (i.e., Rs. 60).

(ii) Average Variable Cost

The average variable cost is found by dividing the total variable costs by the total units of output. It is the per unit cost of the variable factors of production. Symbolically,

$$AVC = \frac{TVC}{TQ}$$

(Here TVC is the total variable cost and TC is the total quantity produced)

Total variable costs, as we already know, are determined by the law of variable proportions. Consequently, average cost also shows the same tendency. Average variable cost falls initially and rises after the point of normal capacity has been reached. Average variable cost can be explained with the help of Table 10.5

Table 10.5 Average Variable Cost

Output	Total Variable Cost (Rs.)	Average Variable Cost (Rs.)
0	0	0
1	10	10
2	18	9
3	24	8
4	28	7
5	32	6.4
6	38	6.3
7	46	6.6
8	62	7.8

It is clear from Table 10.5 that initially upto 6 units of output, the average variable cost has been falling, but it begins to rise from the seventh unit. It is so because in the initial stages of production law of increasing returns operates which causes the costs to diminish. But after a point, law of diminishing returns sets in, as a result of which the average variable cost begins to rise.

Graphically, AVC curve is a dish-shaped or similar to letter 'U' of English language. In Fig. 10.6. It is evident that upto 6th unit, AVC curve is falling. It implies that average variable cost is diminishing as output is increasing. From seventh unit onwards it begins to rise upward, implying that the average variable cost is increasing. This tendency is determined by the law of variable proportions.

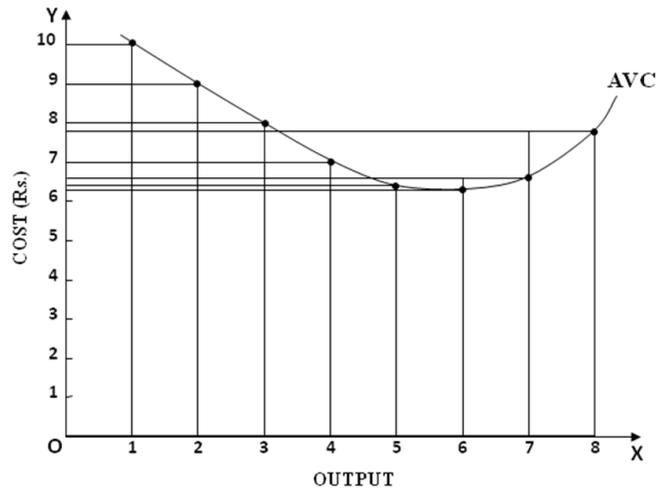


Fig. 10.6 Average Variable Cost

Relation between Average Cost, Average

Fixed Costs and Average Variable Costs

Average cost (AC) is the aggregate of average fixed cost (AFC) and average variable cost (AVC). The relation is depicted in Table 10.6.

Table 10.6 Relation between AC, AFC and AVC

Output	AFC (Rs.)	AVC (Rs.)	AC = AFC + AVC (Rs.)
0	α	0	∞
1	10	10	20
2	5.0	9	14.0
3	3.3	8	11.3
4	2.5	7	9.5
5	2.0	6.4	8.4
6	1.7	6.3	8
7	1.4	6.6	8
8	1.2	7.8	9

It is evident from the table that the Average Cost has been falling upto the seventh unit, because both AFC and AVC are also falling. It is the lowest at the seventh unit. After the seventh unit, it begins to rise because AVC is also rising. Fig. 10.7 represents average cost. Units of output are shown on x-axis and costs on y-axis. AC curve is average cost curve. It is similar to English Letter 'U'. It indicates that initially, when output increases average cost falls. After a minimum point, it begins to rise, the reason being that when output increases, initially law of increasing returns or diminishing costs applies. After a point when production is increased, law of diminishing returns or increasing costs sets in. Consequently the curve starts rising upward.

The following observations need be made about the nature of AC curve.

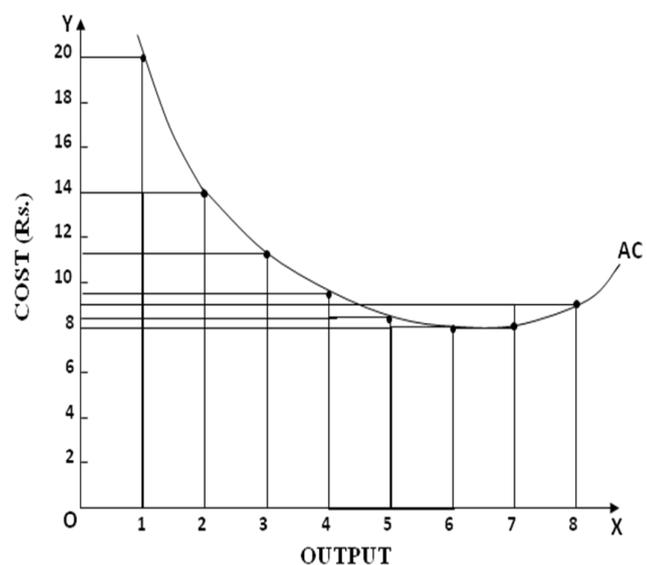


Fig. 10.7 Average Cost

- (i) Geometrically, AC curve is obtained by adding AFC and AVC curves as in Fig. 10.8. At each level of output, AC curve lies above AVC curve at a distance equal to the corresponding height of curve AFC.
- (ii) AC curve tends to come closer to AVC curve, but it never touches the latter.
- (iii) The minimum point on AC curve is reached for a larger output OQ_1 than the minimum point on AVC curve (at OQ_2 level of output).
- (iv) Another important observation about the shape of short-run AC curve is that it is a 'U' shaped curve.

The 'U' shape of the AC curve is explained in the following paragraphs:

1. Behaviour of Average Fixed Cost and Average Variable Cost : AC is the sum of AFC and AVC. As the production increases, average fixed cost goes on falling. In the initial stages of production, average variable cost also goes on falling. Consequently, the aggregate of these two costs, i.e. average cost also falls as is shown in Fig. 10.8 upto point 'A' average cost curve is falling. It is at its minimum at point

'A'. In this situation the firm is making full use of its production capacity. The firm is having optimum output if firm produces beyond this normal capacity, no doubt, average fixed cost will continue to fall, but average, variable cost will begin to rise. Rising of average variable cost will make the average cost to rise also. It is so, because after point 'A' rate of increase in AVC is much more than the rate decrease in AFC. Consequently its cumulative effect is reflected in the upward rising of AC curve. In this way AC curve being the aggregate of AFC and AVC, initially falls, and having reached its minimum point begins to rise upward.

2. Law of Variable Proportions : The 'U' shape of the short run average cost curve can also be explained in terms of the law of variable proportions. This law tells that when the quantity of one variable factor is changed while keeping the quantities of other factors fixed, the total output increases, but after some time it starts declining. In other words, when increasing quantities of variable factors are applied on the fixed factors, the law of variable proportions operates. When, say the quantities of a variable factor like labour are increased in equal quantities, production rises till fixed factors like machines, equipment, etc.; are used to their maximum capacity. In this stage, the average costs of the firm continue to fall as output increases, because it operates under increasing returns due to various *internal economies*. When the variable factors are increased further, the firm is able to work that machines to their optimum capacity. It produces optimum output and its average cost of production will be minimum. If the firm tries to raise output beyond this point by increasing the quantities of variable factors, this would lead to *diseconomies of production* and diminishing returns. Hence, due to the working of the law of variable proportions the short-run average cost curve is u-shaped.

3. Marginal Cost

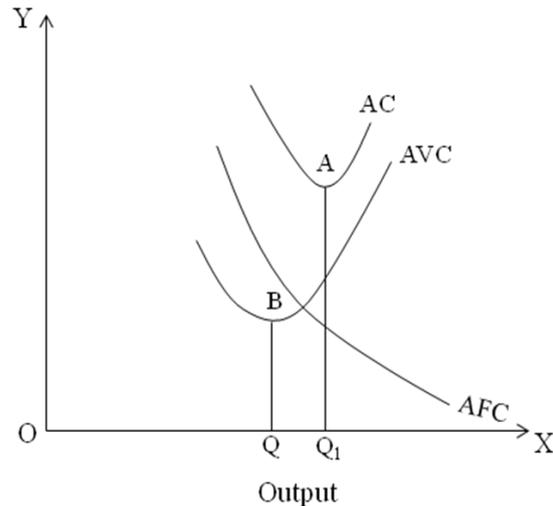


Fig. 10.8 Relationship Involving AFC, AVC and AC

Marginal Cost is the addition made to the total cost by the production of one more unit of a commodity. Its formula is :

$$MC = TC_n - TC_{n-1}$$

Or

$$MC = TC_{n+1} - TC_n$$

Or

$$MC = \frac{\Delta TC}{\Delta Q}$$

(where MC = marginal cost, TC_n = Total cost of 'n' units; TC_{n-1} = Total cost of 'n-1' units; ΔTC = change in total cost; ΔQ = change in quantity produced.)

Example : Supposing the total cost of production of 10 units of a commodity is Rs. 100 and when 10 + 1 or 11 units are produced, total cost of production goes upto Rs. 110, thus the cost of the 11th unit i.e. marginal cost can be calculated as follows:

$$MC = \text{Rs. } 110 - \text{Rs. } 100 = \text{Rs. } 10$$

Thus marginal cost is the net addition made to total cost by producing one extra unit of a commodity. Marginal cost is illustrated in Table 10.7.

Table 10.7 Marginal Cost

Output	Total cost	Marginal Cost
1	20	20
2	28	8
3	34	6
4	38	4
5	42	4
6	48	6
7	56	8
8	72	16

It is clear from this table that marginal cost is obtained by measuring the change in total cost resulting from a unit increase in output. Like variable cost, initially marginal cost also falls with an increase in the level of output; ultimately it also increases, as output increases. This is shown diagrammatically by MC curve as represented in Fig. 10.9.

In this diagram, MC curve represents marginal cost. It is 'U' shaped signifying that initially it falls and after a certain point, starts rising.

10.5 RELATIONSHIP BETWEEN AVERAGE COST AND MARGINAL COST

The relationship between AC and MC can be explained as under :

1. Both AC and MC are derived from TC- Both AC and MC

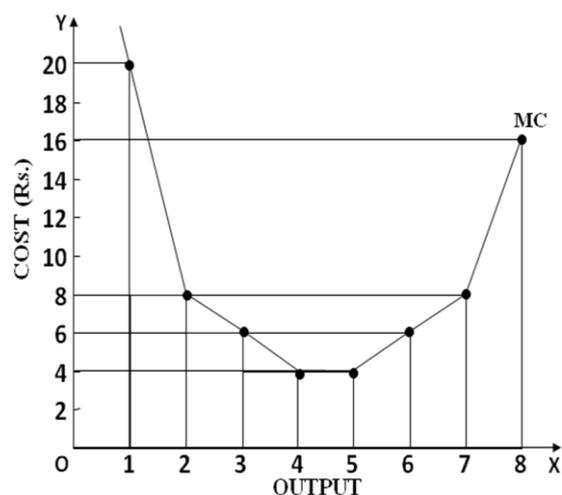


Fig. 10.9 Marginal Cost

are calculated from TC. Average cost is obtained by dividing total cost by the quantity of output. Thus

$$AC = \frac{TC}{Q}$$

Similarly, marginal cost is also estimated from total cost. Addition made to total cost by producing one more unit of output is called marginal cost.

$$MC = TC_n - TC_{n-1}$$

2. When AC falls, MC is also falling : When average cost falls, marginal cost also falls. In this situation, rate of fall in the marginal cost is greater than the fall in average cost. In other words, when AC curve is falling, MC curve will be below it.

3. When AC rises, MC is also rising : When average cost rises, marginal cost also rises, but rate of increase in the marginal cost is higher than that of average cost. Accordingly, as shown in Fig. 10.9. When AC curve is rising MC curve is above it.

4. MC begins to rise at a lesser level of output than AC : In Table 10.7 marginal cost begins to rise with the production of the 6th unit whereas as is clear from Table 10.6 AC rises only after 7 units have been produced. It is also clear from Fig. 10.9 that MC curve begins to rise from OQ, level of output, whereas AC rises from OQ₁ level of output.

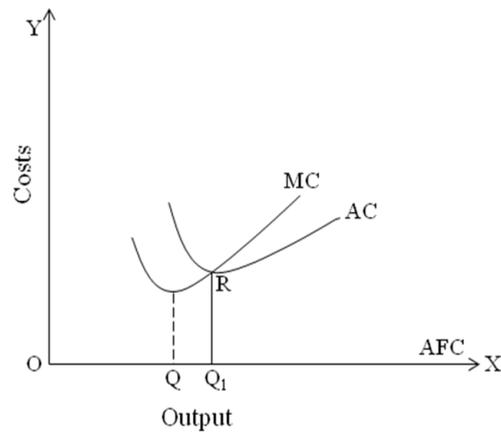


Fig. 10.10 Relationship Between AC and MC

5. MC cuts AC at its Minimum Point – At the level of optimum output, average cost is minimum and constant. At this point marginal cost becomes equal to average cost. The marginal cost curve cuts the average cost curve at its minimum point. R is such a point in Fig. 10.10.

6. Mutual Attraction between MC and AC : Relation between marginal cost and average cost can easily be understood with the help of Fig. 10.11, which shows that if M (marginal cost) is more than A (Average cost), it pulls A upwards, if M is less than A, it pushes A downward and when M = A, A is constant.

The truth of this relationship can be established with the help of an easy example. Consider a cricketer's batting average. If his next innings his score (i.e. his marginal score) is less than his existing average score then his overall average will fall i.e. marginal score will pull down the average score. If his score is more than the existing average, then his overall average score will rise i.e. the marginal score will pull up the average score.

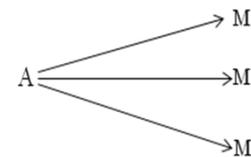


Fig. 10.11 Relationship Between AC and MC

Relationship of different Short run Cost Curves :

You can understand the relation between short-run costs such as AFC, AVC, and MC simultaneously with the help of a diagram as shown in Fig. 10.12. In this figure (i) AFC is average fixed cost curve. It slopes downward continuously meaning thereby that as production increases, average fixed cost goes on falling. Initially it falls steeply but later on rate of all slows down. (ii) AVC represents average cost curve. It falls upto point 'A' which is its minimum point after that it rises upward. It is 'U', shaped (Dish shaped), although not so pronounced (iii) SAC is the short period average cost curve which is also U-shaped. Minimum point 'A' of AVC occurs earlier than the minimum point 'B' of SAC curve.

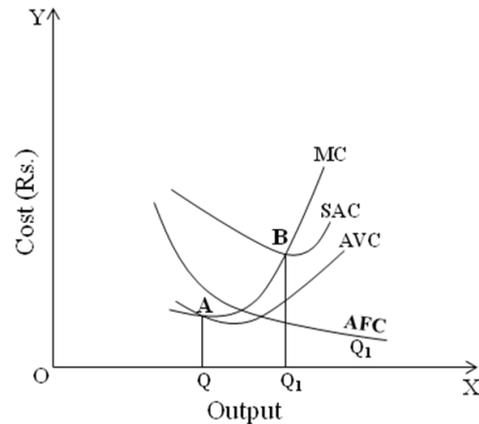


Fig. 10.12 Relationship Between S-R Costs

It may be noted that the **distance between short-run average cost and average variable cost becomes narrower as more and more output** is produced. This distance, as a matter of fact, is equal to average fixed cost. As average fixed cost goes on falling, the distance between SAC and AVC becomes closer and closer (iv) MC curve is also 'U' shaped. It cuts AVC curve and SAC curve at their minimum points i.e. 'A' and 'B' respectively.

10.6 LONG-RUN COST CURVES

Each firm operates under short-run production but it formulates long-run production plans. In order to know about the production plans of a firm, it becomes essential to study long-run costs.

In the long-run, all factors of production are variable, hence there is no distinction between fixed and variable costs. There is nothing like fixed cost. Buildings, machines, employees, capital and organization all are changeable. Enough time is there to bring about all these changes in the long-run. In the long-run, therefore, a firm has to focus on calculating :

1. Long-run Average Cost (LAC)
2. Long-run Marginal Cost (LMC)

Long-run cost curve is a planning curve, in the sense that it is a guide to the entrepreneur in his decision to plan the further expansion of output.

1. Long-Run Average Cost Curve or Envelope Curve

Long-run average cost refers to minimum possible per unit cost of producing different quantities of output of a good in the long period.

In the long period, each firm can make use of different sizes of plants. A given quantity of output can be had from a special sized plant appropriate to it. If such a plant is put to operation, goods will be produced at lowest average cost. A rational producer, in the long-run, will produce with the help of such a plant as may reduce the average cost to the minimum. With change in demand for the output, he will go on changing the size of plant. Each plant has its short-run average cost curve (SAC) with whose help we can derive long-run average cost curve (LAC).

Assume that a firm can make use of three types of plants; a small plant, a medium plant and a large plant. The small plant operates with costs denoted by the curve SAC_1 , the medium size plant operates with the costs on SAC_2 , and the large size plant gives rise to the costs shown on SAC_3 . In Fig. 10.13 if the firm wants to produce output Oq_2 , it will choose the medium plant and if it plans to produce Oq_3 , it will go in for large plant. If the firm starts with the small plant and its demand gradually increases, it will produce at lower costs upto level OQ , beyond that point its costs start rising. If its demand reaches the level of OQ_1 , the firm can either (i) continue to produce with the small plant or (ii) it can install the medium size plant. The decision at this point depends not on costs but on the firm's expectations about its future demand. If the firm expects that the demand will expand further than OQ_1 it will install the medium plant because with this plant output larger than OQ_1 could be produced at a lower cost. Similar considerations hold for the decision of the firm when it has to shift from the medium size plant to large plant. On the other hand, if the firm expects that the demand will remain constant at OQ_1 , the firm will not install the medium size plant, given that it involves a larger investment which is profitable only if demand expands beyond OQ_1 . For example, the level of output Oq_2 is produced at a cost OC_3 with the medium size plant, while it costs C_2 if produced with the small plant ($C_2 > C_3$).

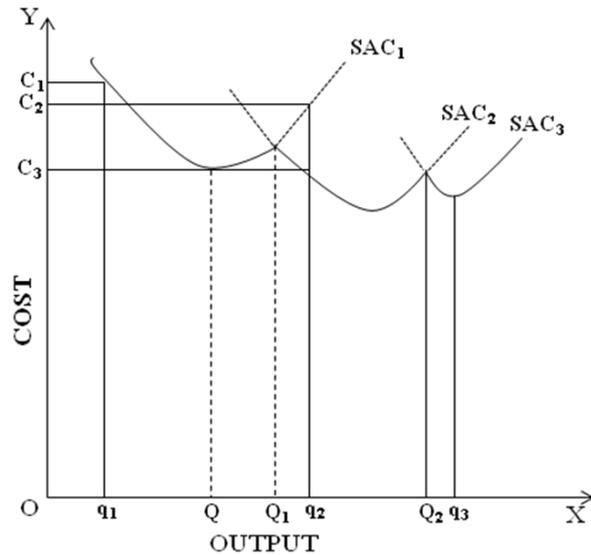


Fig. 10.13 Derivation of LAC

Now, if we assume that there is a large number of plants available, each suitable to a different size, then the curve reflecting the minimum cost of production of each plant will be the long-run average cost curve of the firm. Each point on this curve shows the minimum cost for producing the corresponding level of output. **The LAC curve is the locus of points denoting the least cost of producing the corresponding output. It is a 'Planning curve'** because on the basis of this curve the firm decides what plant to set up in order to produce at minimum cost the expected level of output, the tradition LAC curve is U-shaped and R is often called, the 'envelope curve', because it envelopes the SAC curves as shown in Fig. 10.14.

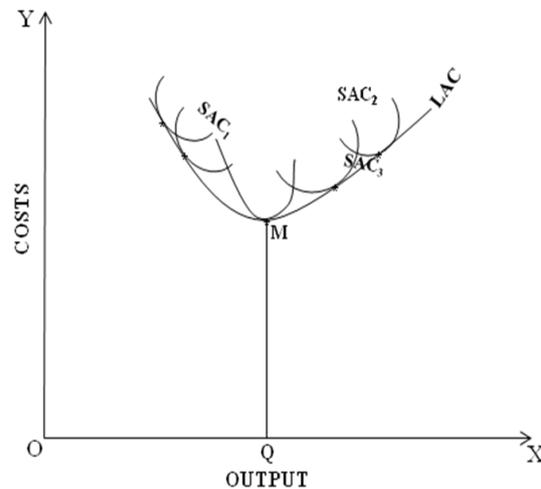


Fig. 10.14 Long Run Average Cost Curve

An implicit assumption of the U-shaped LAC curve is that each plant is designed to produce optimally a single level of output. Any departure from that leads to increased costs. The plant is

completely inflexible. There is no *reserve capacity*. As a consequence of this assumption the LAC curve ‘envelopes’ the SAC curves. The point of tangency occurs to the falling part of the SAC curves for points lying to the left of the minimum point, M, of the LAC. The point of tangency for outputs larger than OQ occurs to the rising parts of the SAC curves. Thus at the falling part of the LAC the plants are not worked to **full capacity**, whereas to the rising part of the LAC the plants are *over-worked*, only at the minimum point M is the plant optimally employed.

The U-shape of the long-run average cost curve can be explained by the economies and diseconomies of scale. Initially, when the firm increases its scale of production it reaps economies of scale. However, beyond a point in the short run period, further expansion in the scale of production results in diseconomies of scales and the long-run average cost begins to rise.

The Shape of the Average Cost in the Long-run

In the long-run the average cost curve is ‘U’-shaped to show that it declines first and rises later. Where it is the lowest, it is the optimum output point. It is argued by many economists that this is the usual shape of the long-run average cost curve. Many economists have accepted this view, but some have argued to the possibility of long-run average cost curves to be declining, horizontal and upward sloping. If a firm is able to expand its scale of production and experiences increasing returns it will have only a downward sloping average cost curve. On the other hand, if a firm expands its scale of production and it has constant returns and constant cost, it will have a long-run average cost curve which is horizontal in shape. Finally, if expansion of the firm is accompanied by diminishing return or increasing cost, the firm will have upward sloping long-run average cost curve.

Relation between Long-run average Cost and Short-run Average Cost Curves

Relation between long-run average cost and short-run average cost curves is shown in Fig. 10.15, where SAC curve represents the costs of a single plant, whereas LAC curve represents the average cost of different plants.

LAC curve like SAC curve is ‘U’ shaped but it is relatively flatter. The ‘U’ shape of Long-run average cost curve is less pronounced than that of a short run average cost curve. It means rate of increase or decrease in costs in the long-run is relatively less than in the short-run. The main reason being that the LAC curve represents the minimum average cost of different quantities of output. So there is little possibility of fluctuation in it. On the contrary, SAC curve represents the different quantities of output. SAC is the aggregate of a firm’s average fixed costs and average variable costs. As the output of a firm increases, upto a point, both AFC and AVC fall rapidly. Having reached the minimum point, AFC falls very slowly while AVC rises very quickly. Hence SAC curve is more pronounced than LAC curve.

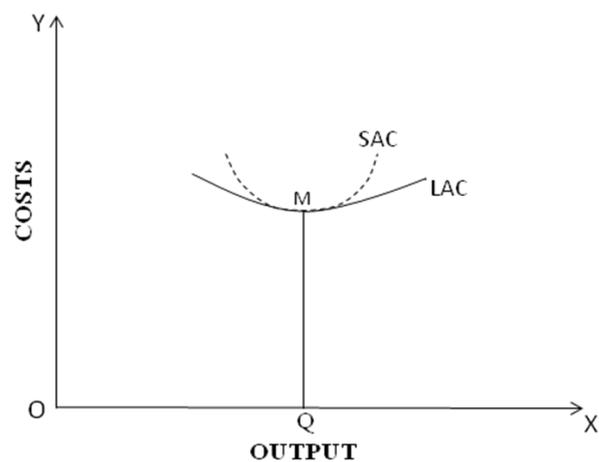


Fig. 10.15 Relationship between short run and Long run Cost Curves

At a given level of output, LAC cannot be more than SAC. It is so because LAC curve is tangent to SAC curve LAC curve can never cut SAC curve.

It may, however, be noted that excepting one SAC curve, LAC curve is not tangent to all other SAC curves at their minimum points. It will be tangent to that SAC curve at its minimum point, which coincides with the minimum point of LAC. This point will represent the optimum level of output.

2. Long-Run Marginal Cost Curve

Change in the total cost, in the long-run, due to the production of one more unit, is called long-run marginal cost. Long-run marginal cost curve (LMC) bears the same relationship of the long-run average cost curve (LAC) that any given short-run marginal cost bears to short-run average cost. LMC curve cuts LAC at its lowest point as shown in Fig. 10.16. LMC cuts LAC at its lowest point R. LMC curve is flatter than the short-run marginal cost curve. It is because of the fact the U-shape of the long-run average cost curve is less pronounced than that of the short-run average cost.

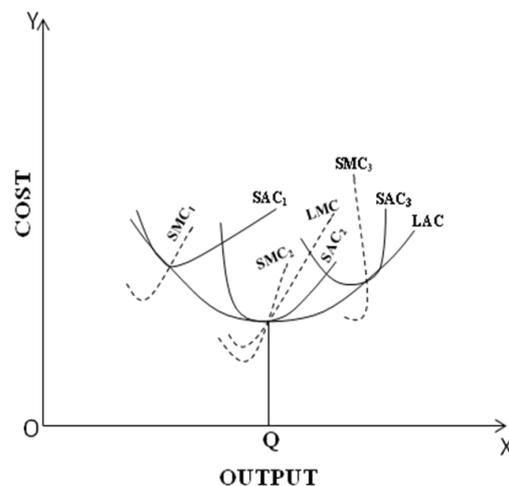


Fig. 10.16 Longrun MC Curve

10.7 MODERN APPROACHES OF COST CURVES

We shall now discuss some recent developments in the theory of costs. Modern theory of costs has been propounded by economists like Stigler, Andrews, Sargent, Florence and Friedman etc. According to traditional theory of costs, costs are of 'U'-shape, but according to modern economists, in real life, cost curves are L-shaped. These are also called empirical curves. Like traditional theory of costs, modern theory of cost can also be studied on the basis of two time periods i.e. (i) Short-run cost curves, (ii) Long-run cost curves, and four types of short-run curves drawn to show Average fixed cost, Average variable cost, Average cost and Marginal cost.

1. Average Fixed Cost

This is the cost of indirect factors, that is, the cost of the physical and personal organization of the firm. The fixed costs include costs on account of :

- (i) the salaries and other expenses of administrative staff;
- (ii) salaries of staff involved directly in production but paid on a fixed-term basis;
- (iii) the depreciation of machinery;
- (iv) expenses on account of the maintenance of the factory-buildings;
- (v) expenses connected with the maintenance of land on which the plant is installed and operated.

The average fixed cost curve under these circumstances will be as shown in Fig. 10.17. The firm has some largest capacity units of machinery which set an

absolute limit to expansion of output in the short-run. This is indicated by boundary line M in the diagram. The firm also has some small sized machinery which sets a limit to expansion. This is shown by the boundary line N.N, however, is not an absolute limit because the firm can expand its short-run output upto M by paying overtime to labour for working longer hours. In this case, the AFC is shown by the dotted line *ab*. The firm can also expand output by purchasing some additional small-sized machinery. In this case, the AFC shifts upwards and starts falling again, as shown by the dotted line *cd*.

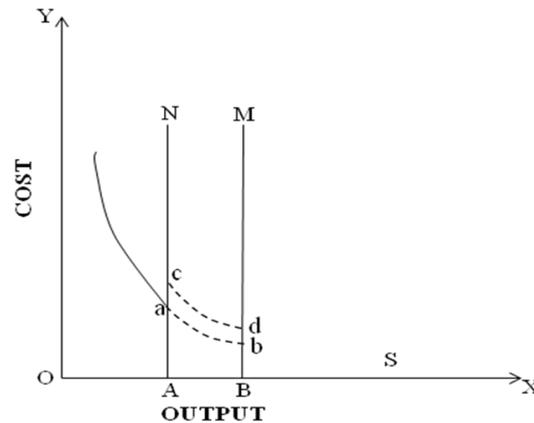


Fig. 10.17 Average Fixed Cost

The businessman wants to have some reserve capacity for various reasons.

2. Average Variable Cost

At in the traditional theory, so in modern economics, the average variable cost includes wages of labour employed, cost of raw-material, and running expenses of machinery. The short-run average variable costs curve in modern microeconomic theory is saucer-shaped, that is, it is broadly U-shaped but has a flat stretch over a range of output. This flat stretch represents the built-in reserve capacity of the plant.

- (i) To meet seasonal and cyclical fluctuations in demand.
- (ii) It gives the businessman greater flexibility for repairs of broken down machinery without disturbing the smooth flow of production process.
- (iii) It gives greater freedom to the entrepreneurs to expand output if demand increases.
- (iv) Technology makes it necessary to build into the plant some reserve capacity.

Over this flat stretch, the SAVC is equal to the MC, both being constant per unit of output. To the left of the flat stretch, MC lies below the SAVC, while to the right of the flat stretch, marginal cost rises above the SAVC. The falling portion of the SAVC shows reduction in costs due to better utilization of the fixed factor like machinery and also due to improvement in the skill and efficiency of labour. Better efficiency of labour helps in reducing wastage of raw-material and achieving better utilization of the whole plant.

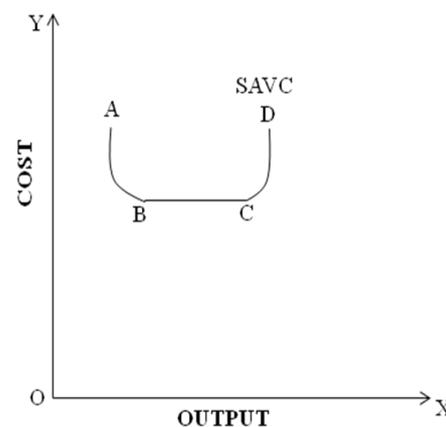


Fig. 10.18 Shortrun Average Variable Cost

On the other hand, rising portion of the SAVC curve indicates declining labour efficiency due to longer hours of work, rising costs due to payment of overtime wages, frequent breakdown of machinery, and wastage of raw-materials. This has been shown in Fig. 10.18.

Traditional Concept of Excess Capacity

The traditional theory assumes that each plant is designed without any flexibility. It is designed to produce a single optimal level of output. This optimal level of output is known as ideal output. The difference between ideal output and actual output is known as excess capacity. The existence of excess capacity is a waste because, it

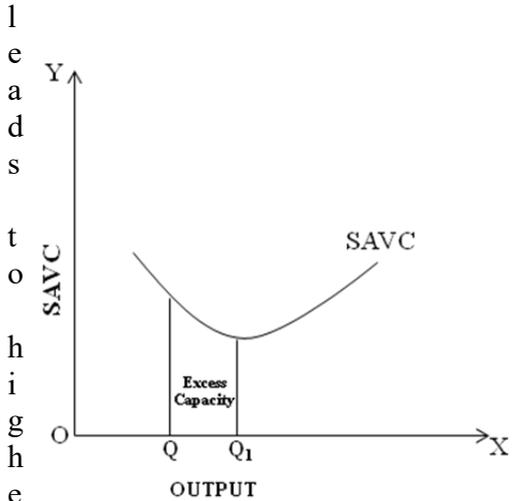


Fig. 10.19 Excess Capacity (Traditional)

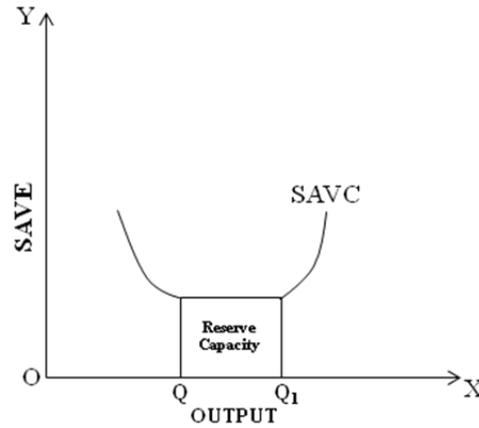


Fig. 10.20 Excess Capacity (Modern Approach)

unit costs. This is shown in the Fig. 10.19.

In the modern theory of costs, the range of output QQ_1 , reflects the planned reserves capacity which does not lead to increase in costs (See Fig. 10.20).

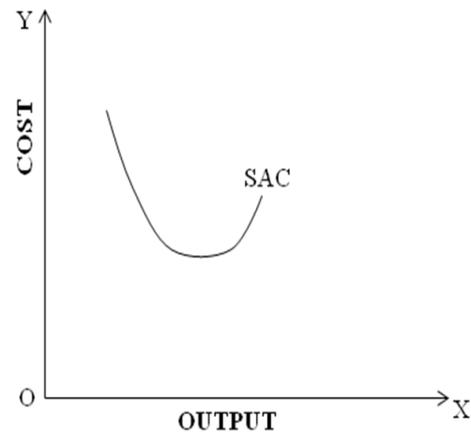


Fig. 10.21 Shortrun Average Cost Curve

Usually firms consider that the normal level of utilization of their plant is somewhere between two-third and three-quarters of their capacity, that is at a point in Q_1 and to Q .

3. Short Run Average Cost Curve

The average cost is derived by adding up average fixed cost and the average variable cost. According to modern economists, short-run Average Cost Curve is continuously falling upto a given level of output. This given level of output represents reserved capacity output. Thereafter, average cost curve rising upward meaning thereby that

average cost will rise rapidly if output is increased beyond reserved capacity. This is shown with the help of Figure 10.21.

4. Short Run Marginal cost Curve

In the initial stages, SMC, to modern economists falls and MC lies below AVC. From point A to B, it becomes horizontal. Moreover, from A to B marginal cost is equal to average variable cost. In this situation, production takes place under reserved capacity. After point B, MC rises above the AVC, as shown in the Fig. 10.22.

Modern Theory of Long Run Cost Curves

In the long-run, all costs are variable costs. There is no fixed cost. According to modern theory of cost curves, long-run average cost curve (LAC) and long-run marginal cost curve (LMC) are L-shaped and not U-shaped as maintained by the traditional theory.

1. Long-Run Average Cost Curve

According to modern theory, long-run costs are mainly of two types (1) Production Cost and (2) Managerial Cost. On account of increase in production, production cost goes on falling continuously. On the contrary, as the scale of production is enlarged managerial costs may rise. Since fall in production cost is more than rise in managerial cost, long-run average cost (LAC) goes on falling with increase in output. In the long-run, each firm makes use of different sizes of plant and equipment. A given quantity of output needs a particular type of plant relevant to it. Each plant has a short-run average cost (SAC) curve. One can estimate long-run average cost (LAC) with its help. Supposing, a firm makes use of four types of plants with different dimensions. Their short-run average cost curves are sAC_1, sAC_2, sAC_3 and sAC_4 . According to modern theory of cost curves, statistics relating to long-run production reveal that a firm normally makes use of $2/3^{rd}$ of its plant's production capacity. It does not make full use of production capacity of its plant. Thus, on the basis of SAC relating to $2/3^{rd}$ utilization of plant capacity LAC can be estimated. In Fig.10.23 LAC has been shown. It has been obtained by joining together points indicating $2/3^{rd}$ utilization of production capacity of different short-run average cost curves.

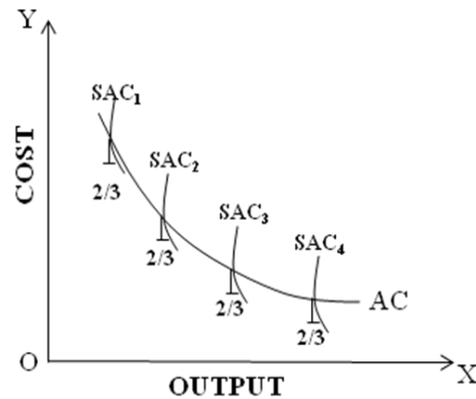


Fig. 10.23 Longrun Average Cost

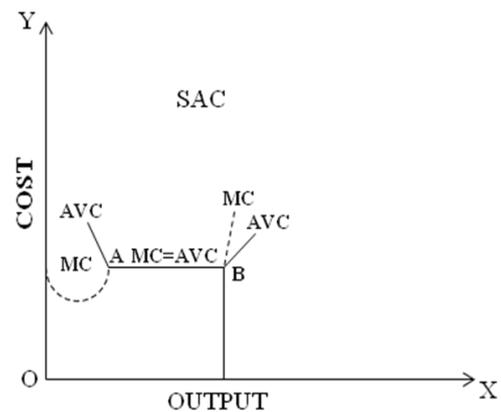


Fig. 10.22 Shortrun MC Curve

Why LAC curve is 'L' Shaped ?

There are two main causes of 'L' shape of LAC.

(i) Technological Progress

(ii) Learning by Doing.

(i) Technological Progress and LAC : The traditional version of the L-shaped LAC is based on the assumption that no technological progress takes place in business. Modern economists, however, consider the vital role played by technological progress as a cost minimizing and output maximizing function. The existence of technological progress confirms the 'L' shape of the long-run average cost curve as shown in Fig.10.24.

Fig.10.24 shows that initially the firm produces OQ_1 output on LAC_1 at cost OP per unit. With rise in demand, the firm will raise its output to OQ_2 , and technology remaining unchanged (i.e. producing at the same LAC_1) the cost will rise to OP_1 . However, if the technological progress takes place, output OQ_2 , can be obtained at a lower cost OP_2 . The firm, after the technological progress, will operate on the LAC_2 . A further technological progress will shift the long-run average cost curve to LAC_3 and now larger output OQ_3 can be obtained at a still lower cost. In brief, technological progress substantiates the L-shape of the LAC.

(ii) Learning By Doing : Learning by doing is another important factor which causes the long-run average cost curve to slope downwards. Due to learning by doing as greater accumulated output is produced, the production of labour increases hence the level of LAC decreases with cumulated output over time. There are several reasons why productivity increases owing to learning by doing. For example, the development of greater skill and shortcuts by a large range of personnels including machine operators, supervisors, salesmen, quality control and product specifications may be changed slightly to conserve raw material or reduce machine time per item. Thus learning provide reasons why long-run average costs are 'L' shaped rather than 'U' shaped.

2. Long Run Marginal Cost Curves

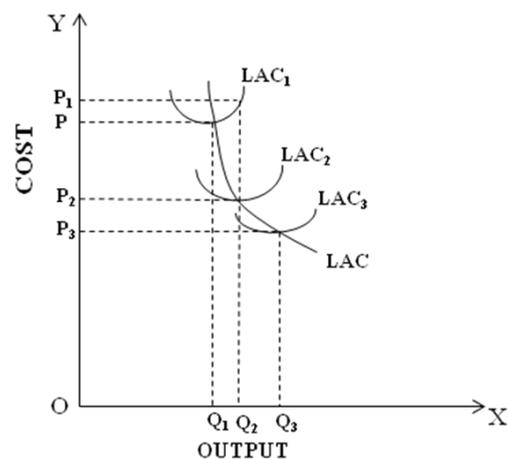


Fig. 10.24 L-shaped LAC

According to modern theory, shape of long-run marginal cost curve corresponds to the shape of long-run average cost curve. Relation between LMC curve and LAC curve is shown in Fig. 10.25(A) and 10.25(B) respectively. Fig. 10.25(A) shows that when LAC is L-shaped and LAC curve is falling then LMC curve will also be falling and its falling portion will be below the falling portion of LAC curve.

The figure shows that when LAC curve is of inverted J-shaped then LMC curve is also of inverted J-shaped and remains always below LAC curve. But, when LAC curve becomes constant then LMC curve also becomes constant and coincides with it.

10.8 SUMMARY

Cost refers to the amount of money spent on the purchase of various inputs. In short period costs have been classified into two fixed and variable cost. Fixed costs are those cost which has to be incurred even if firms decides to stop the production. On the variable cost are those cost which varies with the level of output. Marginal cost is the addition to total cost when one more unit of commodity is produced. Average cost is the sum of fixed cost and variable cost in short period. Average cost curve is U shaped. There exist relationship between AC and MC in short period. On the other hand, there is no difference between Fixed and variable cost. In long period all the inputs are variable. Like SAC, LAC is also U-shaped but it is relatively flatter.

10.9 GLOSSARY

- **C**

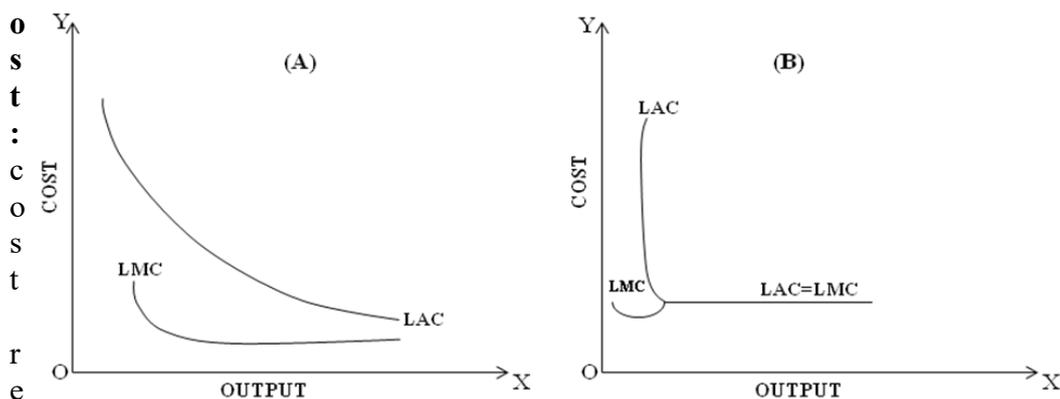


Fig. 10.25 Longrun MC Curves

rs to the amount of money spent by producers to purchase various inputs to produce final goods and services.

- **Social Cost:** It denotes the cost which the society has to bear in the form of increase in pollution, degradation of soil, water and other natural resources.
- **Variable Costs :** Variable costs are those costs which vary as the level of output varies. It implies that these costs undergo a change with the change in output.
- **Total costs:** Total costs of a firm for various levels of output are the sum of total fixed costs and total variable costs

10.10 CHECK YOU PROGRESS

(A) Fill in the blank :

- (i) Accounting costs include the costs only.
- (ii) Real cost cannot be measured in terms.
- (iii) When production is nil,cost is also nil.
- (iv) Average Cost is the total of average fixed cost and
- (v) Marginal Cost reflects change in the
- (vi) Marginal Cost Curve cuts Average Cost Curve at its point.

(B) State whether the following statements are true or false :

- (i) Opportunity cost is a term which describes cost related to an optimum level of production.
- (ii) Full cost is a sum of opportunity cost and normal profit.
- (iii) Fixed costs are also known as overhead costs.
- (iv) With an increase in production, average fixed cost tends to decrease.
- (v) Total Cost is determined by adding marginal cost and average cost.
- (vi) According to the Modern Theory, Average Cost Curve and Marginal Cost Curve are not U-shaped.

10.11 ANSWERS TO CHECK YOUR PROGRESS

(A) (i) Explicit (ii) Monetary (iii) Variable cost (iv) Average Variable Cost
(v) Total Cost (vi) Lowest

(B) (i) False (ii) True (iii) True (iv) True (v) False (vi) True

10.12 TERMINAL QUESTIONS

(A) Short Answer Questions :

1. Define fixed cost.
2. Explain the relationship between AC and MC curves.
3. Explain the nature of long term.
4. What is business cost ?

(B) Long Answer Questions :

1. Explain the various Short run costs.
 2. Explain the relationship between Average Fixed Cost, Average Variable Cost and Average Cost.
 3. Discuss briefly the different cost concepts.
-

10.13 SUGGESTED READINGS

Alfred W. Stonier and Douglas C. Hague, A Text Book of Economic Theory, Longman, 1990.

Spencer, M. H. and L. Sieglemen, Managerial Economics Richard Irwin, 1964.

Mehta, P. L., Managerial Economics – Analysis, Problem and Cases, Sultan Chand & Sons, New Delhi.

H. L. Ahuja, Business Economics Micro- S. Chand & Co. Ltd., New Delhi, 1999.

UNIT-11 THEORIES OF FIRM

Structure

- 11.1 Introduction
- 11.2 Theories of the firm
 - 11.2.1 Profit Maximizing Theory
 - 11.2.2 Wealth Maximization
- 11.3 Baumol's Theory of Sales Maximization
- 11.4 Maximization of Satisfaction Concept
- 11.5 Growth Maximization
- 11.6 Security of Firm
- 11.7 Cyert and March's Behavioural Theory
- 11.8 Maximization of Managerial Utility
- 11.9 Summary
- 11.10 Glossary
- 11.11 Check Your Progress
- 11.12 Answers to check Your Progress
- 11.13 Terminal Questions
- 11.14 Suggested Readings

OBJECTIVES

After studying this unit, you will be able to -

- You should be able to understand the various theories of the firm.
- Explain the concept of satisfaction maximization and the security of the firm.
- Understand the maximization of public utility.

11.1 INTRODUCTION

A firm is a technical unit involved in the production of goods and services. Firms are of various types such as individual proprietorship, partnership or joint stock companies. The success of business to a large extent is influenced by the various decisions in the area of production, marketing, financial, human resource etc. taken by firm. In other words, business decisions thus consist of choice between different courses of action or strategies. Firm takes various decisions regarding the allocation of scarce resources having various alternatives. Firm also takes into consideration cost of various resources and its return to the firm. The firm is most of time concerned with various goals such as profit maximization, sales maximisation, utility maximisation etc.

The economists hold different opinions regarding the objectives of the firm. Classical economists were of the opinion that main aim of the firm is to maximize its profit, the reason being, majority of organizations were owner organisations. It meant that managers and owners were the same persons. But in the modern era, the emergence of large scale organisations created a group of people known as managers, who have been entrusted the responsibility of management of large organisations and real stockholders. The real management of these organizations are in the hands of managers appointed by the shareholders. These managers get salaries and other incentives for the services rendered by them. The objectives of managers and shareholders vary considerably. The former are interested in sales and enhancement of their perks, whereas the latter are more concerned with maximum profit.

Thus, objectives of modern organisations are many and vary from organisation to organisation. The alternative objectives of the firm can be in the form of profit maximization, sales maximization, maximization of satisfaction, growth maximization etc.

11.2 THEORIES OF THE FIRM

Different firms belonging to the same industry, facing the same market environment, behave differently. Thus, there is the necessity for theories of the firm. The theory must have both explanatory and predictive values. The validity of the theory is judged on the basis of several criteria, like; consistency, realism of its assumptions, its generality and application and simplicity. The purpose of the *theory of the firm* is to provide models for the analysis of the decision making in the firm in various market structures. A theory of the firm needs to explain the entire range of price-output decisions-how the firms set their price, decide their product line, advertisement expenses and sales promotion efforts, research and development expenses, etc.

Economists, however, have viewed the ways in which managers take such decisions differently. In general, firms strive for profit maximization. The traditional theory of the firm deals with this aspect. But in the early 1930s, this theory *faced* several criticisms and dissatisfaction. The reasons for this were twofold:

- (a) Emergence of oligopoly, a market structure characterized by the existence of a few large firms. Mergers and amalgamations have made the structure of industries concentrated so that few large (dominant) firms accounted for a major portion of an industry's output. This shifted the pressure on each firm to maximise profits independently and led to joint profit maximizations through cartels and collusions. Profit maximization was not the only inevitable objective,
- (b) Separation of ownership from management: Modern firms started showing a separation of ownership from control-firms were controlled by managers rather than owners (share holders) due to fragmentation and dispersion of ownership of shares. The notion of the entrepreneur started losing relevance with management becoming an executive function, Managers may wish to pursue goals other than profit maximisation, and would be forced to take into consideration the matter of profits to the

extent that sufficient cash had to be generated to pay satisfactory dividends to the share holders (so that they did not withdraw funds from the company).

11.2.1 Profit Maximizing Theory (Marginalist Theory)

The Marginalist theory was developed during 1980s by Leon Walras, W S Tenons and Alfred Marshall.

(A) Basic Assumptions of the Theory:

The basic assumptions of this theory can be listed as follows:

1. The entrepreneur is also the owner of the firm.
2. The firm has a single goal, that of profit maximisation.
3. This goal is attained by application of the marginalist principle i.e. $MC = MR$.
4. The world is one of certainty-full performance, the present conditions and the future developments in the environment of the firm, The firm knows with certainty its own demand and cost functions. It learns from past mistakes in that its experience is incorporated into the continuous appraisal (estimation) of its demand and costs.
5. Entry assumptions vary according to the particular model. The common elements regulating entry in all models of the firm are the following (a) Entry refers to actual model entrants in an industry; no account of potential entrant is taken; (b) Entry in the short-run is practically impossible: entry can take place only in the long-run.
6. The firm acts with a certain time horizon which depends on various factors such as the rate of technological progress, the capital intensity of the methods of production, the nature and gestation period of the product, etc. The firm aims at the maximisation of its profit over this time horizon: the goal of the firm is long-run profit maximisation. This is attained by maximising profits in each period of the time horizon of the firm because the time periods are independent in the sense that decisions taken in any one period do not affect the behaviour of the firm in other periods. The rule $MC = MR$ is applied in each period and profits are maximised with this behaviour both in the short-run and in the long-run.

(B) Conditions of Profit Maximization

The primary objective of every firm is to derive maximum revenue from its operations. The difference between total revenue and total cost received is the net revenue of the firm. Following conditions are fulfilled in order to maximize revenue.

There are two marginal conditions that must be satisfied for the profit to be maximum. These conditions are known as :

- (i) Necessary or First Order Condition, and (ii) Supplementary or Second Order Condition.

1. **Necessary or First Order Condition:** The first order condition states that profit is maximum where Marginal Cost (MC) equals Marginal Revenue

(MR), i.e., where $MC = MR$. This is necessary condition in the sense that it must be satisfied for profit to be maximum and profit is not maximum if this condition is not fulfilled.

2. **Supplementary or Second Order Condition :** The second order of condition of profit Maximization is that the first order condition must be fulfilled under the condition of rising marginal cost. This yields a second order of supplementary condition of profit Maximization, i.e., the MC curve must intersect MR curve from below.

These phenomena can also be explained with the help of Figure 11.1

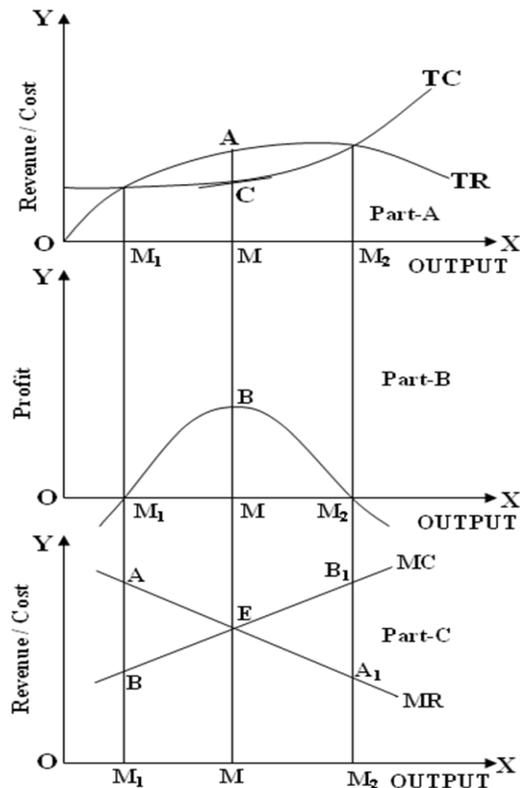


Fig. 11.1

In part A of diagram TC is total cost curve and TR is total revenue curve. Difference between total revenue and total cost curve will be maximum at OM level of output at which slopes of both curves will be equal. The slope of tangents is equal at R and C or TR and TC curves respectively. The AC distance which is maximum also represents maximum profit. At outputs OM_1 and OM_2 total cost is equal to total revenue. It means the firm is not earning any profit.

In part B of the diagram total profit curve has been shown at OM level of output, total profit TP is highest at point B.

In part C of the diagram, it has been shown that at OM level of output, profits are maximum, where both the equilibrium conditions are satisfied i.e., $MC = MR$ and MC cuts MR from below. If the firm produces less than OM output, say OM_1 , then its MR would be AM_1 , which will be more than its MC i.e. BM_1 . Hence the firm will produce more output than OM_1 and its profit will increase. On the other hand, if the firm produces output more than OM, say OM_2 , then its MC i.e. B_1M_2 will be more than its MR i.e. A_1M_2 . Hence there will be loss to the firm equal to B_1A_1 . The firm will, therefore, produce less output than OM_2 . It means the firm gets maximum profits by producing OM output alone where both the conditions of maximum profit are satisfied.

(C) Merit of the Theory

This theory claims the following merits :

1. Chief motive of the firm

Profit maximization is the key motive for which a firm is set up. Being the ultimate goal of a firm, it acts as a driving force of every action of the owner/manager.

2. Survival of firm

The forces of competition compel a firm to earn maximum profits for its survival in the market.

3. Index of Efficiency

Profit earning is the measuring rod of the efficient functioning of the firm. The higher the profit, the greater is reckoned the efficiency of the firm.

4. Source of Internal finance

Profit is considered as one of the main internal sources of finance. The part of profit which is held in reserve is used for expansion or modernization of the business enterprise. The use of business profit is also popularly known as ploughing back of profit.

(D) Limitations of the Theory

The profit maximization objective of a firm is criticized for the following reasons:

- (a) The concept of profit maximization is vague and narrow.
- (b) It ignores the time value of money.
- (c) It may allow decisions to be taken at the cost of long-run stability and profitability of the concern because it emphasizes the short-run profitability.
- (d) The profit is only one of the many objectives of a modern firm in which the different stakeholders participate in firm's success like shareholders, debenture holders, financial institutions, banks, managers, employees, government, creditors, suppliers, customers etc.
- (e) It fails to consider the social responsibility of business, maximization of firm's profit at the cost of society is very much short sighted view.

11.2.2 Wealth Maximization Concept

The objective of wealth maximization is the long-term goal of the firm as it seeks to maximize the return from investment. Wealth maximization means maximizing the net present value (or wealth) of a course of action. The net present value of a course of action is the difference between the present value of its benefits and present value of its costs. A financial action which has a positive net present value creates wealth and, therefore, is desirable. A financial action resulting in negative net present value should be rejected. Between a number of desirable mutually exclusive projects, the one with the higher net present value should be adopted. The maximization of wealth is possible by making decisions of the firm to get benefits that exceeds costs. For long-range planning and management controls, a company establishes its overall goals.

The net present value of wealth is measured in the following way :

$$W = \frac{A_1}{(1+k)} + \frac{A_2}{(1+k)^2} + \dots + \frac{A_n}{(1+k)^n} = - C_0$$

Where A_1, A_2, \dots represent the stream of benefits expected to occur if a course of action is adopted, C_0 is the cost of that action and k is the appropriate discount rate and is also called opportunity cost of investment and risk of benefits, and W is the net present value or wealth which is the difference between the present value of the stream of benefits and the initial cost. The firm should adopt a course of action only when W is positive, i.e. when there is net increase in the wealth of the firm.

(A) Merits :

The wealth maximization goal is favoured on the following grounds :

- (a) It takes into consideration long-run survival and growth of the firm.
- (b) It suggests the regular and consistent dividend payments to the shareholders.
- (c) The financial decisions are taken with a view to improve the capital appreciation of the share price.
- (d) It focuses on the risk and time value of money.

- (e) It considers all future cash flows, dividends and earnings per share.
- (f) Maximization of firm's value is reflected in the market price of share, since it depends on shareholder's expectations as regards profitability, long-run prospects, timing differences of returns, risk, distribution of returns etc. of the firm.
- (g) Profit maximization partly enables the firm to maximize its wealth.
- (h) The shareholders always prefer wealth maximization rather than maximization of inflow of profits.

(B) Criticism

The wealth maximization objective of a firm is criticized for being narrow. It ignores the concept of wealth maximization of society, since society's resources are used to the advantage of a particular firm. The society's resources should be optimally allocated, it should result in capital formation and growth of the economy, which ultimately leads to maximization of economic welfare of the society.

There are various theories to explain profit-making by firms, the important ones are described below.

Innovation Theory

Firms make innovations in new products, new production techniques, new marketing strategies, etc. The innovations are costly and must obviously be rewarding for them to be followed continuously. For this reason, innovating firms are sometimes awarded patent rights for a specific period of time, during which time no other firm is permitted to copy the product and/or technology. Profits are thus considered a reward for innovation.

Risk-bearing Theory

Firms invest large sums in the production system, expecting to produce goods and make profits on it. However, the production may run into difficulties, be delayed and there may not be an adequate market when production is ready. The firms take these risks and must be adequately rewarded.

Monopoly Theory

Some firms are able to enjoy certain monopoly powers in view of being in possession of a huge capital, economies of scale, patent protection or socio-political powers. As a result, there is a lack of perfect competition and such firms are able to reap economic profits.

Friction Theory

According to this theory, there is a long-run equilibrium of economic profit which is zero (adjusted for risk). However, markets are seldom in equilibrium and that gives rise to economic profits or losses. For example, if winter is too severe or too prolonged, firms dealing in woollen garments would reap large economic profits while those dealing in items like ice-cream, or fans may run into losses.

Managerial Efficiency Theory

This theory argues that economic profit can arise because of exceptional managerial skills of well managed firms. For example, if firms that operate at an average level of efficiency can also losses, then those which operate above that level must reap economic profits. Thus, existence Profit is essential to ensure good performance.

11.3 BAUMOL'S THEORY OF SALES MAXIMIZATION

This theory is based on the assumption that sale maximization rather than profit maximization is the major objective of the firm. By sale we mean total revenue earned by the sale of goods. This is also known to as revenue maximization.

According to this theory, when the firm achieves a level of profit which is acceptable to shareholders then the effort of the managers is to maximize revenue by promoting sales instead of profit maximization. It is to be kept in mind that firms do not ignore profit altogether.

According to Baumol, business managers pursue the goal of sale maximization rather than profit maximization for the following reasons:

1. Financial institutions are more concerned with sale performance. It is considered as one of the criteria to identify the performance of the firm.
2. Sales figures are available more easily as compared to profit figures.
3. Salaries and perks of managers are linked with sales rather than profit.
4. Employees problems can be handled with growing sales. Higher payments are offered to employees achieving higher sales targets. It is considered as better measure of performance.
5. Sales maximization also indicates growing market shares and greater competitive strengths and bargaining power.

Conditions of sales maximization

Maximization of sales means firm should produce at that level of output when marginal revenue becomes zero. It means, if more is produced than total revenue will be less than maximum. Sales maximization objective can be explained with the help of the figure which follows.

In Part(a) of the figure 11.2 TC and TR are the total cost and total revenue curves of the firm respectively. Line PP represents the minimum profit earned by the firm, which is acceptable to shareholders. In the part (b) of the figure, AR and MR is average and marginal revenue curves of the firm respectively. MC is the marginal cost of the firm. If firm wants to maximize its revenue. The firm should produce at that level of output, where MR is zero. MR will be zero when TR is maximum. The firm should produce OM level of output because at OM level of output, marginal revenue is zero. Thus OM output represents maximum total revenue equal to AM. But at OM level of output the firm will earn profit (BM) which is less than minimum acceptable level of profit i.e. B_1M_1 .

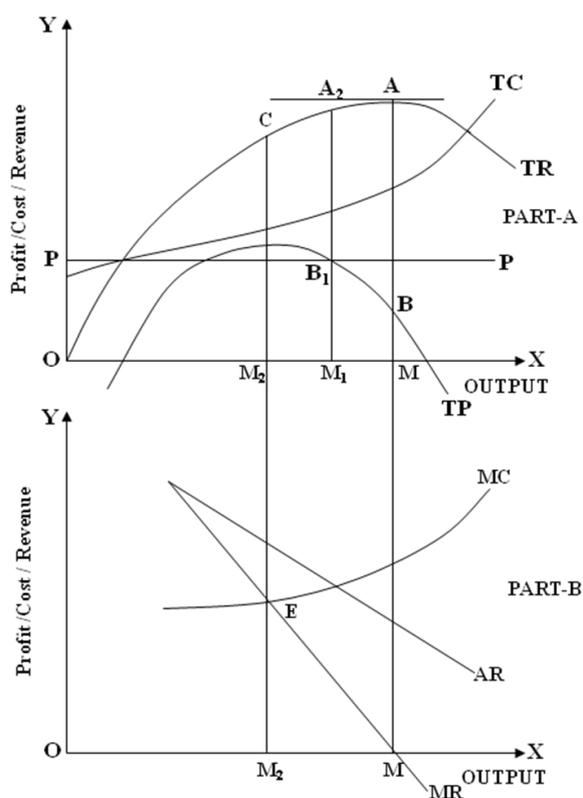


Fig. 11.2

Thus, OM level of output will not be acceptable to shareholders. On the other hand, if firm wants to maximize profit, it will produce OM_2 level of output. At this level of output, $MC = MR$ and MC curve cuts MR curve from below. Thus, corresponding to this equilibrium level of output i.e. OM_2 . The total revenue is CM_2 which is less than maximum revenue AM. On the other hand, if firm wants to earn minimum level of profit i.e. B_1M_1 , then the firm will have to produce OM_1 level of output. In this case, the firm will earn revenue equal to A_2M_1 which is less than maximum revenue AM.

It may be noted that revenue of the firm will depend upon minimum profit. If the minimum level of profit is BM, the firm will be able to get maximum revenue, but if minimum level of profit is B_1M_1 , the firm will get little less than maximum revenue.

Criticism of the theory

The following are the points of criticism raised by experts in this field:

1. **Unrealistic assumption:** The theory is based on the assumption that prices of goods and services remain constant. But in reality, prices change frequently so is the profit of the firm. In other words, prices change frequently in the dynamic markets.
2. **Industry equilibrium:** This theory fails to explain the equilibrium of the industry when objective of all firms is to maximise its sale. In the other words, how the industry will achieve equilibrium under the sales maximization objectives.

3. **Narrow scope:** Sales maximization goal might be one of the objectives of joint stock companies. But in real terms, the economies are dominated by small and medium enterprises and main objectives of these firms are profit maximization not the sale.
4. **Unrealistic:** The theory ignores the competition prevailing in the market and its likely impact on future.
5. **Profit constrains:** The theory is based on the assumption of minimum level of profit. But in practice it is difficult to decide the minimum level of profit acceptable to shareholders. In the changing environment and increase in competition, it becomes very difficult to decide minimum acceptable level of profit.

11.4 MAXIMIZATION OF SATISFACTION CONCEPT

This theory is based on the assumption that entrepreneurs want to maximize satisfaction even at the cost of profit. According to this theory, beyond certain level of profit, entrepreneurs prefer to give more preference to leisure in comparison to profits. As income of entrepreneur enhances, entrepreneurs prefer leisure to efforts to be incurred in producing output. In other words, if entrepreneur works more, less time will be available for leisure.

In Figure 11.3 profit is measured on Y-axis and leisure and efforts on X-axis. AP is the net profit curve. Leisure is measured from Point A to Q and output from P to Q. More output means less leisure and vice-versa. II and I_1I_1 are indifference curves. These curves highlight entrepreneurs' level of satisfaction yielding combination of his profit and leisure. The entrepreneurs' satisfaction level is maximum where indifference curve is tangent to net profit curve. Such a situation is reached at PQ_1 level of output. But this level of output is less than profit maximization output PQ.

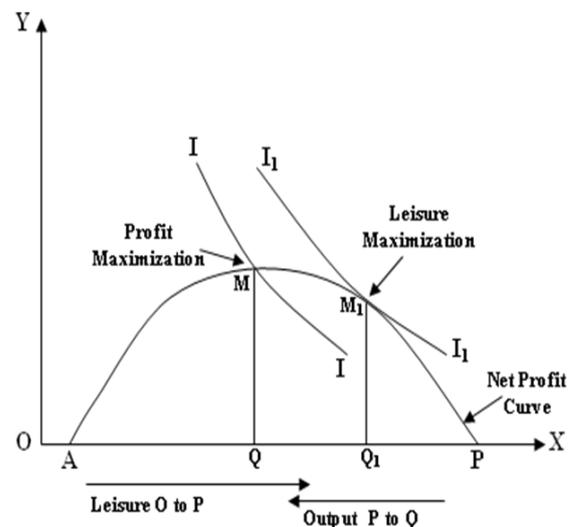


Fig.11.3 Satisfaction Maximization Analysis

This theory is criticized for its unrealistic assumption that entrepreneurs' willingness to work is independent of his income. In practice, entrepreneurs are guided by more profit. The firm considers profit as an index of its efficiency and success. Thus, to assume that firm gives more preference to leisure over work is highly unrealistic.

11.5 GROWTH MAXIMIZATION MODELS

The main objective of modern business enterprises is growth maximization. By growth maximization we mean the increase in size, production and sale of the firm.

(i) Penrose's Theory of firm :

Mrs. Penrose incorporated this objective of the firm in her famous book, the theory of growth of the firm. She suggested that managers are more interested in the growth maximization of the firm, rather than in profit maximisation. According to this theory, performance of the managers is judged by the ability of the manager in achieving the growth of the firms managed by them. Adequate profit be made available by managers to provide funds for further investment and to attract the capital from outside.

In other words, funds should be generated from internal sources for the expansion of the firms. Internal sources are considered as more desirable as compared to external sources or borrowed funds. Moreover, extended sources acts as burden on the firm. The reason being, the firm has to pay interest along with principal amount, which hinders the growth capacity of the firm. Thus, internal sources of finance are generated through the increase in profit. In order to avoid the threat of takeover of the firm, the managers should adopt that strategies which maximize profit of the firm so that it may be able to face the tough competition and problem of takeover by other firms may be avoided.

(ii) Marri's Model of Managerial Enterprise :

Marris' hypothesis is that executive actions are limited by the need for management to protect itself from dismissal or take over raids in the event of failure. He suggests that managers have a utility function in which salary, power, prestige and security are important variables. The shareholders of the firm (i.e. the owners) are more concerned about profits, market share output etc.

Marris opines that the managers aim to have a balanced growth considering that growth in demand (especially of new products) would be matched with growth in capital (making available the investible funds for bringing out these products). It implies that the managers would want to maximize balanced growth rate (g) which is equal to the growth rate of demand for the product (gd) and growth rate of capital supply (gc):

Thus Max. $g = gd = gc$

The first step to achieve balanced growth rate would be to identify the factors that go into determine gd and gc . These determinants can be expressed in term of two variables –

- (i) Diversification rate (d) and
- (ii) Average Profit Margin (m)

Both these variables can be, however, determined only after the management, has decided about its financial policy 'a'. The diversification rate can be chosen either by changes in style of the existing products or by expanding the range of

products. Given the price of the product and the production cost, the average profit margin would be affected by the levels of advertising and R & D. Higher the expenditure on advertisement (A) as well as R & D, lower p would be average profit margin (m). Thus, the Marris firm has three policy variables- a, d and m.

Marris adopts Penrose's thesis of the existence of sure limit on the rate of managerial expansion. In other words, the capacity of managerial team in fact determines the upper limits to the growth of the firm.

Criticism

The following are the shortcomings of this theory :

1. **Unrealistic assumption:** This theory assumes that there is no change in factor prices, profit, sale and cost of the firm. But in real practice, all these variables frequently change over the period of time.
2. **Financial constraints:** The theory assumes that finance is available easily. In other words, firm have easy accessibility of financial resources. But in practice, a firm has to face the problem of procuring adequate finance. Delay in sanctioning of the loans creates hurdles for the growth of the firm in case of small and medium enterprises which find it difficult to get the required amount of funds in time.
3. **Difficult to estimate growth rate:** It is very difficult for the firm to grow at a constant rate. In changing market situations, the firm may decide to grow at faster rate and some other time at lower rate. It becomes difficult for the firm to estimate the rate of growth which is necessary over the period of time.
4. **Interdependence:** The theory assumes that a firm takes decisions independently. This theory ignores the oligopolistic firms, where interdependence is very high. It means the firm does not take into consideration reaction of rivals while facing price and output.

11.6 SECURITY OF FIRM

According to Rothschild, firm objective is not to earn maximum profit but to maintain a steady flow of profit over a longer period of time. In other words, firm is interested in getting security of profits. According to this theory, the profit maximization is valid under perfect competition or monopolistic competition, where there are large number of firms. Individual firm is not faced with security profit. In case of monopoly there is no competition, security of profit is ensured. According to Rothschild under oligopoly, this assumption is no longer valid. Under oligopoly, the firm is not motivated by profits, it wants to achieve secure position in the market. The main objective of the firm is survival in the long run.

11.7 CYERT AND MARCH'S BEHAVIOURAL THEORY

According to Cyert and March, business world in real world is different. There exists a high degree of uncertainty in business world. Information is not so easily available to firm. In other words, accurate data are not available. Data which are available to managers, due to time constraint, managers fails to process them.

Moreover, managers have to work under various constraints. Under such conditions, it becomes difficult for the firm to work under the assumption of maximization of profits. Firm seeks to achieve a satisfactory profit. This behaviour of the firm is known as satisfying behaviour. The firm is association of various groups, such as managers, shareholders, workers, input suppliers, customers, bankers and so on. All these groups have their own expectations or goals and organization wants to satisfy the goals of different groups in one way or another.

The theory has been criticised by various experts on the following grounds:

- The theory fails to explain the behaviour of firm under dynamic conditions in the long run.
- The firm activities in the future cannot be predicted so easily.
- The theory fails to deal with equilibrium of the industry.
- Interdependence and interaction of the firm under oligopolistic market cannot be explained by this theory.

11.8 MAXIMIZATION OF MANAGERIAL UTILITY

This theory is also termed as Managerial Discretion Theory. This theory assumes that the shareholders and managers are the two separate groups having different objectives. The former group is more interested in profit maximization whereas, the latter group has other motives than profit maximization.

In other words, shareholders desire to have maximum dividend and are interested in maximisation of profits. When managers are able to achieve a level of profit which is acceptable to shareholders, they are free to increase their salaries, size of their staff and expenditure on them.

According to Williamson, managerial utility function may be expressed as follows:

$$U = f(S, M, I_D)$$

Here U = Managerial utility

S = additional expenditure on staff

M = Managerial emoluments

I_D = Discretionary investment

The explanation of all these variables has been given below:

Expansion of staff:

Managers are more interested in increasing staff having better quality and knowledge. More staff under managers results in increase in salary of manager and prestige. In other words, managers are more interested to increase the number of persons working under them. In this process, managers can claim more salary for them, when more persons are employed.

Increase in Managerial Emoluments:

Managerial utility is also dependent on management emoluments. It comprises offices having maximum comforts. such as more cars for its office, telephone, air

conditioners etc. Greater availability of these facilities highlights the status, power and prestige of managers.

Discretionary power of investment:

Managerial utility also depends on power of managers to invest money beyond the normal requirements. This comprises investment in the latest technology in the factory. Such type of investments may not even prove more beneficial to the organization. This may be in the form of excessive automation, which may prove costly with the passage of time. But such investments bring improvement in the status of managers.

Criticism

This theory integrates monetary and non-monetary factors. Both these benefits have different utility. Here more emphasis has been given to luxuries which may not be acceptable to shareholders. Moreover, it will lead to decline in the profitability of the firm.

11.9 SUMMARY

Firms take various decisions regarding the allocation of scarce resources having various alternatives. They also takes into consideration cost of various resources and its return to the firm. Classical economists were of the opinion that main aim of a firm is to maximize its profit, the reason being, majority of organizations were owner organizations signifying that managers and owners were the same persons. But in the modern era, the real management of these organizations is in the hands of managers appointed by the shareholders. Thus, objective of modern organisations are many which vary from organisation to organisation. The alternative objectives of the firm can be in the form of profit maximization, sales maximization, maximization of satisfaction, growth maximization etc. According to Baumol's theory, if the firm wants to get maximum revenue, profitability of the firm will decline. On the other hand, if firm wants to earn minimum profit, the revenue of the firm will not be maximum. According to maximisation of satisfaction theory given by Scitovsky, entrepreneurs wants to get maximum satisfaction even at the cost of profit. Beyond certain level of profit, more preference is given to leisure in comparison to profit. According to growth maximization theory given by Penrose, managers are interested more in growth maximisation rather than in profit maximisation, according to security of firm theory objective of firm is not to earn maximum profit but to maintain a steady flow of profit. According to behavioral theory,

Firm wants to seek satisfactory profits due to existence of uncertainty in the business world. According to maximisation of management discretion theory, managers seeks to maximize their own utility function, subject to minimum level of profit. Thus, there are a number of theories of firm having their distinct features and the choice as to the best model to be adopted by an entrepreneur depends upon the nature and focus of the business he operates.

11.10 GLOSSARY

- **Profit Maximization:** The primary objective of every firm is to derive maximum revenue from its operations.
- **Wealth Maximization:** The objective of wealth maximization is the long-term goal of the firm as it seeks to maximize the return from investment.

11.11 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- (i) The difference between Total Revenue Total Cost reflects..... .
- (ii) Equality between MR and MC is the of profit maximization.
- (iii) A financial strategy which has a positive net present value creates..... .
- (iv) Figures relating to sales are available more easily as compared to figures.
- (v) Leisure is given more preference to profit after a certain level, is the essence of
- (vi) The concept of Managerial Utility gives more emphasis to

(B) State whether the following statements are true or false :

- (i) According to profit maximization theory, management decides output level which minimizes cost.
- (ii) Profit is the chief source of external force.
- (iii) Profit maximization concept does not considered time value of money.
- (iv) In Baumol's theory of the firm, the firms are solely motivated to increase sales revenue.
- (v) In the Marris' theory of the firm managers are at maximization of growth rate.
- (vi) External sources of finance are usually preferred to internal sources by business entrepreneurs.

11.12 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Net Revenue (ii) First order (iii) Wealth (i) Profit (iv) Maximization of Satisfaction Concep (v) Luxuries
- (B) (i) False (ii) False (iii) True (i) False (iv) False (v) True (vi) False

11.13 TERMINAL QUESTIONS

(A) Short Answer Questions :

1. How far is profit maximization the basic objective of a firm ?
2. Explain the behavior of sales maximizing firm.

3. Compare the features of the model given by Williamson with that given by Marris for managerial objectives.

(B) Long Answer Questions:

1. Discuss the Profit Maximization concept in detail.
2. Explain the Wealth Maximization model.
3. Explain the Growth Maximization concept.
4. discuss Cyert and March's behavioural theory.

11.14 SUGGESTED READINGS

Cyert, R. M. and J. G. March, A Behavioural Theory of the Firm, Englewood Cliffs, N. J., Prentice Hall, 1963.

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Unit 12-MARKET STRUCTURE AND EQUILIBRIUM

Structure

12.1 Introduction

12.2 Market Structure

12.3 Supply Analysis

12.4 Equilibrium

12.4.1 What is Equilibrium?

12.4.2 Equilibrium of demand and supply

12.4.3 Equilibrium price

12.4.4 Effect of Fluctuations in demand and supply on the equilibrium price

12.4.5 Changes in the condition of demand and supply

12.5 Summary

12.6 Glossary

12.7 Check you Progress

12.8 Answers to Check you Progress

12.9 Terminal Questions

12.10 Suggested Readings

OBJECTIVES

After studying this unit, you should be able to:

- Understand the different types of market structure
- Understand the conditions for the equilibrium of a firm under all market forms and fluctuations.
- Understand how the demand and supply affect the price and equilibrium.

12.1 INTRODUCTION

The price of a commodity and its supply are inter-related. When there is change in supply due to the change in price, it results in expansion or contraction of supply. When price increases, there is expansion of supply. When price decreases, there is

contraction of supply. The law of supply shows the relationship between price and quantity of a particular product supplied.

The demand for and supply of a commodity largely depend on market structure. The price that matches the quantity demanded and supplied is the equilibrium price. The quantity bought and sold at the equilibrium price is called equilibrium quantity. This unit introduces the basic concepts of supply, the law of supply, market structure and equilibrium in detail.

The term equilibrium means a ‘position of rest’ or a ‘position of balance’ or a ‘position of no change’. A firm is an individual unit producing and selling a product. An industry is a group of firms producing and selling the same commodity. A firm is said to be in equilibrium when it has reached a stage of production from which it does not want any change. The firm normally does not have a tendency to change its output if it gets the maximum possible profit. Therefore, the firm is said to be in equilibrium when it earns maximum profits. If the firm expands or contracts its output, its total profits will be less than the maximum.

In this unit, the equilibrium of a firm is explained in general terms which holds good under all market forms. For the sake of simplification, the analysis is based on certain assumptions. It is assumed that the entrepreneur is a rational person and, therefore, wants to maximize profits of the firm. Further, it is assumed that the firm has full knowledge of the profit maximizing position and by means of a series of experiments the firm has found out the point at which it can secure the maximum profit. The third assumption is that the firm produces only one product.

12.2 MARKET STRUCTURE

According to Cournot, a French economist, ‘market’ is not the place where purchases and sales of a commodity take place. It actually denotes a state of relationship in which a product is demanded when it is offered for sale. Following are the important points for categorizing the structure of a market.

1. Number and size of sellers and buyers:

If there are a number of sellers, the influence of one firm will be very small; but if a market has few sellers, each and every firm will have enough impact on price and supply. When the firm has dominant share in the market, it exerts enough influence over price and supply.

Similarly if there are large number of buyers in the market, their bargaining power is weak.

2. Product Differentiation:

Product differentiation is the degree by which one product differs from the other in market. When there is product differentiation, the decision of buyers is mainly influenced by the particular attributes of the products. Product differentiation may be real or notionally perceived by the buyers.

3. Condition of Entry and Exit:

The degree of freedom regarding entry and exit of firm governs the structure of the market. If there are restrictions on entry of new firms, there is no threat of potential competition in the market and existing firms enjoy high degree of freedom in framing their policies and strategies.

Exit from industry also happens when firms incur loss and the resources that are deployed, can be used in producing other products.

Perfect Competition

Following are the basic features of perfect competition: -

1. Large number of buyers and sellers:

In this market structure, there are large number of buyers and sellers. If, for example, a large number of farmers are growing wheat and one of them produces more or less, that will not affect the market supply or the market price. There are a large number of buyers also in the market. Even the entire group of buyers can't influence the price by changing their demand because each buyer and seller is like a drop in the ocean.

2. Homogeneous product:

The products, which this large number of buyers buy from a large number of sellers are identical i.e. they are perfect substitutes, if one buyer increases the price, the buyer will buy it from some other seller as the products are absolutely similar.

3. Free entry and exit of firms:

There is no restriction on entry of new firms in the industry and exit of existing firms from industry.

4. Firms are price takers:

As there are many buyers and sellers, no firm can influence the price or the supply in the industry. The firm is price taker rather than price maker. Price is determined by the total demand and total supply in the market. Therefore, no firm can charge higher price than that charged by other firms.

5. Perfect Knowledge:

All the buyers and sellers have perfect knowledge about the market.

6. No Cost of Transportation:

The cost of transportation does not exist because the product is available where it is demanded.

7. Perfect mobility of factors of production:

It is assumed that all the factors of production can be migrated from one place to another. There is no hindrance in the movement. This helps in entry of new firm and exit of a loss-making firm.

Now, we will differentiate between perfect and pure competition. Perfect competition has all the features of pure competition over and above some more features. The first three features of perfect competition mentioned earlier constitute pure competition (that is large number of sellers and buyers, free entry and exit and identical products)

whereas perfect competition has the features of pure competition and two more features, namely, perfect knowledge about the market and perfect mobility of factors of production.

Monopoly

When one seller constitutes the whole industry, it is a case of monopoly. Monopoly exists when there is a single seller or producer in the market. It is also known as single firm industry.

Features of Monopoly-

1. **Single seller:** Mono means single and poly means seller. Thus, monopoly means single seller. Producer may be an individual, Government, Company or Partnership firm. But, it is the only producer in the market.
2. **No close substitutes:** There are no substitutes available in the market for the product.
3. **Barrier to entry of firm:** There is restriction an entry in the industry by any new firm, whereby control over the market by the monopolist is protected.

Monopsony

Monopsony is a market situation, in which there is a single buyer for the commodity or services. For example, if there is a single factory in an isolated locality and that factory is the sole buyer of the labour force there, it is a case of monopsony in the labour market

In Monopoly, the seller has the control over the supply whereas in monopsony, the buyer can influence the price by his absolute control over demand.

Bilateral Monopoly

Bilateral monopoly is a market situation, where a monopolist faces a monopsonist, which means that a single producer encounters a single buyer.

The main features of this type of market are as under :

1. There in a single commodity without any close substitute.
2. The monopolist is the single producer.
3. The monopsonist is the sole buyer.
4. The monopolist will try to maximize his profit, whereas the monopsonist will try to maximize his utility.

Monopolistic Competition

In this type of market structure, there are large numbers of sellers selling slightly different products. This situation comes when the sellers are selling the products under different brands e.g. soaps, detergents, shampoo. All the brands are close substitutes and they have very tough competition. But each firm enjoys some elements of monopoly over a group of buyers who are having specific preference for the brand of the firm. Thus, monopoly and competition co-exist in this market. The features of monopolistic market structure are as under-

1. **Large number of buyers and sellers:** There are large number of buyers and sellers. Each seller pursues his own course of action. There is no interdependence.
2. **Product differentiation:** This is the most important feature of the monopolistic competition. The products differ in one-way or the other; the difference may be real or imaginary as long as it is important for the customers or buyers. The products are not perfect substitute but close substitute; there is slight difference between the products.
3. **Advertisement and selling cost:** The only way to prove the product better is by advertisement and promotion of the product. Advertisement brings psychological reaction on the part of buyers; it can even create imaginary difference, even if the products are same. Selling cost and advertisement affect the demand for the product and thus makes the demand less elastic.
4. **Free entry and free exit of the firms:** No single firm has total control over more than the small portion of the total demand. The firms have free entry in the firm to start the production and bring a close substitute in the market. On the other hand, the firms which incur loss can leave the industry by shutting down the production.

Oligopoly

Oligopoly market structure exists when there are few firms or sellers in the market and they are selling close substitutes. The features of oligopoly are:

1. **Interdependence** – The most important feature in oligopoly is interdependence. Here, interdependence means interdependence of decision-making. The number of sellers are few and so when one of the seller changes the price that will affect the demand for the rival producer; e.g. if there are two sellers 'A' and 'B', and seller 'A' decreases the price, many buyers will shift from 'B' to 'A,' as these two sellers are selling close substitutes. The seller 'B' will lose his many customers. Therefore, he cannot stick to the same price and he will retaliate by either decreasing price to the level of seller 'A' or more than that. In oligopoly, every action by the seller has a reaction from his competitor.
2. **Importance of selling and advertisement cost-** As the sellers are selling close substitutes, advertisement and selling cost is very important to increase the sales and the revenue. Oligopolist employs aggressive and defensive marketing weapons to get greater share of the market for which he has to depend a good deal on advertisements and sales promotion.
3. **Group behaviour** – There is a tendency of group behaviour in oligopoly. Due to interdependence between the sellers, the sellers may try to group up and agree to promote the interest of the group instead of going into price war against each other where no one gains.

12.3 SUPPLY ANALYSIS

Supply refers to various quantities of goods, which a seller is willing and able to sell for a price in a given market at a particular time, other things remaining constant. Here, supply refers to the amount or quantities that come to market for sale and not the stock in a go-down.

The Supply Schedule: - The supply schedule shows how much of goods and services would be supplied at different prices. It shows the relationship between the market price and quantity of goods the producer is willing to sell, other things remaining constant. Now, we will see a supply schedule for Rice.

Table 12.1: Supply Schedule for Rice

Price (Rs.)	Quantity supplied (in Kgs)
50	100
75	150
100	200

With the help of the above supply schedule, we can draw a supply curve.

In the figure 12.1, X-axis shows quantity supplied and Y-axis shows price. As the price increases, quantity supplied of rice also increases.

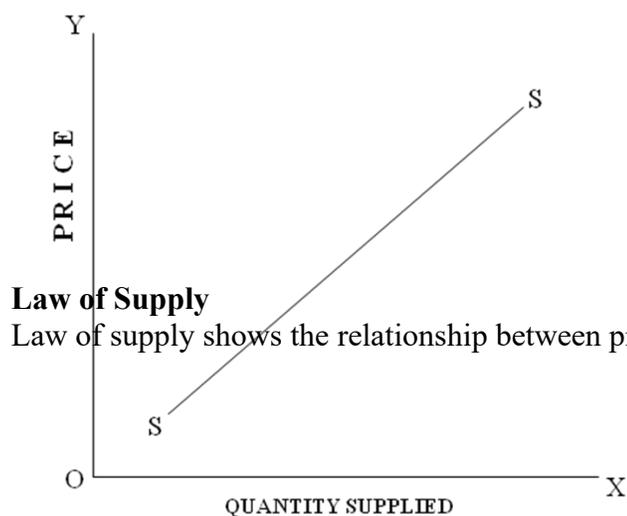


Fig. 12.1 Supply Curve

Law of supply shows the relationship between price and quantity supplied of a particular product. This relationship is positive, as when price increases the quantity supplied will also increase. Here, we assume that price changes and other things are constant.

In the figure 12.2, the X-axis shows quantity supplied and Y-axis shows price. Supply curve is upward sloping, which points out that price and quantity supplied are directly related to each other.

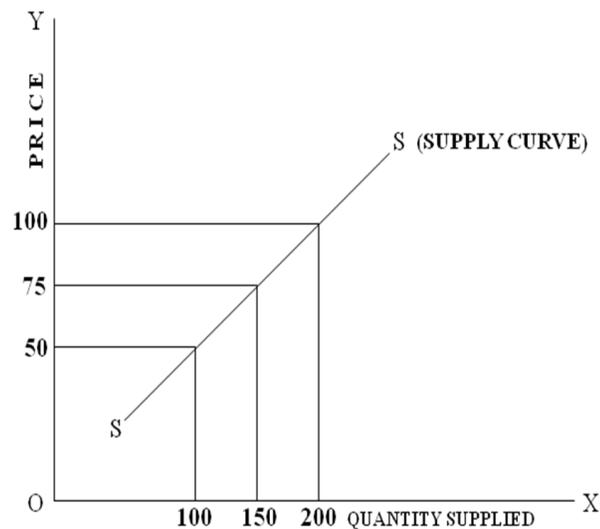


Fig. 12.2 Law of Supply

Exceptions to this law. Under following conditions, the law of supply does not hold good.

1. To clear the old stock the seller sells more even when the prices are low, but it usually happens in the short run.
2. Improvement in technology reduces the cost of production. Consequently, more goods are sold at reduced prices.
3. In case of distress sales caused by obsolescence of the product and changes in tastes and preferences of consumers efforts are made to sell more by reducing the price considerably.

Shift in Supply:

The supply curve shifts when there is change in quantity supplied due to change in any factor other than price. In this case the supply curve shifts entirely to right or left. Let us take an example.

If the number of sellers increases in the mangoes market, price being constant, the supply curve shifts to right. In the figure 12.3, X -axis shows the quantity supplied and Y-axis price. The supply curve SS_1 shifts to SS_2 , when the number of sellers increase leading to an increase in the quantity supplied. Now, we will see the shift in supply curve to the left, when the number of sellers for mangoes decreases.

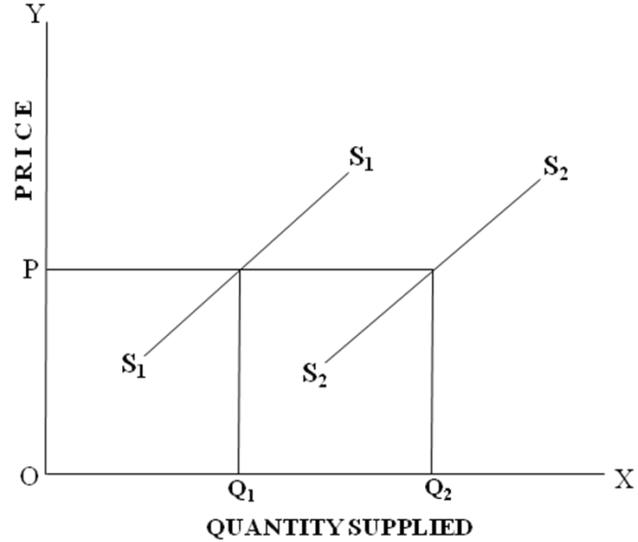


Fig. 12.3 Shift in Supply Curve to right

In the figure 12.4, the supply curve SS_2 shows the shift in supply curve to left when the number of mangoes sellers decrease.

Expansion and Contraction of Supply or Movement along the Supply curve

When there is change in supply due to the change in price, we call it expansion or contraction of supply. When price increases, it results in expansion of supply. In this case, supply goes up on the same supply curve.

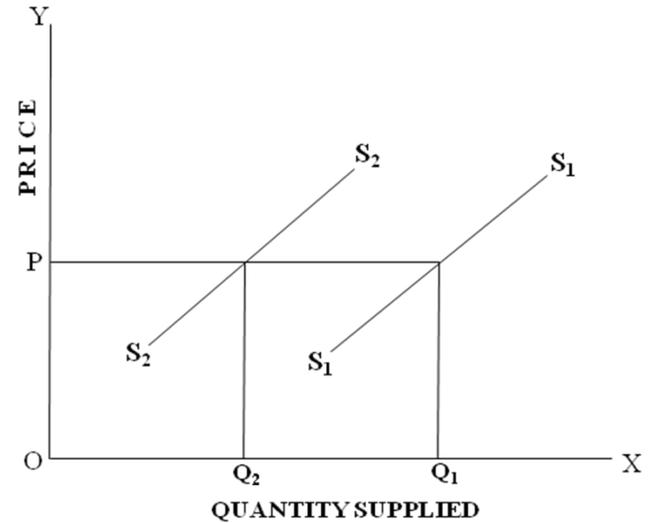


Fig. 12.4 Shift in Supply Curve to Left

When price decreases, it causes contraction of supply. In this case, supply moves down on the same supply curve. In both the cases the supply curves will not shift. The movement is along the same supply curve. It has been shown in the following table.

Let us understand it through the supply schedule of Rice charted further.

Table 12.2: Supply Schedule of Rice

PRICE (Rs) per kg	QUANTITY SUPPLIED (In Kgs)
50 (P ₁)	100 (Q ₁)
75 (P ₂)	150 (Q ₂)
100 (P ₃)	200 (Q ₃)

When the price is P_1 , the quantity supplied is Q_1 , we are on point B as shown in the figure 12.5. When the price increases from P_1 to P_3 , we go up along the supply curve up to point C. But as the price decreases from P_3 to P_2 , we come down along the supply curve to point A and the quantity supplied is Q_2

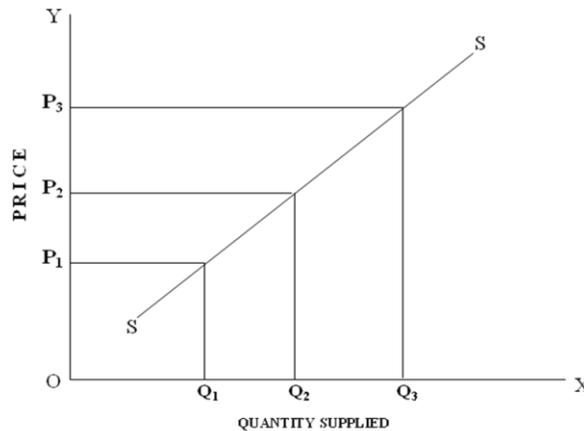


Fig. 12.5 Movement along the Supply Curve

Factors affecting Supply

These are some factors other than price, which affect supply:

1. Change in the cost of production- Production of any commodity needs different factors of production. When there is increase in the factors of production, the cost of production will increase. Increase in cost results in reduced supply and decrease in cost leads to increase in supply.
2. State of technology- When the firm changes the production techniques, which decrease the cost of production, the capacity of production will naturally increase. This will lead to increase in the quantity supplied.
3. Political uncertainty- The political uncertainty reduces the level of investment and therefore the supply also falls.

4. Natural factors- Unfavourable natural changes like earthquakes, floods and droughts have adverse impact on supply.

Price Elasticity of Supply

The price elasticity of supply refers to percentage change in quantity supplied resulting from a given percentage change in the price. It is calculated with the help of following:

$$E_s = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

E_s = price elasticity of supply

Δq – change in quantity supplied

q = original quantity supplied

Δp – change in price

P = original price

Let us take a numerical example:

A firm supplies 300 pencils at a price of Rs. 10 per pencil. After a few months, due to increase in the price from Rs. 10 to Rs.20, the firm increases the quantity supplied from 300 to 600 pencils. Calculate the Price Elasticity of supply.

Elasticity of supply on $E_s = \frac{300 \times 10}{10 \times 300} = 1$

$$\Delta q = 600 - 300 = 300$$

$$\Delta P = 20 - 10 = 10$$

Hence price elasticity of supply is moderate. If E_s exceeds one, it is highly elastic and when E_s is less than one, it is less elastic.

12.4 EQUILIBRIUM

12.4.1 What is equilibrium ?

The word 'Equilibrium' means balance between two opposing forces. It is the position from which it is not the tendency to deviate from the equilibrium position disappears.

12.4.2 Equilibrium of Demand and Supply

After understanding the concept of demand and supply, now we will take up the interaction between the demand and supply. The price that matches quantity demanded and the quantity supplied is the equilibrium price. The quantity bought and sold at the equilibrium price is called equilibrium quantity.

Let us have, the diagrammatic presentation of market equilibrium. Market equilibrium occurs at point E, where the DD demand curve intersects the SS supply curve. At the point E, the demand and supply are equal to OQ.

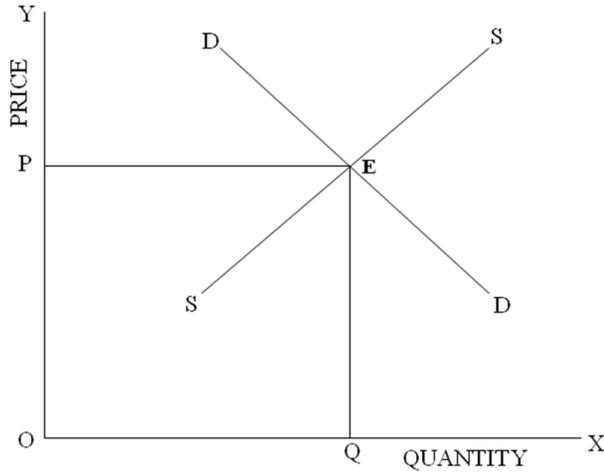


Fig. 12.6 Equilibrium of Demand and Supply

12.4.3 Equilibrium Price

It is the price at which both demand and supply are equal. It is shown in the following diagram.

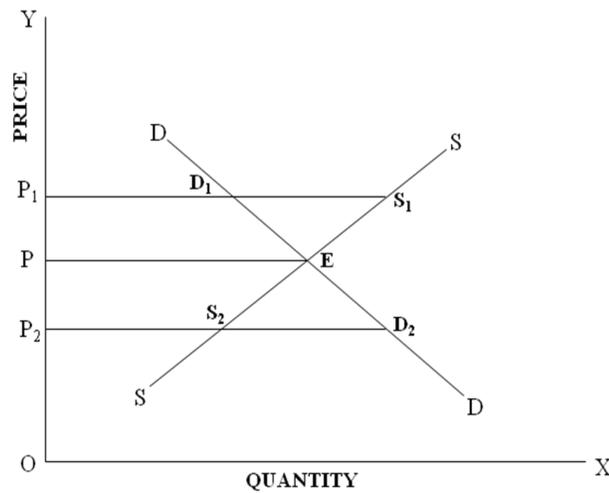


Fig. 12.7 Equilibrium Price

In the figure 12.7, quantity is shown on the X-axis and price is shown on the Y-axis. If the price goes up to OP_1 , the quantity demanded is $P_1 D_1$ and the quantity supplied is $P_1 S_1$. Here, supply is more than demand and $D_1 S_1$ is the amount of excess supply. At point OP_2 , the total quantity demanded is $P_2 D_2$ and the total quantity supplied

is $P_2 S_2$. In this case, total demand is more than total supply and the excess demand is equal to $S_2 D_2$. When there is excess demand at price OP_2 , there will be competition among buyers, which brings the price up and in case of excess supply there will be competition between the suppliers, which brings the price down. Let us start with price OP_1 , where buyer wants to buy $P_1 D_1$ and the seller wants to sell $P_1 S_1$. $P_1 S_1$ is greater than $P_1 D_1$, the seller will not be able to sell their product, so they will dispose it off by decreasing the price and the price will come down to OP . If the initial price is OP_2 , then the demand is $P_2 D_2$ and supply is $P_2 S_2$. There is excess demand of $S_2 D_2$. Due to competition in buyers, the price increases to OP .

12.4.4 Effect of Fluctuations in Demand and Supply on Equilibrium Price

The equilibrium will continue as long as there is no change in the condition of either demand or supply.

Let us first take the change in the demand curve assuming that the supply curve remains constant.

The equilibrium is point E , where the price is OP and the quantity supplied and demanded is OQ . When there is a shift in demand curve from DD to $D_1 D_1$, due to increase in income, the new price is OP_1 and new quantity is OQ_1 . Then equilibrium point will shift from E to E_1 as the demand increases and the supply remains constant.

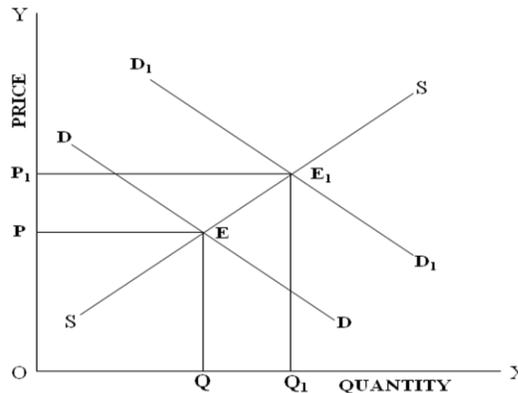


Fig. 12.8 Market Equilibrium (Shift in demand curve)

Let us now see the shift in the supply curve assuming that the demand curve remains constant.

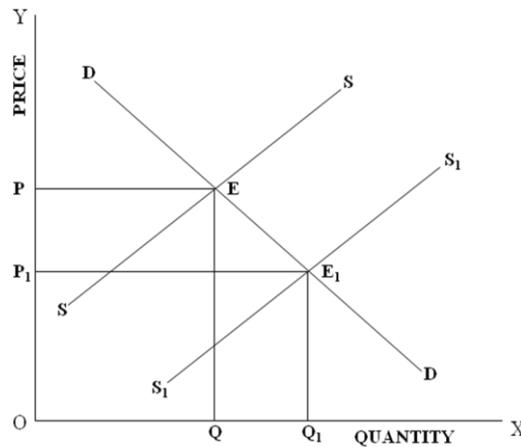


Fig. 12.9 Market Equilibrium (Shift in supply curve)

In the figure 12.9, the supply curve has shifted from SS curve to S_1S_1 and demand curve DD is constant. Due to increase in supply, the new equilibrium price is OP_1 and the new equilibrium quantity is OQ_1 and the new equilibrium point is E_1 . The table given below will help you understand the effect of shift in demand and supply on price and quantity.

Table 12.3: Effect of shift in demand and supply on price and quantity

If the demand increases	The demand curve shifts to right	Both the price and the quantity increase
If the demand decreases	The demand curve shifts to left	Both the price and the quantity decrease
If the supply increases	The supply curve shifts to right	Price will decrease and the quantity increases
If the supply decreases	The supply curve shifts to left	Price will increase and the quantity decreases

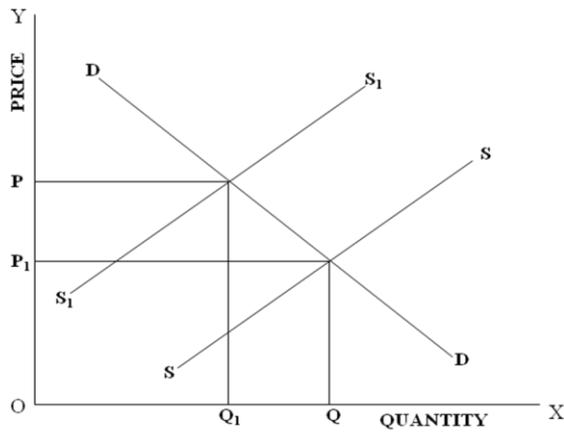


Fig. 12.10 Effect of shift in supply on price and quantity

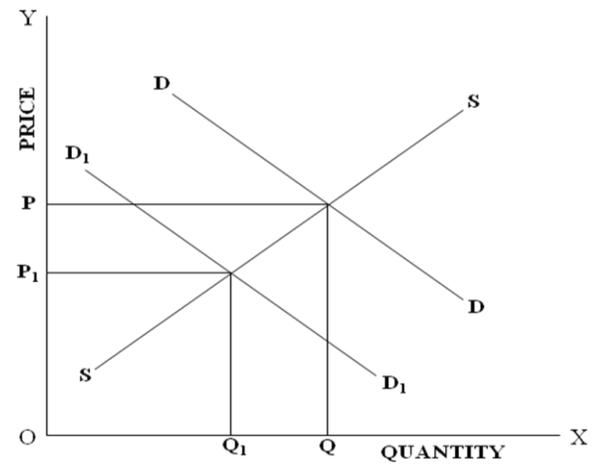


Fig. 12.11 Effect of shift in demand on price and quantity

In the figure 12.10 the supply curve SS shifts to SS_1 and the demand curve DD is constant. There is decrease in the supply; the price increases from OP to OP_1 and the quantity decreases from OQ to OQ_1 . You can observe from the figure 12.11 that the demand curve shifts from DD to D_1 and the supply curve remains constant. Due to decrease in demand, demand shifts from OP to OP_1 and the quantity decreases from OQ to OQ_1 .

12.4.5 Changes in the Condition of Demand and Supply

After understanding the shift either in demand or supply, we will see the effect of simultaneous shift in supply and demand. In real world, many complicating factors work together on demand and supply. In case when demand and supply change at the same time, the change in equilibrium price and equilibrium quantity depends on the quantity of relative change in demand and supply. In the figure 12.12, the shift in demand and supply is both at right side, then the price will be unaffected.

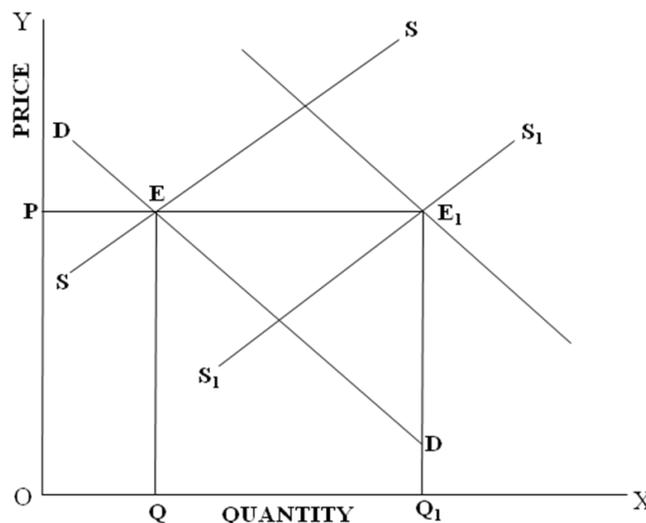


Fig. 12.12 Simultaneous shift in demand and supply (price unaffected)

In the figure 12.13, the shift in demand curve is greater than the shift in supply curve, thus the price increases.

12.5 SUMMARY

This unit introduces us the basic concepts of supply and the law of supply. The supply curve is upwards sloping. The supply curve can be drawn with the help of a supply schedule, which shows direct relationship between the price and quantity supplied. There are many other factors that affect supply, like cost of production, technology, weather conditions, and number of sellers, cost conditions and price of related products.

Market Equilibrium is the point where the demand and supply curves intersect each other and the demand is equal to supply. If this equilibrium is disturbed, the price increases above the equilibrium. The supply will be more than the demand and this surplus created between the sellers drives the price down. The increase in the demand increases both the equilibrium quantity and equilibrium price, whereas the decrease in demand leads to decrease in both equilibrium price and quantity. Increase in the supply leads to decrease in the equilibrium price and increase in equilibrium quantity. Whereas decrease in supply leads to increase in the equilibrium price and decrease in equilibrium quantity. When there is shift in the demand and supply in the same direction, then the change in equilibrium is predictable but not the change in price. When both demand and supply change in opposite direction, then the equilibrium price can be predictable, but not the equilibrium quantity.

12.6 GLOSSARY

- Equilibrium price- at which the demand is equal to supply
- Equilibrium quantity-the quantity which buyers are ready to buy and the seller are ready to sell at equilibrium price
- Supply-quantity of goods and services that is ready to be sold at a given price on a particular time.
- Surplus- It arises when the quantity supplied is more than the quantity demanded; due to increase in the price above the equilibrium price
- Shortage- It arises when the quantity demanded is more than the quantity supplied, due to fall in price below the equilibrium price
- Equilibrium- It indicates that position when the forces of demand and supply operating are in balance in such a way that there is no tendency to expand or contract the level of output.
- Movement along the supply curve-when the supply move up or down the same supply curve due to the change in the price
- Shift of supply- It shows the shift in supply curve either rightward or leftward of the original supply curve due to change in factors other than price.

12.7 CHECK YOUR PROGRESS

(A) Fill in the blanks:

- (i) Market embodies a relationship in which a product is ----- when it is opened for sale.
- (ii)----- shows the relationship between price and quantity supplied of a particular product.
- (iii)The supply curve shifts when there is change in quantity supplied due to any factor other than
- (iv)The quantity bought and sold at the equilibrium price is called..... .
- (v) When the supply increases, the supply curve shifts to
- (vi) If the demand decreases, the demand curve shifts to

(B) State whether the following statements are true or false:

- (i) In perfect competition price a firm is free to determine its price.
- (ii) In monopoly, entry of only a small number of firms is allowed.
- (iii) A monopsonist has full control over demand.
- (iv) Equilibrium price is the price at which both demand and supply are equal.
- (v) Price decreases when supply decreases.
- (vi) If both demand and supply curves shift to the right at the same rate, the price will remain the same.

12.8 ANSWERS TO CHECK YOUR PROGRESS

- (A)** (i) Demanded (ii) Law of Supply (iii) Price (iv) equilibrium quantity (v) the right
(vi) the left
- (B)** (i) False (ii) False (iii) True (iv) True (v) False (vi) True

12.9 TERMINAL QUESTIONS:

1. Explain the law of supply with its exceptions.
2. Bring out the difference between movement of supply and the shift of supply.
3. What are the factors affecting supply?
4. Define the terms Equilibrium, Equilibrium price and Equilibrium quantity.
5. Explain why the price settles down at the point where demand curve intersects the supply curve.

12.10 SUGGESTED READINGS

Chamberlin, E. H., The Theory of Monopolistic Competition, Cambridge, Mass : Harvard University Press, 1933.

Stigler, "Price and Non-Price Competition", *Journal of Political Economy*, Feb., 1968.

Mrs. J. Robinson, *The Economics of Imperfect Competition*, London, Macmillan, 1933.

Jhingan, M. L. *Advanced Economic Theory*, Vrinda Publications (P) Ltd., New Delhi.

S. K., Mishra and V. K. Puri, *Advanced Microeconomic Theory*, Himalaya Publishing House, Mumbai, 2001.

UNIT 13 - PRICE THEORY AND ITS APPLICATION

Structure

- 13.1 Introduction**
- 13.2 Pricing**
- 13.3 The Price-Quality Relationship**
- 13.4 Revenue Analysis**
- 13.5 Factors to be considered while making price decision**
- 13.6 Pricing Strategies**
- 13.7 Pricing Policies**
- 13.8 Objectives of pricing policy**
- 13.9 Different Pricing Practices by Firms**
- 13.10 Summary**
- 13.11 Keywords**
- 13.12 Check your Progress**
- 13.13 Answers to Check your Progress**
- 13.14 Terminal Questions**
- 13.5 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to -

- Define pricing
- Understand the Price/Quality Relationship
- Describe the Pricing Strategy
- List out factors to be considered in the pricing decision
- Explain Pricing Policy

13.1 INTRODUCTION

Price is one of the four Ps of the marketing mix. The other three aspects are product, promotion, and place. It is also a key variable in microeconomic resource allocation theory. Price is the only revenue generating element amongst the 4ps, the rest being cost centers. Pricing is the manual or automatic process of applying prices to purchase and sales orders, based on factors such as: a minimum amount, quantity supplied, promotion or sales campaign, price prevailing on entry, shipment or invoice date and combination of multiple orders. Automated systems require more setup and maintenance but may prevent pricing errors.

13.2 PRICING

Pricing is the process of determining what a company will receive in exchange for its products. Pricing factors include manufacturing cost, market place, competition, market condition and quality of product. The **effective price** is the price the company receives after accounting for discounts, promotions, and other incentives.

Promotional pricing refers to an instance where pricing is the key element of the marketing mix. It is for increasing sales through the application of various sales promotion measures.

13.3 THE PRICE QUALITY RELATIONSHIP

The price-quality relationship refers to the perception by most consumers that a relatively high price is a sign of good quality. The belief in this relationship is most important with complex products that are hard to test, and experiential products that cannot be tested until used (such as services). The greater the uncertainty surrounding a product, the more consumers depend on the price-quality hypothesis and the more of a premium they are prepared to pay. The classic example of this is the pricing of the snack cake Twinkies, which were perceived as low quality when the price was lowered. However, the excessive reliance on the price-quality relationship by consumers may lead to the raising of prices on all products and services, even those of low quality, which in turn makes the price-quality relationship rather unreliable.

Premium pricing (also called prestige pricing) is the strategy of consistently pricing at, or near, the high end of the possible price range to help attract status-conscious consumers. A few examples of companies which partake in premium pricing in the marketplace include Rolex and Bentley. People will buy a premium priced product because:

1. they believe the high price is an indication of good quality;
2. they believe it to be a sign of self worth - "They are worth it" - It authenticates their success and status - It is a signal to others that they are a member of an exclusive group;
3. they require flawless performance in this application - The cost of product malfunction is too high to buy anything but the best, eg. heart pacemaker.

The name derives from the Goldilocks story, in which Goldilocks chose neither the hottest nor the coldest porridge, but instead the one that was "just right". More technically, this form of pricing exploits the general cognitive bias of aversion to extremes. This practice is known academically as "framing". By providing three options (i.e. small, medium, and large; first, business, and coach classes) you can manipulate the consumer into choosing the middle choice and thus, the middle choice should yield the most profit to the seller, since it is the most chosen option.

Demand-based pricing is any pricing method that uses consumer demand - based on perceived value - as the central element. These include: price skimming, price discrimination and yield management, price points, psychological pricing, bundle pricing, penetration pricing, price lining, value-based pricing, and premium pricing. Pricing factors are manufacturing cost, market place, competition, market condition, quality of product.

Multidimensional pricing is the pricing of a product or service using multiple numbers. In this practice, price no longer consists of a single monetary amount (e.g., sticker price of a car), but rather consists of various dimensions (e.g., monthly payments, number of payments, and a downpayment). Research has shown that this practice can significantly influence consumers' ability to understand and process price information.

13.4 REVENUE ANALYSIS

Revenue is the income received by the firm. The revenue concept is related to total revenue, average revenue and marginal revenue.

Total Revenue (TR) – Total Revenue is the total income of a firm by selling a commodity at a price. If a firm sells 5 units @ Rs 2/- each, then

$$TR = P \times Q \quad \text{where } P = \text{price and } Q = \text{number of units sold}$$

$$TR = 2 \times 5 = 10$$

Average Revenue (AR) – We can find AR by dividing the total revenue with the number of units sold, for e.g., when Total Revenue is Rs 10/- and number of units are two.

$$AR = \frac{TR}{Q}$$

$$AR = \frac{10}{2}$$

$$AR = 5$$

Now, we can say that, AR of a firm is in fact the price of the commodity at each level of output.

Marginal Revenue (MR) – It is the addition to the total revenue as a result of the sale of an additional unit by the firm.

$$MR = TR_{(n \text{ units})} - TR_{(n+1 \text{ units})}$$

Relationship between Total Revenue and Price Elasticity of Demand

The relationship between price elasticity of demand and total revenue is important because every firm has to decide whether to increase or decrease the price depending on the price elasticity of demand of the product. If the price elasticity of demand for his product is relatively inelastic ($E_p < 1$), then he can raise the price to increase the total revenue. Whereas, if the price elasticity of demand for his product is relatively elastic ($E_p > 1$), increase in price will decrease the total revenue. When $E_p = 1$, change in price does not affect total revenue. The relationship between E_p and TR is shown in the following table.

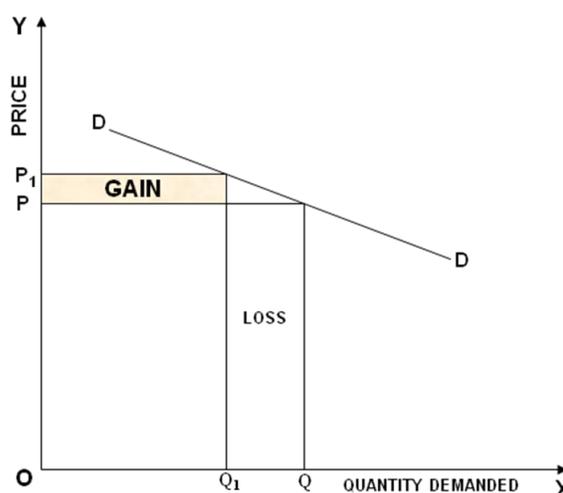
Table 13.1 Relationship Between Total Revenue and Price Elasticity of Demand

Price Change	Relatively Elastic ($E_p > 1$)	Relatively Inelastic ($E_p < 1$)	Moderately Elastic demand ($E_p = 1$)
When price increases	Total revenue will decrease	Total revenue will increase	No change in TR
When price decreases	Total revenue will increase	Total revenue will decrease	No change in TR

Diagrammatic Presentation

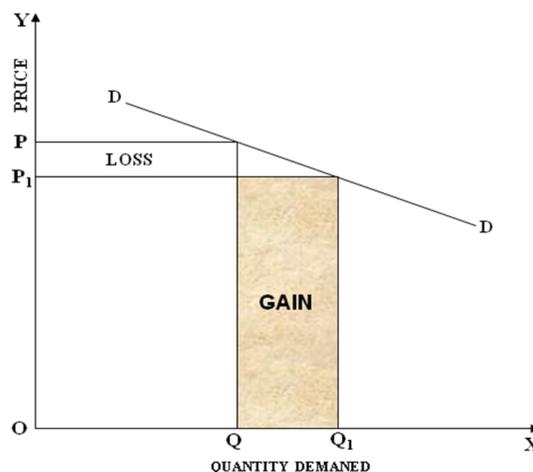
When price increases and E_p is relatively elastic i.e. $(E_p > 1)$.

In the figure 13.1, initially the price is OP and quantity demanded is OQ . When there is an increase in price from OP to OP_1 , the quantity demanded decreases from OQ to OQ_1 . The increase in price is shown as gains 'G' (shaded portion). But the decrease in quantity demanded is shown as loss 'L'. It is clear from the figure the total area of gain is less than the total area of loss. Thus there is decrease in total revenue.

Figure 13.1 ($E_p > 1$)

When price decreases and E_p is relatively elastic i.e. $(E_p > 1)$.

In the figure 13.2, initially the price is OP and quantity demanded is OQ . When there is a decrease in price from OP to OP_1 , the quantity demanded increases from OQ to OQ_1 . The decrease in price is shown as loss 'L'. But the increase in quantity demanded is shown as gain 'G' (shaded portion). We can see in the figure $G > L$, therefore the total revenue increases.

Fig. 13.2 ($E_p > 1$)

When price increases and E_p is relatively inelastic i.e. ($E_p < 1$).

In the figure 13.3, initially the price is OP and quantity demanded is OQ . When there is an increase in price from OP to OP_1 , the quantity demanded decreases from OQ to OQ_1 . The increase in price is shown as gains 'G' (shaded portion). But the decrease in quantity demanded is shown as loss 'L'. We can see in the figure $G > L$, therefore the total revenue increases.

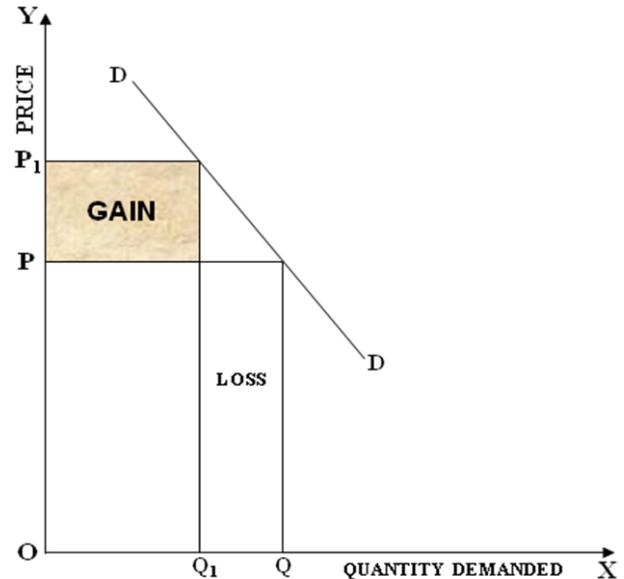


Fig. 13.3 ($E_p < 1$)

When price decreases and E_p is relatively inelastic i.e. ($E_p < 1$).

In figure 13.4, initially the price is OP and quantity demanded is OQ . When there is a decrease in price from OP to OP_1 , the quantity demanded increases from OQ to OQ_1 . The decrease in price is shown as loss 'L'. But the increase in quantity demanded is shown as gain 'G' (shaded portion). We can see in the figure $G < L$, therefore the total revenue decreases.

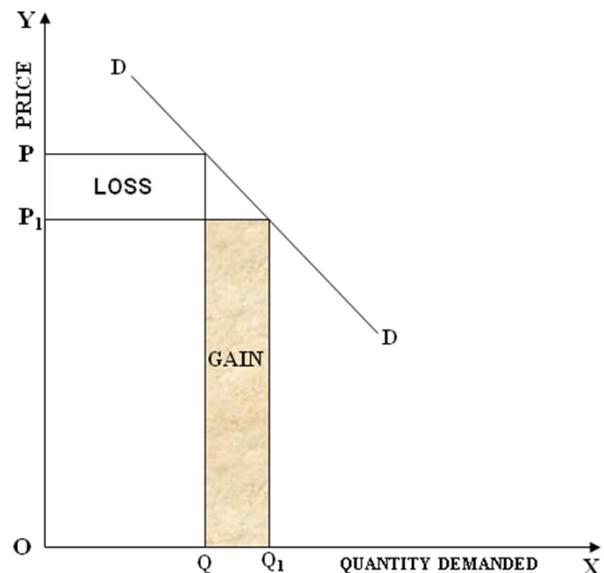


Fig. 13.4 ($E_p < 1$)

13.5 FACTORS TO BE CONSIDERED WHILE MARKING PRICE

Since no readymade formula can be suggested for pricing because of its complex nature, there are some factors which must be considered while formulating a pricing policy. These are as follows :

- (i) **Nature of Corporate Objectives** – Generally Corporate Objectives include profitability and growth of market share etc. Pricing Policy is formulated in the light of the targeted rate of profit.
- (ii) **Nature and form of Competition** – In case of a perfectly competitive market, pricing policy is not needed at all since an individual firm, as you know, is never a price maker. On the contrary, a firm, operating in imperfect market pricing policy becomes important.
- (iii) **Promotional Policies** – Firm's pricing policies should always accompany the promotional policies since both of these aim at maximizing sales.
- (iv) **Down the line Conflict** – The market price depends not only on the initiative of the producer but also on the behavior and reactions of the middlemen. In case there is a mismatch between the interests of the producer (i.e. the firm) the middlemen, there is bound to be a periodic fixation of price rather than a unanimously acceptable prices.
- (v) **Pricing policies as a routine matter** – Situations are common when a firm adopts the price policy of some other firm(s) dealing in a similar product rather than framing/ mathematic method of pricing its own pricing policy.

This policy is practised under the conditions when prices have to be fixed for a product which provides only a small fraction of revenue. Besides, in case the firm is not able to obtain reliable data on demand; mechanical techniques are better options. Such techniques deliver quick results and therefore, are better than the elaborate conventional system of price fixation.

- (vi) **External Variables** – Elasticity of demand and supply of the product, the trend in the market, the general level of purchasing power in the economy and the government policies towards prices are the common factors which influence the pricing policy of a firm. In order to protect the interest of consumers, the government might exercise control on some essential commodities or control the monopoly pricing and collusion among businessmen. Besides, the government, the firm has to take care of the possible impact of the conditions of trade cycles like the recession or inflation.

13.6 PRICING STRATEGIES

The price strategies which are usually adopted by business managers are being detailed below:

1. Stay-out Pricing

In a situation of uncertainty as to the fixation of price of a product, a firm starts with a very high price. If he fails to sell his product at this price, it then lowers the price. It will continue to do so till it is able to sell the targeted quantity. This enables the firm to ascertain the maximum possible price for its product.

2. Price Lining

According to this approach, price of one product in the total range of products is fixed. Price of rest of the commodities is automatically determined by the relationship between the commodity whose price has been fixed and the rest of the commodities in range. For example, if a firm producing garments for children fixes up the price for a particular size, price of rest of the sizes is then fixed simultaneously on the basis of the differences in their sizes. Besides, when price of one size of garments changes, prices of rest of the line of the product get automatically adjusted.

3. Psychological Pricing

This is, in fact, a method of price tagging instead of pricing, in which a firm fixes the price of its product in a manner which gives the impression of being low. For example, if the price of a product is fixed at Rs. 79.90 rather than Rs. 80, it may have the psychological impression on consumers that price is in 70s rather than 80s. This strategy is very common in case of Shoe companies.

4. Skimming Price – Such a strategy has the following preconditions:

- (a) There must be a large segment of buyers whose demand is relatively less elastic, not sensitive to a high or low price.
- (b) Unit costs are relatively unaffected by small volume, high ratio of variable to fixed costs.
- (c) price is high so that there is no attraction for competition. As the term suggests, it aims at ‘skimming the cream’ by taking advantage of the target segments willingness to pay a high price. This is, in reality, a discriminatory strategy.

5. Penetration Price – This strategy has the following preconditions :

- (a) The market is highly price sensitive with high price elasticity.
- (b) There are economies of scale in production and distribution, and the ratios of variable to fixed costs are low.
- (c) Low price is likely to discourage competition.

This is a strategy of charging low price so as to stimulate demand for the product of the firm and capture a large share of the market.

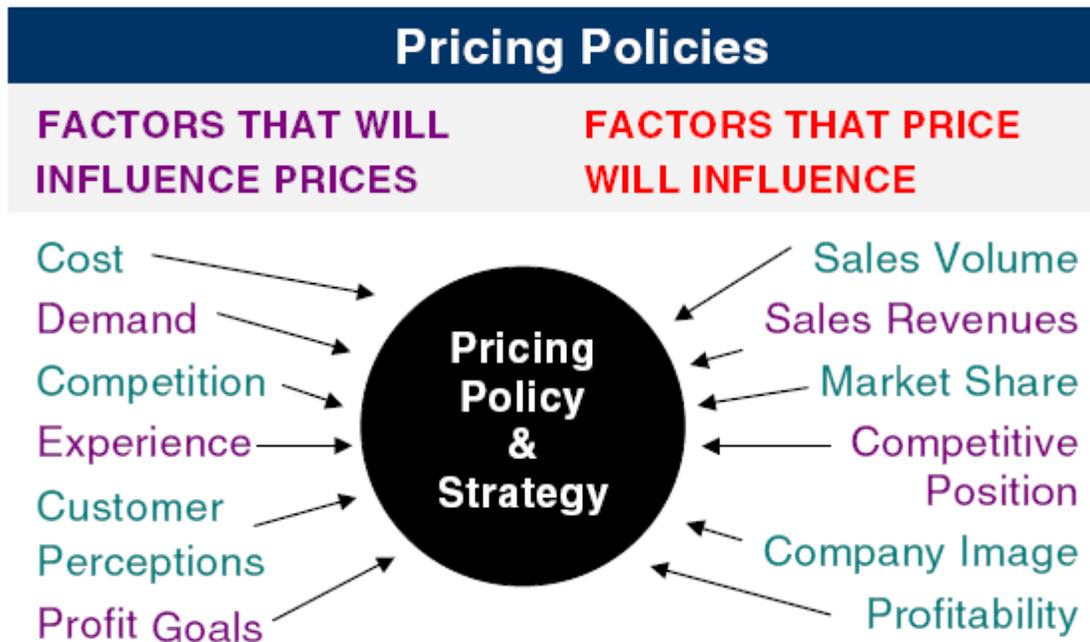
6. Limit Pricing – When a firm tries to fix a price that reduces or eliminates the threat of entry of new firms into the industry, such a price is called limit pricing.

13.7 PRICING POLICY

Crucial to a good marketing is good pricing policy, for the prices you charge for your products and services will greatly affect your sales volume, profit levels and among other things the business image. To establish an effective pricing policy, a firm is required to do the following:

1. Define the pricing objectives: pricing objectives should be closely tied with the overall objective and goals of business and marketing as a result take into consideration what impact your prices will have on your sales volume, sales revenue, market share, competitive position, company image and profitability.
2. Establish a simple yet effective pricing structure taking into consideration all the business costs.
3. Choose a pricing strategy to establish a market share:
4. Fine tune and adapt your general pricing policy in response to trends, industry practices and new innovative pricing strategies to help solidify your competitive position within your market place.

The following figure illustrates the factors that influence pricing and factors that are influenced by the price.



If these factors are given due consideration while fixing the price of the product, the firm would be able to have an effective pricing policy..

13.8 OBJECTIVES OF PRICING POLICY

Price policy has following objectives: -

1. **To maximize profits:** - Every firm tries to maximize its profits. So it should have a price policy, which fetches maximum revenue. Every firm should have a price policy keeping the long run prospects in mind.
2. **Price Stability:** - A stable price always wins the confidence of customers.
3. **Capture the Market:** - Producer's aim is to increase the market share and to do so, he fixes comparatively lower price for his product, while introducing a product to capture the lion share of market. But in the long run the firm can change the price policy according to the conditions of the market.
4. **Matching with competitive situation:-** Every producer should fix the price, keeping the price of his competitor in mind and in some types of market structure, prices are fixed in such a way so as to restrict the entry of rival firms in the industry (eg oligopoly).
5. **Ability to pay:** - The price should be fixed according to the ability of consumer to pay; high price for rich customers and low for poor customers. This can be applied in case of services given by doctors, lawyers etc.

13.9 DIFFERENT PRICING PRACTICES BY FIRM

Every firm has its own pricing practice, depending on the nature of its product, demand, utility of its product, taxes etc. Now, under this section, we will discuss some main pricing practices:

1. **Cost-plus pricing:** - After taking into account the cost per unit and profit margin, cost-plus price is fixed. In this method the firms simply calculate the average variable cost of the product, add to it the allocated fixed cost and then add a mark-up. The mark-up is called profit margin. The most difficult is deciding on the profit margin. New firm entering in the industry will imitate the existing firm and get information of profit margin from the competitor. But one with new product has to use his judgement according to market conditions and potential demand. The commodities requiring huge investment will fix high profit margins e.g.; Television, Air-conditioners, Cars etc (sometime have 25% of total cost), whereas commodities with simpler techniques and small investment stick to low profit margins.

This pricing practice has its limitations:

- It ignores demand side of market and has no consideration for fluctuation in demand and needs to change the price.
 - It fails to show the force of competition in market.
2. **Going – rate pricing:** This is opposite to the cost-plus pricing; it suggests fixing price according to the existing price of similar product in market. The firm adjusts its own price according to the general price structure. This is the safest way; here price leadership fits better. But one should not confuse it with perfect competition because in perfect competition, the firms are price takers and they have no choice

of determining price; whereas, in going rate pricing, the firms can charge higher price as compared to its competitors in period of prosperity and lower than competitors in depression; which means they can change the price according to the market situations. This kind of practice is followed not only by small firms but also by big firms. It is time saving and convenient.

- 3. Imitative Pricing:** - It is similar to going rate pricing. The firm imitates the price of leading firm. In oligopolistic situation, the firm which joins later imitates the leader's price. There is a price leader and price followers who charge the price fixed by price leader. This is also a simple and convenient way of pricing.

Marginal cost pricing: According to this method the price of a product is based on the incremental cost of the product. Price does not cover the full cost, it is never below variable cost. Marginal cost pricing is applicable in case of multiproduct in multimarket firms. In such cases, the firm may charge a price just equal to variable cost for one product, while it may charge higher price for the other product. However, the method of pricing has following limitations:

- (1) Marginal cost pricing is suitable only for short period. It does not provide a long period stable pricing policy.
- (2) It does not generate that the firm will operate at the break even point, although it avoids the situation of shut down point.
- (3) During recessionary period, firms using marginal cost pricing may lower cost and prices in order to maintain sales. This may lead other firms to follow suit, thereby leading to cut throat competition.

13.10 SUMMARY

Pricing is the process of determining what a company will receive in exchange for its products. Price lining is the use of a limited number of prices for all your product offerings. The price-quality relationship refers to the perception by most consumers that a relatively high price is a sign of good quality. Premium pricing (also called prestige pricing) is the strategy of consistently pricing at, or near, the high end of the possible price range to help attract status-conscious consumers. Revenue is as important as the cost concept in Business Economics.

Total revenue is the total income earned by the firm, average revenue is the revenue earned per unit, and marginal revenue is the addition to total revenue by selling an extra unit of the commodity. The relationship between revenue and price elasticity of demand has practical significance in real business life. A producer can use the knowledge of these two concepts to decide the price and alter the prices. The government uses this information in deciding which commodity should be taxed; an inelastic commodity will be taxed more than elastic commodity.

Prices once fixed cannot be kept constant forever; it has to be revised according to the condition and the economic situation. The main objective of pricing policy is to maximize profit for the firm, stability is necessary to win the confidence of the customers and it should be able to capture enough market for the firm. Different pricing practices are used by the firms depending on the demand, nature of the

product, utility etc. There are different pricing policy for established products and new product that are introduced to the market. They are Cost-plus pricing, Going-rate pricing, Imitative pricing and Marginal cost pricing. Penetration pricing is when the firm charges low price than what the economic analysis has indicated to get the foothold in the market and Price skimming is the practice of charging a price more than indicated by the economic analysis while introducing a new product and when the competition is weak.

13.11 GLOSSARY

- **Effective price:** It is the price the company receives after accounting for discounts, promotions.
- **Price lining:** It is the use of a limited number of prices for all your product offerings and other incentives.
- **Promotional pricing:** It refers to an instance where pricing is the key element of the marketing mix.
- **Demand-based pricing:** It is any pricing method that uses consumer demand - based on perceived value - as the central element.
- **Penetration pricing:** Whereby a low price is combined with aggressive advertising aimed at capturing a large percentage of the market.
- **Skimming** - This is a high-price policy suitable for top-quality versions of established products.

13.12 CHECK YOUR PROGRESS

(A) Fill in the blank :

1. If the average revenue curve is above average cost, then the firm is earning _____ profits.
2. The point where _____ is equal to marginal cost the firm is in equilibrium.
3. _____ is the total income of a firm by selling a certain unit of commodity at a given price.
4. A stable _____ price always wins the confidence of customers.
5. Cost-plus price is fixed after taking into account the cost per unit _____ and profit margin _____.
6. The strategy in which a firm charges very high price for a product at the initial stage, is known as _____.
7. Marginal cost pricing is suitable only for _____ period.

(B) State the following statements are true or false :

- (a) Higher price always ensures higher quality.
- (b) When price elasticity = 1, increase in price will decrease the total revenue.
- (c) Premium Pricing targets status conscious consumers.

- (d) AR of a firm is also its price.
- (e) In a perfectly competitive market a firm has to adopt a pricing policy.
- (f) In going rate pricing, a firm cannot change its price as per changes in the market condition.

13.13 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Supernormal (ii) Marginal Revenue (iii) Total Revenue (iv) Stable
 (v) Cost per unit and price margin (vi) Skimming Pricing Strategy
 (vii) Short
- (B) (i) False (ii) False (iii) True (iv) True (vi) False

13.14 TERMINAL QUESTIONS

1. What do you understand by price strategy ?
2. What are the factors to be considered in the pricing decision?
3. What is a pricing policy? What factors influence pricing policy?
4. Explain the different Pricing Policies by firms.
5. Explain the methods of Cost-Plus Pricing.

13.15 SUGGESTED READINGS

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UNIT 14- PRICING UNDER PERFECT AND IMPERFECT COMPETITION

Structure

- 14.1 Introduction**
- 14.2 Market Structure and Price Determination**
- 14.3 Equilibrium under Perfect Competition**
- 14.4 Equilibrium under Pure Monopoly**
- 14.5 Price Discrimination**
- 14.6 Monopsony**
- 14.7 Bilateral Monopoly**
- 14.8 Monopolistic Competition**
- 14.9 Oligopoly**
- 14.10 Summary**
- 14.11 Glossary**
- 14.12 Check your Progress**
- 14.13 Answers to Check your Progress**
- 14.14 Terminal Questions**
- 14.15 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to:

- Understand how sellers determine their equilibrium under perfect competition.
- Understand why a producer continues to produce in short run even at losses.
- Know how price and output decisions are taken under monopoly.
- Understand how and quantity of output are adjusted under discriminatory monopoly
- Be aware of how Oligopoly works in practice.
- Understand how producers in Monopolistic competition determine their prices.

14.1 INTRODUCTION

Determination of prices and output of products depends upon the type of market structure in which they are produced, sold and purchased. In this context, markets are classified into perfect competition, monopolistic competition, oligopoly and monopoly out of which monopoly, monopolistic competition and oligopoly are usually grouped under the category of imperfect competition, since these forms of market differ from

that of the perfect competition with respect to the degree of imperfection. This unit would explain and analyse the operation of these markets in detail.

14.2 MARKET STRUCTURE AND PRICE DETERMINATION

There are several ways (methods) to classify the market, but there are certain specific features which are mentioned below:

- 1. Number and Size of Sellers**
If the number of sellers is large, the influence of any particular firm will be minimal (small). But if the number of sellers in the market is limited (few sellers), then each one will have a significant impact on price and supply in that direction. When the market is dominated by a few powerful firms, they have a considerable effect on price and supply.
- 2. Number and Size of Buyers**
If the number of buyers in a market is large, each individual buyer has little ability to influence demand. But if the number of buyers is small, then each of them can have some influence on market demand.
- 3. Product Differentiation**
Product differentiation refers to the extent to which a product in the market is distinct or different from another product. The degree (extent) of product differentiation determines how much influence the product has on price. Each firm tries to make its product unique or different and attempts to create an imaginary distinction or variation.
- 4. Conditions of Entry and Exit**
Entry means when a new firm enters the market with an attractive profile or description. If there are no substitutes for the product in the market, the company can enter without fear of losing customers. However, if free entry (ease) into the market exists, then new firms can easily enter the market. In such a situation, the competition among existing firms in the market increases.

14.3. EQUILIBRIUM UNDER PERFECT COMPETITION

Under perfect competition price is determined by the equilibrium between total demand and total supply of the industry as a whole. The demand curve for the whole industry slopes downward because demand changes inversely with any change in price. Individual firms don't determine price independently. They are price takers rather than price makers because of the basic characteristics of the market such as very large number of sellers and buyers, homogeneous product, full knowledge of the market and absence of transportation and advertisement cost etc. Any increase in price on the part of an individual firm is bound to cause infinite fall in the demand for its product. Hence the firm accepts the price determined by the market and consequently the demand curve of the firm is a horizontal line representing perfect price elasticity of demand. The market equilibrium and the attendant demand curve of the firm are shown in the figure given further.

It is clear from the figure 14.1 that the market demand and supply curves are intersecting at point E, hence equilibrium output is OQ and equilibrium price is OP. All the firms of the market will accept this price and hence their demand curve D_1 is horizontal. Therefore, the firm has to decide the output to be produced according to its cost condition at that price. Since at the given price the firm sells all its output, hence MR is equal to AR.

Equilibrium of the Firm

The firm which wants to maximize its profit or minimize the loss shall produce an output where $MR=MC$ (that is, where the additional revenue received from the last unit sold is equal to the additional cost for producing that unit).

If marginal revenue is greater than marginal cost, i.e. $MR > MC$, the firm will be prompted to expand its output because additional output is yielding more revenue than the corresponding additional cost. On the other hand, if marginal revenue is less than marginal cost, it implies that the firm is suffering loss due to excess production and hence the firm will contract its output. Thus, the firm will continue to expand its output if $MR > MC$ and conversely it will contract its output if $MR < MC$. Ultimately the tendency to expand or contract the level of output will disappear when $MR = MC$. Thus, a firm is in equilibrium when following conditions are fulfilled :

- (i) $MR = MC$; and
- (ii) MC curve intersects MR curve from below.

This situation is shown in the figure given further.

In the figure 14.2, MC curve is intersecting MR line at two points, namely T and E. But at point T, MC curve is intersecting MR line from above, meaning thereby that for any increase in output between Q_1Q , MC will be less than MR, hence tendency to expand will operate and if output is

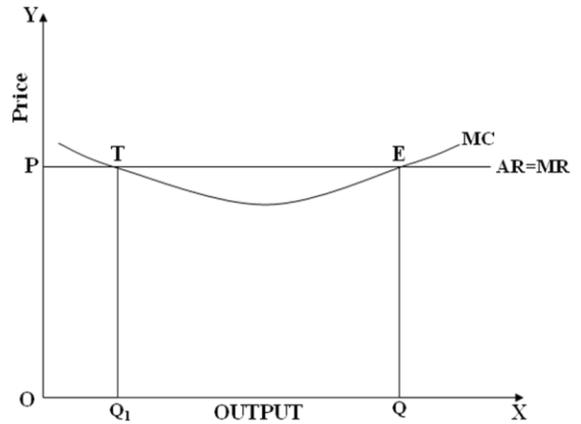


Fig. 14.2 Equilibrium Condition Under Perfect Competition

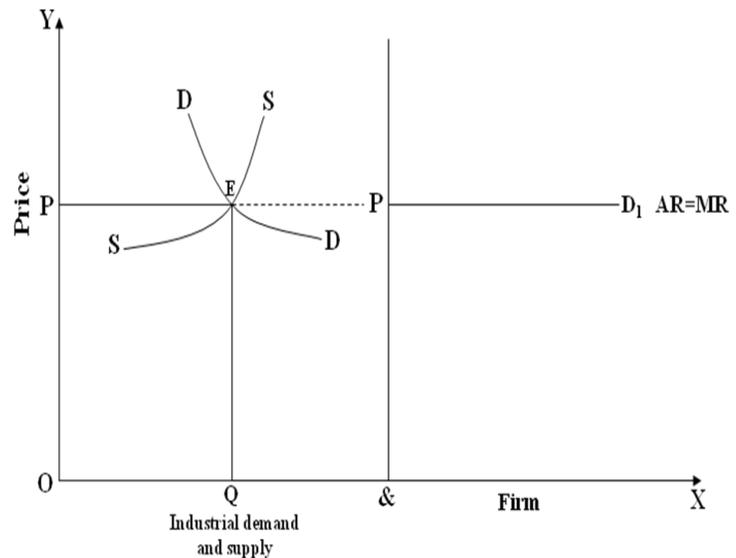


Fig. 14.1 Market Equilibrium and Firm's demand curve

raised beyond OQ, MC becomes greater than MR, hence the firm will not expand output beyond OQ. Thus, OQ is the equilibrium output and E is the equilibrium point at which both the conditions of equilibrium are being fulfilled.

Short Run Equilibrium with super Normal Profit- In this case following conditions are fulfilled :

- (i) $MR = MC$; and
- (ii) $AR > AC$.

This situation is shown in the figure 14.3.

It is clear from this figure that at point E, $MR = MC$. Hence EQ is the equilibrium output and average revenue, i.e. price is OP and average cost, i.e. is OG. Since $AR > AC$, therefore the firm is earning super normal profit to the extent of GP per unit and its total super normal profit is equal to the area PEFG.

Short run equilibrium with loss:

In the figure 14.4, OP is the price given according to the demand and supply of the market. The cost of OG and the price is OP, which is less than cost, the equilibrium point is E. The shaded areas PEFG is the total loss incurred by the firm in the short run.

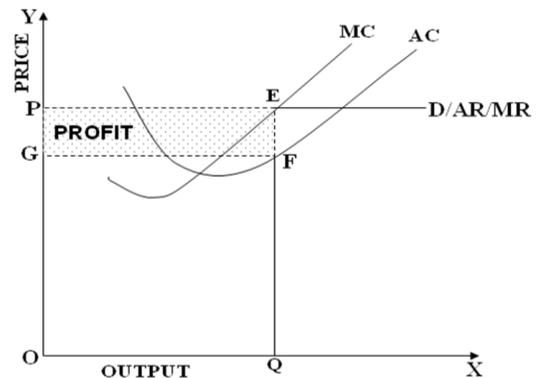


Fig. 14.3 Short Run Equilibrium with Profits

SHUT DOWN POINT:

In short run, the firm may continue its production to recover losses in long run. In short run, as we have discussed in cost concept, fixed cost is incurred even if the output is 0. Now, when the firm is incurring loss it may go on producing till the loss is less than or equal to total fixed cost. Then the firm may go on producing till the loss is less or equal to TFC. If the firm is able to cover its variable cost and part of fixed cost it will go on producing because if it stops, the firm has to incur the complete fixed cost as loss. There will be no variable cost, if there is no production; but, if the loss is more than fixed

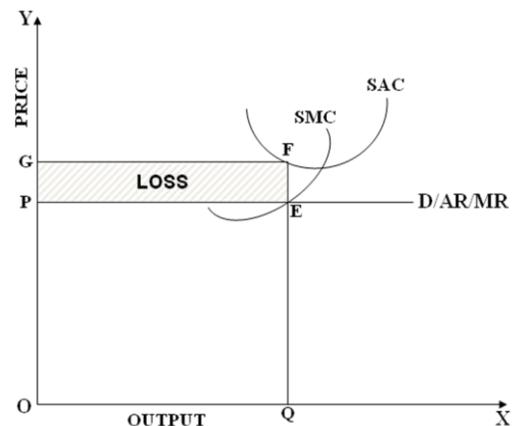


Fig. 14.4 Short Run Equilibrium with Loss

cost, the producer will decide to shut down. It is, thus, advisable to shut down and incur loss equal to fixed cost as there will be no variable cost when production is nil. This situation is explained further through the figure 14.5.

Suppose the price is OP, then the Total Revenue is OPEQ Total Variable Cost is OQHR, and the Total Fixed Cost is RHFS. With OP price we can see that the Total Revenue covers Variable Cost and part of Fixed Cost (PEHR that is part of Fixed Cost and complete Variable Cost ORHQ that the price OP covers). When price falls from OP to OP_1 , in this situation, the equilibrium point is E_1 and equilibrium output is OQ_1 . At price OP_1 , average variable cost, i.e. Q_1E_1 is fully recovered but the firm is not able to recover any part of fixed cost. Hence, in this situation it is advisable to shut down production because in either situation, i.e. production or no production, the total loss will be equal to total fixed cost.

LONG RUN EQUILIBRIUM:

It has been explained earlier that in the short run, the firm will keep on producing even when it is incurring loss provided the price is equal to or more than average variable cost. But in the long run, the firm, which is not even getting normal profit, will shut down. On the other hand due to entry of new firms in the industry competition will further intensify and ultimately the situation of super normal profit will disappear. Thus all firms will just earn normal profit in the long run. In brief following conditions will prevail in the market.

- (i) $MR = MC$
- (ii) $AR = AC$
- (iii) $MR = AR = MC = AC$

In the long run, as it is shown in the figure 14.6, the firm is in equilibrium at point E where $MR = MC$ and the firm is just earning normal profit only.

14.4 EQUILIBRIUM UNDER PURE MONOPOLY

A monopoly seller is the sole producer in the industry; he has total control over the price and production, so the average revenue curve will be sloping downwards. He can increase the price if

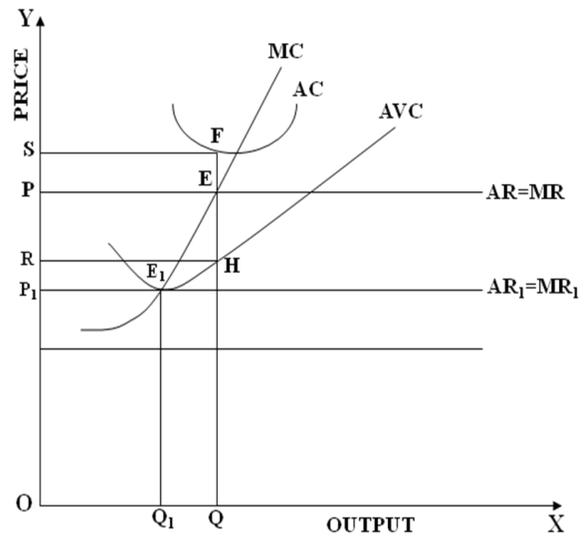


Fig. 14.5 Shut Down Point

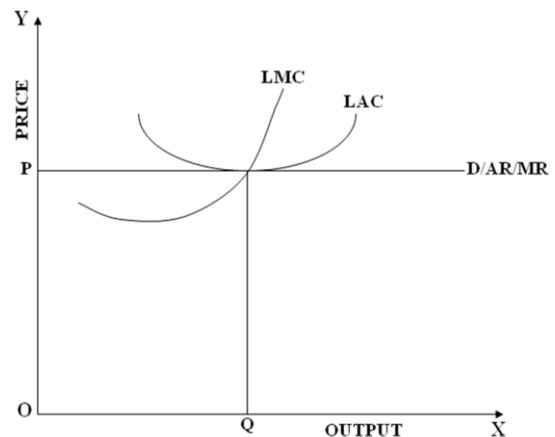


Fig. 14.6 : Showing Long-run equilibrium

he is ready to sacrifice the demand a little and can decrease the price if he wants the sales to increase.

Price output determination under monopoly is based on the following assumptions:

- (i) The monopolist charges uniform price in the whole market
- (ii) The monopolist follows the basic condition of equilibrium which means that he attains equilibrium output when $MR = MC$
- (iii) There is single firm in the industry hence, demand curve (AR curve) is identical both for the firm and industry.
- (vi) The demand curve of the monopolist slopes steeply downwards because he can not sell more without reducing price, despite having full control over the supply, with falling demand curve, the marginal revenue falls more rapidly. This situation is shown in the diagram given further.

In the figure 14.7, output is shown on X-axis and the price is shown on Y-axis. Demand curve, as we can see, is downwards sloping. It is further clear that MR is always lower than AR because increase in sales is not possible without reduction in price.

Price Output Equilibrium

Monopolist will always try to maximize profits. He will go on producing additional output as long as the MR is more than MC, because it is profitable for him to do so. His profit will be maximum when he produces an output where the $MR=MC$. If he produces output less than this, he will be foregoing the profit he could have otherwise earned. If he increases the output beyond the output where the $MR=MC$, the MR will be less than MC and he will incur loss on the additional unit produced.

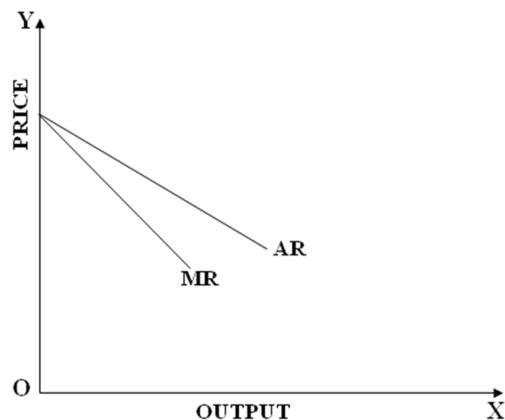


Fig. 14.7 Demand Curve under monopoly

Short Run Equilibrium (showing profit)

In the figure 14.8, X-axis shows output and Y-axis shows price. OQ is output produced, where the $MR=MC$. OP is the price, QE is the average cost and EF is the profit earned per unit. Profit per unit multiplied by OQ output makes the total profit equal to PFEG.

However, the monopolist may incur loss also in the short run when $AC > AR$. This situation will arise when the monopolist is forced to charge price below average cost due to the threat of the entry of potential competitors.

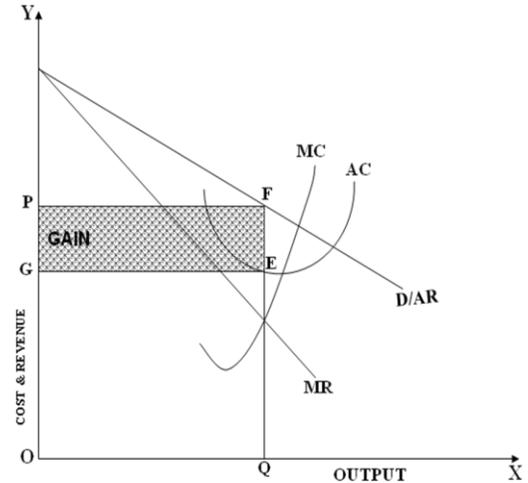


Fig. 14.8 Short run Equilibrium with profit

SHORT RUN EQUILIBRIUM WITH LOSS

In the figure 14.9, the seller is in equilibrium at OQ_1 output, with OP_1 or Q_1S price which is less than the average cost Q_1G . The seller incurs loss of P_1SGH , the shaded area. As the price OP_1 is higher than average variable cost, he will continue production.

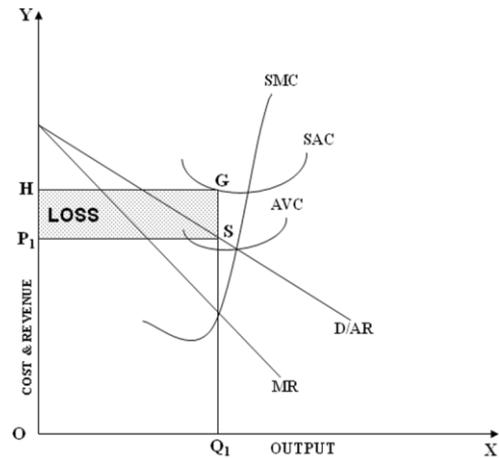


Fig. 14.9 Short run equilibrium with loss

Long Run Equilibrium

In the long run, the monopolist adjusts his supply to demand in such a way that he earns super normal profit at a point where $MR = MC$ but $AR > AC$. This situation is shown in the figure given further.

The long run equilibrium is at point E, where it produces output OQ. At this level of output $LCM = MR$ and price is OP and average cost is QK. Thus the monopolist is earning super normal profit equal to the area PTKL.

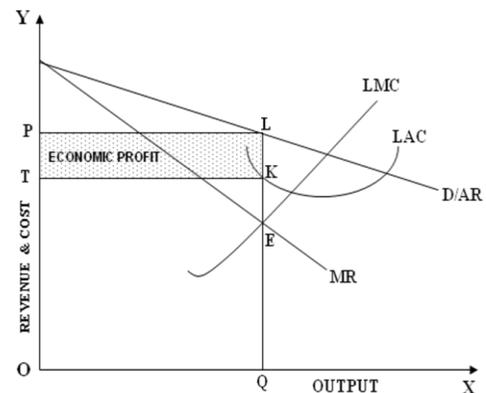


Figure 14.10

14.5 PRICE DISCRIMINATION

The monopoly seller has the advantage of price discrimination, as he is the only producer in the market. Price discrimination means charging different price from different buyer for the same product. Price discrimination can be practised when following conditions are fulfilled.

- (i) The price elasticity of demand must be different under both the markets. The monopolist will charge higher price in the market having less elasticity of demand and vice-versa. In other words, lower price will be charged where demand is relatively more elastic.
- (ii) There must be tight separation of markets so that there is no possibility of transfer of the goods from the low priced market to the buyers of the other market where price is higher.

Degrees of Price Discrimination

1. **First degree price discrimination** – It is also called perfect price discrimination, as it involves maximum exploitation of the consumer in the interest of the seller. It happens when the seller is able to sell each unit separately at a different price. Each buyer is made to pay the amount he is willing to pay rather going without it. In this case there is total exploitation of consumer and consumer surplus is zero.
2. **Second degree price discrimination** – It happens when the monopoly seller charge a separate price from different groups according to their price elasticity of demand. He will quote lower price in the market where the price elasticity of demand is relatively elastic, whereas he will charge high price at the market where the demand for his product is relatively inelastic.
3. **Third degree price discrimination** – When the seller divides the market into sub-markets and charge different price depending on the demand condition of that sub-market. The seller practising price discrimination between the domestic market and international market, will charge higher price in the domestic market, where he enjoys monopoly and charge low price in the international market, where he has to face more competition.

Equilibrium under Price Discrimination

Under price discriminating, the monopoly seller will charge different prices in different markets according to the elasticity of demand for the product.

The discrimination monopolist will attain the state of equilibrium by following the conditions described below :

- (i) He will try to attain equilibrium in each market by equating marginal revenue of each market with the corresponding marginal cost. In other words, marginal revenue equals marginal cost in each market.
- (ii) He will continue to shift goods from the market having lower marginal revenue to the other market having higher marginal revenue until the MR_1 becomes equal to MR_2 .

- (iii) He will also try to maximise his total profit by equating total marginal revenue of both market with the marginal cost of the product.
- (iv) He will charge less price and sell more quantity in the market where price elasticity of demand is relatively higher. Conversely he will charge higher price and sell less quantity in the market where price elasticity of demand is lower.

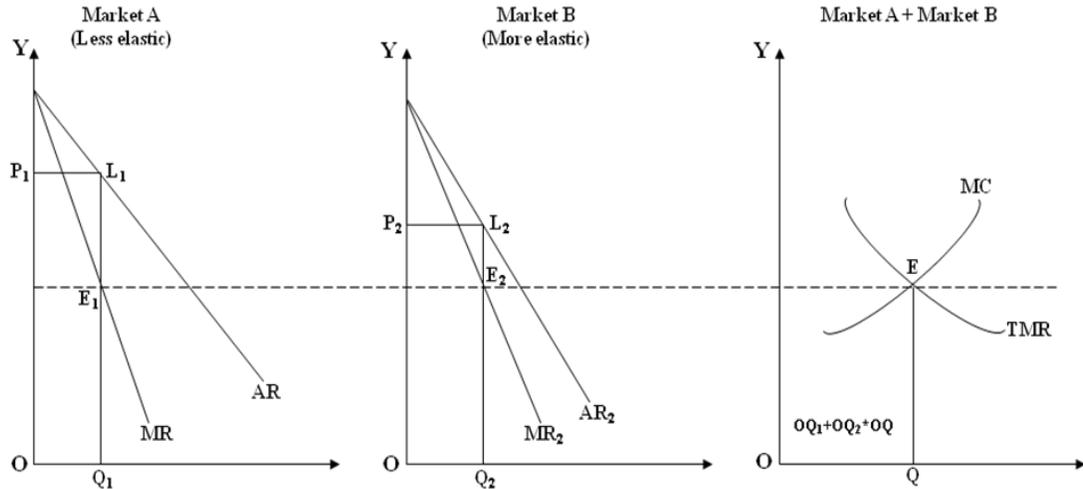


Figure 14.11

It is clear from the above figure that the total marginal revenue (TMR) is equal to total marginal cost when total output is OQ. The discriminating monopolist is selling OQ_1 and OQ_2 in Market A and Market B by charging OP_1 and OP_2 prices respectively. In both markets marginal revenue is equal to each other. Besides, the marginal revenue in both markets is also equal to marginal cost of the product. Price in market A, i.e. OP_1 is higher than the price in Market B which is equal to OP_2 . But quantity sold in market A is OQ_1 which is less than the quantity sold in market B which is OQ_2 because elasticity of demand in market A is less than that of market B.

14.6 MONOPSONY

While monopoly aims at maximum profit, monopsony aims at maximum consumer's surplus (consumer's surplus is the difference between the amount the consumer is ready to pay and the amount he actually pays). The equilibrium in Monopoly is when the $MR=MC$ whereas the equilibrium in Monopsony is when $MC=MU$ (marginal utility).

In the figure 14.12, supply curve of

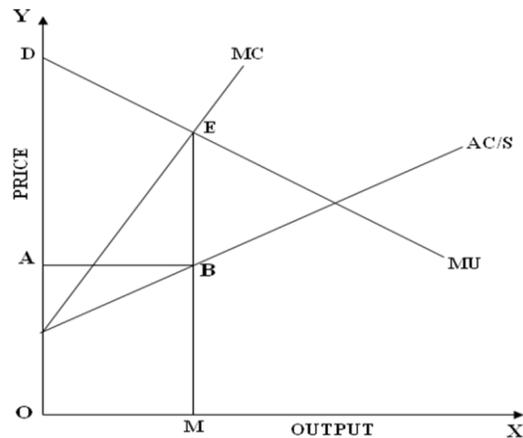


Fig. 14.12 Equilibrium in Monopsony

the industry is AC (average cost) curve. MU (marginal utility) of the Monopsonist. The Monopsonist will be in equilibrium at point E, where the $MU=MC$, he will buy output OM at OA price. The surplus obtained by the Monopsonist is the area DEBA (the difference between what he is willing to pay, ODEM and what he actually pays that is OABM).

14.7 BILATERAL MONOPOLY

Bilateral monopoly is a market condition in which both a monopolist (a single seller) and a monopsonist (a single buyer) operate. In such a market price and output are determined by forces like collective bargaining power of both the buyer and the seller. For example, when a labour union (a monopolist in the supply of labour forces a single large employer (a monopsonist) is to determine wage rate, it is a case of bilateral monopoly. This has been graphically expressed in the diagram given further:

Bilateral Monoply

Considering labour union as a seller of labour, industry demand for the labour is shown by the demand curve DD, the marginal revenue product of labour and MR is the MR curve relative to the labour demand curve. SS shows the supply function and the marginal expenditure for labour is shown by ME. The Monopolist will be in equilibrium at point E, where the $MR=MC$ and the profit will be maximized if he produces the output OM. The monopsonist will be in equilibrium at point B where the ME intersects D/MU; he buys OQ of the product (i.e. labour) at OP_2 or QA price (i.e. wage rate). Now there is a disagreement over the price between the single buyer and the single seller. The Monopolist wants to charge higher price of OP_1 whereas the Monopsonist wants a lower price of OP_2 . The actual quantity sold and the price will be decided by the bargaining power of the two parties. If the Monopsonist has greater bargaining strength, the price will settle down near OP_2 price and if the bargaining strength of the Monopolist is more than the price, he will tend to settle down near the OP_1 price. Thus, there will be a tendency of price to settle between OP_1 OP_2 in which a single seller faces a single buyer. For example, when in the factor market labour supply is controlled exclusively by the trade union and demand for labour is made by the single manufacturing firm representing the whole industry, it represents a typical case of bilateral monopoly.

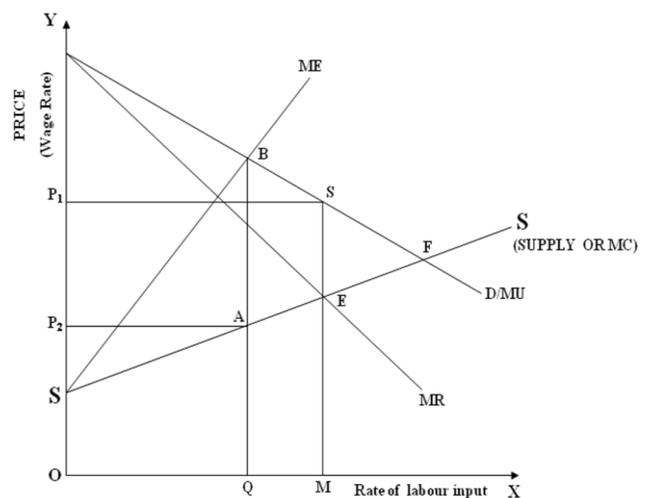


Figure 14.13 Showing Wage rate and employment determination for a bilateral monopoly

14.8 Monopolistic Competition

(a) Short Run Equilibrium (Profit)

Monopolistic competition is a condition in which many firms sell differential products which seem to be similar but are not perceived to be identical by a buyer. For example you, as a buyer, may find different brands of TV sets manufactured by many firms enjoying some control over the price they can charge for their products individually. It is to be noted that price variation is not too large. A very peculiar feature of this market is that the element of competitors is not limited to variation in price and volume but extends to various modes of promotion and distribution adopted by the firms to defeat their rivals. Besides, on account of high cross elasticities, a small increase in the price of a product, say wheel detergent, may push up the demand for Nirma detergent. Now it would be advisable for the producer of Wheel to change the strategy of advertisement and add new features to make the product more acceptable instead of resorting to price reduction. The most important characteristic of this market is the classification of buyers in two groups, first, tied buyers, who are loyal to a particular brand of the product; and the second, untied buyers, who do not have any preference for a given brand. As regards the former group of buyers the firm enjoys monopoly power while in case of the latter group, the firm faces tough competition. The crux of the marketing strategy of all the firms lies in the fact that they focus their attention on attracting the untied buyers as much as possible. Thus, the market situation is a mix of both monopoly and competitor. The figure given further exhibits the point of profit maximization in a firm facing monopolistic competition.

In the figure 14.14, the cost and demand condition shows that the firm will adjust its price and output at a level, where it earns maximum profit, when $MR=MC$. The firm produces output at price OP , At this point, the firm is in equilibrium at point E . The firm will earn profit of $PMSR$. This is the super normal profit earned by the firm.

(b) Short Run Equilibrium (Loss)

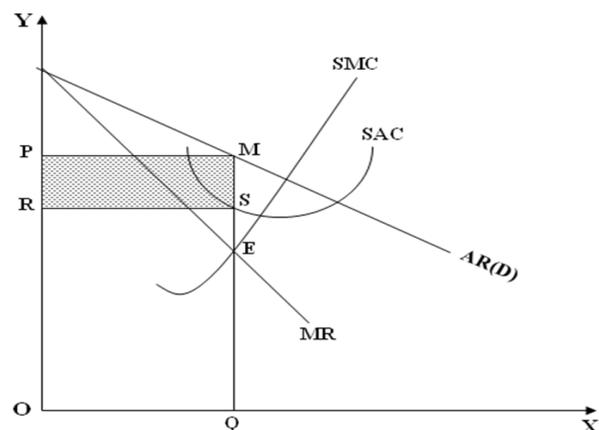


Figure 14.14 Profit Maximisation under Monopolistic Market Structure

You can see in the figure 14.15 which shows a situation in which a firm can incur losses in the short run.

Losses may be caused, when the demand conditions for its product are not favourable as compared to the cost condition. D is the demand curve and producing output ON at price OT, the cost incurred by the firm is OG. Therefore, the losses earned by the firm is GHKT.

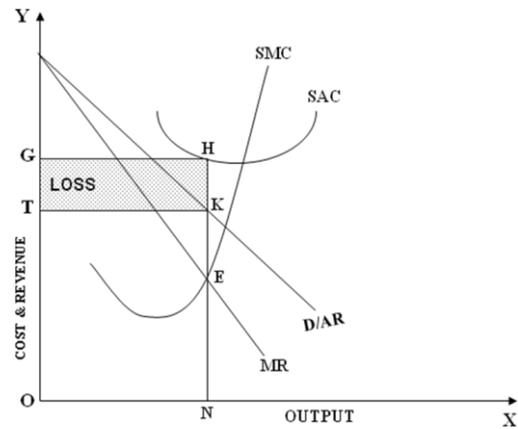


Figure 14.15 Short Run Equilibrium - Loss

(c) Long Run Equilibrium

Under monopolistic competition, there is free entry and exit, which means that the new producer can enter the industry and produce close substitute. When the firms enjoy super normal profit, the industry becomes attractive. Then new producers will enter the industry and the supply increases. This leads to decrease in the price. As a result, the supernormal profits are shared by the new firms and the all the firms start enjoying only normal profit. On the other hand, when the firms incur losses, firms incurring huge losses will shut down in the long run, and will quit the industry. As a result, the supply will decrease and the prices will go up and the existing firms will start enjoying normal profit. In brief, all firms just break-even in the long run.

You can observe from the figure 14.16, that AR curve is tangent LAC at point T. Therefore, the firm will be in equilibrium by producing output OQ, at price OK or QT, because AR=AC. At this point, the firms enjoy normal profits. When the firms are getting normal profits, there is no tendency for new entry and firms as a whole are in equilibrium.

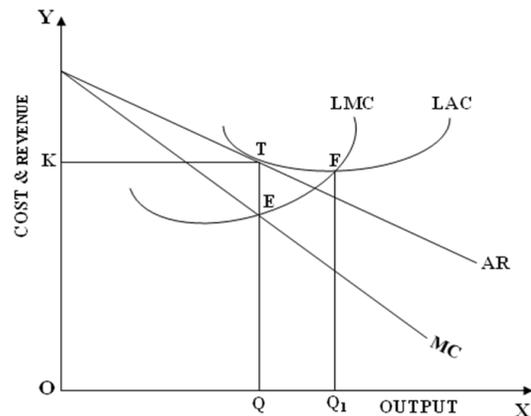


Figure 14.16 Long Run Equilibrium

Phenomenon of unutilized or excess Capacity

A close analysis of the equilibrium of a monopolistically competitive firm reveals that the firm never operates at its minimum average cost in the long run. It is clear from the above figure that Accrue is U-shaped and AR is falling at the point of equilibrium when MR = MC. Since in the case of normal profit, price or AR is equal to AC, a

Kinked Demand Curve

In oligopoly if the price tends to be sticky, there is a tendency for the oligopolist to make no change in the price even if the market conditions undergo changes. The oligopoly market structure faces a kinked demand curve, which means there is a kink at the prevailing price or where the price tends to be sticky.

In the figure 14.18, we can see a kink at point K. The upper segment of the demand curve is relatively elastic and the lower portion of the demand curve is relatively less elastic. A kinked demand curve dKD_1 has a kink at the point K at the price level OP and the firm is selling and producing Q output. The reason for the upper segment (dd_1) to be more elastic is if the firm increases

the price, it will be more than proportionate decrease in demand, as the other rivals will never ever follow the action of price rise as this action from any firm will be profitable for the rival firm. Thus, this part of demand curve is said to be elastic. On the other hand, the lower portion demand curve (DD_1) is less elastic because when a firm decreases the price, there will be less than proportionate increase in the demand, as the other rivals cannot stick to the same price and they are forced to reduce the price or else they lose all the customers. The slight increase in demand is only till the rivals notice

the decrease in price. Therefore, there is rigidity at the prevailing price level. This rigidity is because, in oligopoly there is no incentive either to raise the price or decrease it, as the demand will not rise due to the decrease and there may be tendency of price war. So the oligopolist will adhere to the prevailing price. As for the shape of marginal revenue curve, we can observe that corresponding to the DD_1 curve, we have DMR as MR curve while corresponding to the dd_1 , the MR curve will be in the form of dK , but the demand curve has a kink at K, therefore, if the price is lower than OP it will be on the MR curve relevant to the more elastic portion i.e. dC . The MR curve is thus $dc...FMR$. This discontinuity is as large as the vertical distance of CF. Thus MC could be anywhere between C and F, and the firm will need not change the price or quantity of the product. In the nutshell, therefore, at any point the gap between dC and FMR, MC can cut MR and thus the firm can continue with the current price until this gap is disturbed.

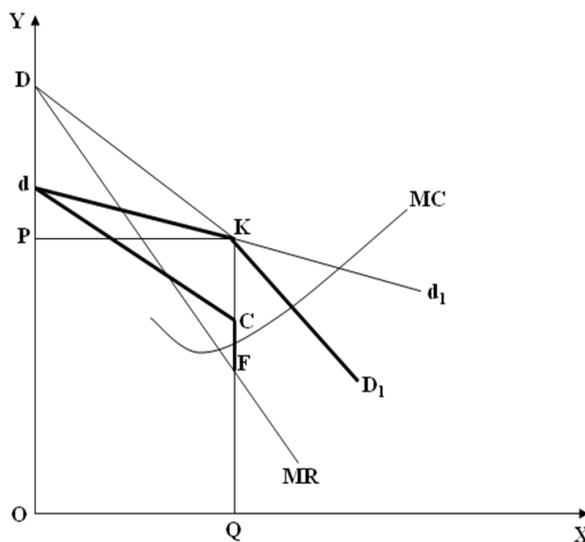


Figure 14.18 Kinked Demand Curve

14.10 SUMMARY

The pricing policy, conduct of the seller and buyer, marketing strategy etc are decided by the type of market structure the manager is working in. Any market structure is characterized by four basic characteristics: number and size distribution of buyer, ease of entry and exit, product differentiation and number and size distribution of seller. In Perfect competition, the demand curve is horizontal line and the equilibrium is at point where the marginal revenue and marginal cost is equal. The products sold in the market are homogenous, they are price taker and output adjuster and there is free entry and exit in Perfect competition, that is, all the firms will enjoy only normal profit, there are no super normal profit and huge losses.

Monopoly market structure is a market structure, where there is one seller or producer. There are no close substitutes available in the market and there are barriers in the entry and exit from the industry. The sellers enjoy price discrimination, as the seller will charge different price to different buyer of the same product. The demand curve in monopoly is downwards sloping as the Monopoly seller is the price maker and can restrict the output to increase the price.

Monopsony is the market situation, when there is Monopoly element in case of buyer. This is the situation where there is only one buyer; the equilibrium is when the marginal utility is equal to marginal cost. Monopsony buyer has influence on the price of his purchase by the amount he buys.

Bilateral Monopoly is when one buyer meets one seller. The buyer will try to reach equilibrium only when marginal cost is equal to marginal revenue and the seller will try to reach equilibrium when marginal utility is equal to marginal cost. When the two of them merge, they bargain and settle down at a price between the price of Monopsony buyer and monopoly seller. The Monopsony buyer will try to reduce the price and monopoly seller will try to increase the price.

Monopolistic market structure exists when there are large number of buyers and sellers, sellers selling close substitutes, there are free entry and exist condition The firm incurring losses can leave the industry and any firm can enter the industry and start producing. Advertisement cost and selling cost are very important in the Monopolistic competition. Product differentiation is important in this type of market structure.

In Oligopoly market structure, there are competitions between a few sellers, who are producing close substitutes; there is a lot of interdependence among the sellers. Any action regarding price leads to reaction by the rivals. There is a tendency of price war, as reduction in price is followed, but increase in price is not followed. Advertisement and selling cost is very important in Oligopoly competition. Collusive oligopoly is when the sellers come together and try to have competition on non price bases; there are cartels and price leadership.

14.11 GLOSSARY

- **Perfect competition**-a market structure where there are many buyers and sellers, homogenous product, free entry and exit and complete information about the market.
- **Monopoly**-a market structure with only one seller, no close substitutes and restriction on the entry and exit.
- **Monopolistic competition**-a market structure with many buyers and sellers, sellers selling close substitutes and free entry and exit.
- **Oligopoly**-competition between a few sellers, interdependence between the sellers selling close substitutes.
- **Monopsony**-when there is only one buyer and tries to reach equilibrium by equating marginal utility with marginal cost.
- **Bilateral monopoly**- when the single producer meets single buyer. monopoly element in seller and buyer.
- **Kinked demand curve**-a demand curve which explains the stability of oligopoly pricing, the upper portion of the demand curve is elastic and the lower portion is inelastic.
- **Shut down price**- the price at which the firm decides to stop the production, because the market price is not even able to cover the minimum variable cost.
- **Product differentiation**-the efforts by the firms to convince the customers that their products are different and better from of other firms in the industry.
- **Price discrimination**-charging different prices from different buyers for the same product.

14.12 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- (i) In case of perfect competition, if a firm increases its price, it would result in an in its demand.
- (ii) A firm applies a shut down when its exceed fixed cost.
- (iii) A monopolist will charge higher price and sell less quantity in the market where price elasticity is
- (iv) _____ is the market situation, when there is Monopoly element in case of buyer.
- (v) _____ Monopoly is when one buyer meets one seller.
- (vi) _____ and _____ costs are very important in the Monopolistic competition.

(B) State whether the following statements are true or false:

- (i) Supernormal profit occurs when AR is equal to AC.
- (ii) A monopolist will continue producing until MR becomes equal to MC.

- (iii) A monopolist's gain is equal to the excess of what he is willing to pay and what he actually pays.
- (iv) Product differentiation is a form of price discrimination.
- (v) Kinked demand curve suggests that when one seller increases or decreases his price, others follow.
- (vi) In case of untied buyers, a firm operating under monopolistic competition, faces tough competition.

14.13 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Infinite (ii) Losses (iii) lower (iv) Monopsony (v) Bilateral (vi) Selling, Advertisement
- (B) (i) False (ii) True (iii) True (iv) False (v) False (vi) True

14.14 TERMINAL QUESTIONS

- (1) Explain with diagrams price determination in perfect competition.
- (2) How does a monopolist fix his price and output?
- (3) Explain the shutdown point of a firm.
- (4) Define monopolistic competition and discuss the behaviour of a firm operating under it.
- (5) Write short notes on:
 - (a) Price leadership
 - (b) Product differentiation

14.15 SUGGESTED READINGS

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Unit 15- STRATEGY AND GAME THEORY

Structure

- 15.1 Introduction
- 15.2 Competitive Games and Strategies
- 15.3 Maximin – Minimax Principle and Saddle Point
- 15.4 Dominance
- 15.5 Graphical Method
- 15.6 Summary
- 15.7 Glossary
- 15.8 Check Your Progress
- 15.9 Answers to check your progress
- 15.10 Terminal Questions
- 15.11 Suggested Readings

OBJECTIVES

At the end of this unit, you should be able to:

- Apply theory of game in any Management related projects.
- Learn a mathematical model of a competitive game
- Know the principle of dominance
- Learn graphical method to solve game problems
- Find the solution of a game with and without saddle point.

15.1 INTRODUCTION

It was in 1928 when John Von Neumann (called the father of game theory) developed the theory of games. However, it was only after 1944, when von Neumann and Morgenstren published their now well known ‘Theory of Games and Economic Behavior’ that the theory received the proper attention. The theory of games (or game theory) deals with mathematical analysis of competitive problems and is based on the Minimax principle or Rule put forward by von Neumann which implies that each competitor will act no as to minimize his maximum loss (or maximize his minimum gain).

Everyone is interested in games and in learning how to win. Therefore, the game theory has received considerable popular attention. However, so far only simple competitive problems have been analyzed by this mathematical theory. This theory does not describe how a game should be played, it describes only the procedure and principles by which plays should be selected. Therefore, it is a decision theory applicable to competitive situations.

15.2 COMPETITIVE GAMES AND STRATEGIES

Definition:

A competitive situation will be called a *competitive game* if it has the following six properties:

- (i) There are finite numbers of participants. The number of participants is $n \geq 2$. If $n = 2$, the game is called a two-person game; if $n > 2$, it is called n-person game.
- (ii) Each participant has a finite number of possible courses of action.
- (iii) Each participant must know all the courses of action available to others but must not know which of these will be chosen.
- (iv) A play of the game is said to occur when each player chooses one of his courses of action. The choices are assumed to be made simultaneously, so that no participant knows the choice of other until he has decided his own.
- (v) After all participants have chosen a course of action, their respective gains are finite.
- (vi) The gain of the participant depends upon his own actions as well as those of others.

In the present discussion only games which involve competition, actions and counteractions will be dealt with. Henceforth, the simple term game will be used in place of competitive games.

(a) Important Terms:

- (i) Each participant (interested party) is called a *player*.
- (ii) A *play* of the game results when each player has chosen a course of action. After each play of the game, one player pays the other an amount determined by the courses of action chosen.
- (iii) The decision rule by which a player determines his course of action is called a *strategy*. To reach the decision regarding which strategy to use, neither player needs to know the other's strategy.
- (iv) If a player decides to use only one particular course of action during every play, he is said to use a *pure strategy*. A pure strategy is usually represented by a number with which the course of action is associated.
- (v) If a player decides in advance, to use all or some of his available courses of action in some fixed proportion, he is said to use *mixed strategy*. Thus a mixed strategy is a selection among pure strategies with some fixed probabilities (proportions).
- (vi) A game with two players, where a gain of one player equals the loss to the other is known as a *two-person zero-sum game*. In such a game interests of the two players are opposed so that the sum of their net gains are (sum of the game is) zero. If there are n players and sum of the game is zero, it is called n-person zero-sum game.

(Two-person zero-sum games are also called *rectangular games* because their payoff matrix is in the rectangular form. In this unit, we are primarily concerned with two-person zero-sum games only).

A *payoff* is the outcome of playing the game. A payoff (gain or game) matrix is a table showing the amounts received by the player named at the left hand side after all possible plays of the game. The payment is made by the player named at the top of the table.

(b) Characteristics of Two-person-zero-sum game:

- (a) Only two players participate.
- (b) Each payer has finite number of strategies to use.
- (c) Each specific strategy results in a payoff.
- (d) Total payoff to the two players at the end of each play is zero.

A competitive game has the following characteristics.

1. The number of players (competitors) is finite.
2. Each player has finite number of courses of action (moves).
3. The game is said to be played when each player adopts one of his course of action.
4. Every time the game is played, the corresponding combination of courses of action leads to a transaction (payment) to each player. The payment is called pay-off (gain). The pay-off may be monetary (money) or some such benefit as increased sales, etc.
5. The players do not communicate to each other.
6. The players know the rules of the game before starting.

(c) Construction of Payoff Matrix:

Step (i): Row designations for each matrix are the courses of action available to A.

Step (ii): Column designations for each matrix are the courses of action available to B.

Step (iii): With a two-person zero-sum game, the cell entries in B's payoff matrix will be the negative of the corresponding entries in A's payoff matrix and the matrices will appear as follows:

Table 15.1

A's Pay-Off Matrix
Player B

		1	2	3	...	j...	n
Player A	1	a_{11}	a_{12}	a_{13}	...	$a_{1j...}$	a_{1n}
	2	a_{21}	a_{22}	a_{23}	...	$a_{2j...}$	a_{2n}
	3	a_{31}	a_{32}	a_{33}	...	$a_{3j...}$	a_{3n}

	i	a_{i1}	a_{i2}	a_{i3}	...	$a_{ij...}$	a_{in}

	m	a_{m1}	a_{m2}	a_{m3}	...	$a_{mj...}$	a_{mn}

Table 15.2

B's Pay-Off Matrix
Player B

		1	2	3	...	j ...	n
Player A	1	a_{11}	a_{12}	a_{13}	...	$a_{1j...}$	a_{1n}
	2	a_{21}	a_{22}	a_{23}	...	$a_{2j...}$	a_{2n}
	3	a_{31}	a_{32}	a_{33}	...	$a_{3j...}$	a_{3n}

	i	a_{i1}	a_{i2}	a_{i3}	...	$a_{ij...}$	a_{in}

	m	a_{m1}	a_{m2}	a_{m3}	...	$a_{mj...}$	a_{mn}

Observations:

- (i) The sum of payoff matrices for A and B is a null matrix.
- (ii) The objective is to determine the optimum strategies of both the players that result in optimum payoff to each, irrespective of the strategy used by the other.
- (iii) We shall usually omit B's payoff matrix, keeping in mind that it is just the

negative of A's payoff matrix.

(iv) The game value is the average winnings per play over a long number of plays.

Example:

Consider the following game, where competitors A and B are assumed to be equal in ability and intelligence. A has a choice of strategy 1 or strategy 2, while B can select strategy 3 or 4.

Table 15.3

		Competitor B		Minimum of row
		Strategy 3	Strategy 4	
Competitor A	Strategy 1	<div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center;">+4</div>	<div style="border: 1px solid black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center;">+6</div>	4
	Strategy 2	<div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center;">+3</div>	+5	3
Maximum of column		4	6	

The various possible strategies for the two competitors are

- (1) A wins the highest game value if he plays strategy I all the time since it has higher values than strategy 2.
- (2) B realizes this situation and plays strategy 3 in order to minimize his losses since the value of 4 in strategy 3 is lower than the value of 6 in strategy 4.

The game value must be 4 since A wins 4 points while B loses 4 points each time the game is played.

15.3 MAXIMIN – MINIMAX PRINCIPLE AND SADDLE POINT

Suppose player A and player B are to play a game without knowing what the other player would do. However, player A would like to maximize his profit and player B would like to minimize his loss. And thus, each player would expect his opponent to be calculative.

Suppose player A plays A₁. Then, his gain would be a₁₁, a₁₂, ... a_{1n} according as B's choice is B₁, B₂, ... B_n. Let Δ₁ = min {a₁₁, a₁₂, ... a_{1n}}. Then, □₁ is the minimum gain of A when he plays A₁. (Here, □₁ is the minimum pay-off in the first row.) Similarly, if A plays A₂, his minimum gain is □₂ which is the least pay-off in the second row. Thus proceeding, we find that corresponding to A's play A₁, A₂, A_m, the minimum gains are the row minimums □₁, □₂, □_m. Suppose A chooses that course of which α_i is maximum. This **maxi-mum of the row minimum in the pay-off**

matrix is called maxi-min. The maxi-min is $\alpha = \min_i \left\{ \max_j (a_{ij}) \right\}$

Similarly, by taking the minimum of the column maximums in the pay-off matrix is called mini-max.

The mini-max is $\beta = \min_j \left\{ \max_i (a_{ij}) \right\}$

Definition

For any game, if the maxi-min and the mini-max are equal, then such games are said to have a **saddle point**.

Note

- (i) If a game has saddle point, and if (r, s) is the saddle point, suggested solution to both the players is pure strategy. For player A, the suggested solution is A_r . For player B, the suggested solution is B_s .
- (ii) If a game does not have saddle point, the suggested solution is mixed strategy.
- (iii) A game is said to be fair if its value is zero.
- (iv) In a two-person zero-sum game, if the maximin and the minimax are equal, we say that the game has saddle point.
- (v) Saddle point is the position where the maximin (maximum of the row
- (vi) Minimums and minimax (minimum of the column maximums) coincide.
- (vii) If the maximin occurs in the r^{th} row and if the minimax occurs in the s^{th} column, the position (r, s) is the saddle point. Here, $v = a_{rs}$ is the common value of the maximin and the minimax. It is called the value of the game.
- (viii) The value of a game is the expected gain of player A when both the players adopt optimal strategy.

Note 1: If a game has saddle point and if (r, s) is the saddle point, suggested solution to both the players is pure strategy. For player A, the suggested solution is A_r . For player B, the suggested solution is B_s .

Note 2: If a game does not have saddle point, the suggested solution is mixed strategy.

Note 3: A game is said to be fair if its value is zero.

Solution to a Game with Saddle Point

Consider a two-person zero-sum game with players A and B . Let A_1, A_2, \dots, A_m be the courses of action for player A . Let B_1, B_2, \dots, B_n be the courses of action for player B .

The saddle point of the game is found as follows.

1. The minimum pay-off in each row of the pay-off matrix is circled (marked with)
2. The maximum pay-off in each column is boxed (marked with)
3. In the above process, if any pay-off is circled as well as boxed, that pay-off is the value of the game. The corresponding position is the saddle point.

Let (r, s) be the saddle point. Then, the suggested pure strategy for player A is A_r . The suggested pure strategy for player B is B_s . The value of the game is a_{rs} .

Note: However, in the above procedure, if none of the pay-off is circled as well as boxed, the game does not have saddle point. And so, the suggested solution for the players is mixed strategy.

Steps to detect a Saddle Point

Step (1): At the right of each row, write the row minimum and ring the largest of them.

Step (2): At the bottom of each column, write the column maximum and ring the smallest of them.

Step (3): If these two elements are same, the cell where the corresponding row and column meet is a saddle point and the element in that cell is the value of the game.

Step (4): If the two ringed elements are unequal, there is no saddle point, and the value of the game lies between these two values.

Step (5): If there are more than one saddle points then there will be more than one solution, each solution corresponding to each saddle point.

Example: (Two-Person Zero-Sum Game with Saddle Point):

In a certain game, player A has three possible choices L, M and N, while player B has two, possible choices P and Q. Payments are to be made according to the choices made.

Table 15.4

Choices	Payment
L, P	A pays B Rs. 3
L, Q	B pays A Rs. 2
M, P	A pays B Rs. 2
M, Q	B pays A Rs. 4
N, P	B pays A Rs. 2
N, Q	B pays A Rs. 3

What are the best strategies for players A and B in this game? What is the value of the game for A and B?

Solution:

The above payments can be easily arranged in the form of a matrix. Let positive number represent a payment from B to A and negative number a payment from A to B. Now we have the payoff matrix shown in table below.

When player A plays his first strategy (namely L), he may gain -3 or 3 depending upon player B's selected strategy. He can guarantee, however, a gain of at least $\min(-3, 3) = -3$ regardless of B's selected strategy. Similarly, if A plays his second strategy (namely M), he guarantees an income of at least $\min(-2, 4) = -2$; if he plays his third

strategy (namely N) he guarantees an income of at least $\min(2, 3) = 2$. Thus the minimum value in each row represents the minimum gain guaranteed to A, if he plays his pure (grand) strategies.

These values are indicated in the matrix under ‘Minimum of row’.

Now, player A, by selecting his third strategy (N), is maximizing his minimum gain.

This gain is given by $\max. \{-3, -2, 2\} = 2$. This selection of player A is called the maxi-min strategy and his corresponding gain is called the maxi-min or lower value of the game.

Table 15.5

		Player B		
		Plans (choices)		
Plans Player A (choices)		P	Q	Minimum of row
	L	-3	3	-3
	M	-2	4	-2
N	2	3	(2) maximum	
Maximum of column		2	4	
		minimax		

Similar way we can find mini-max corresponding to the Player B, who wishes to minimize his losses (shown in the table).

Therefore, in this game, mini-max value = maxi-min value = 2. The value of the game is thus equal to 2. The game has a saddle point given by the entry (N, P) of the matrix.

As the game value is 2, (and not zero), the game is not fair.

Examples:

Find the saddle point if they exists, game value and optimum strategies.

(a) $\begin{bmatrix} -4 & 3 \\ -3 & -7 \end{bmatrix}$, (b) $\begin{bmatrix} 3 & 2 \\ -2 & -3 \\ -4 & -5 \end{bmatrix}$, (c) $\begin{bmatrix} 1 & 13 & 11 \\ -9 & 5 & -11 \\ 0 & -3 & 13 \end{bmatrix}$, and

(d) $\begin{bmatrix} 16 & 4 & 0 & 14 & -2 \\ 10 & 8 & 6 & 10 & 12 \\ 2 & 6 & 4 & 8 & 14 \\ 8 & 10 & 2 & 2 & 0 \end{bmatrix}$

Solution: For all the matrices the rows stands for strategies for the player A and the columns stands for the strategies for the player B.

In (i) the player A and B has 2 strategies each. Since there is no element which is both the lowest in its row and highest in its column, no saddle point exists here.

In (ii), Row min: 2, -3, -5;

Column max: 3, 2.

Maxi-min = $\max \{2, -3, -5\} = 2$, and mini-max = $\min \{3, 2\} = 2$. This corresponds to the strategies A, row 1 and B, column 2. Therefore, the saddle point is (1, 2). Game value is 2.

(iii) For row minimum, we get, $\max\text{-min} = \max \{1, -11, -3\} = 1$, and for column maximum, $\min\text{-max} = \min \{1, 13, 13\} = 1$. Therefore, the strategies are A, row 1 and B, column 1. The saddle point is (1, 1). The game value is 1.

(iv) Saddle point (2, 3), strategies: A, row 2; and B, column 3; game value: + 6.

Example

Find the ranges of values of p and q which will render the entry (2, 2) a saddle point for the game.

Table 15.6

Player B			
	2	4	5
Player A	10	7	q
	4	p	6

Solution: First ignoring the values of p and q determine the maxi-min and mini-max values of payoff matrix as follows:

Table 15.7

	B ₁	B ₂	B ₃	Row minima
A ₁	2	4	5	2
A ₂	10	7	q	7
A ₃	4	p	6	4
Column maxima	10	7	6	

Therefore Maxi-min = 7 and mini-max = 7. This imposes the condition on p as $p \leq 7$ and on q as $q \geq 7$.

Therefore, the range of p and q will be $p \leq 7$ and $q \geq 7$.

15.4 DOMINANCE

Definition:

- (i) **The dominance rule for columns:** Every value in the dominating column(s) must be less than or equal to the corresponding value of the dominated column.

- (ii) **The dominance rule for row:** Every value in the dominating row(s) must be greater than or equal to the corresponding value of the dominated row.
- (iii) **The dominance rule for average value of columns:** If the average values of elements of two columns are equal to or less than the corresponding values of the element of third column, then the third column can be deleted.
- (iv) **The dominance rule for average value of Row :** If the average values of elements of two rows are equal to or more than the corresponding values of the element of a third row, then the third row can be deleted.

Example: (3×3 Game, Matrix Reduction by Dominance):

Two players P and Q play a game. Each of them has to choose one of the three colors, white (W), black (B) and Red (R) independently of the other Thereafter the colors are compared. If both P and Q have chosen white (W, W), neither wins anything. If player P selects white and player Q black (W, B) player P loses Rs. 2 or player Q wins the same amount and so on. The complete payoff table is shown below. Find the optimum strategies for P and Q and the value of the game.

Table 15.8

		Color chosen by Q		
		W	B	R
Color chosen by P	W	0	-2	7
	B	2	5	6
	R	3	-3	8

Solution: This matrix has no saddle point. Evidently, player Q will not play strategy R since this will result in heaviest losses to him and highest gains to player P. He can do better by playing columns W or B. Thus, column R is to be deleted (here strategy R is called dominated strategy).

Table 15.9

		Q	
		W	B
P	W	0	-2
	B	2	5
	R	3	-3

From the above table, it is clear that player P will not play row W, since it will give him returns lower than given by row B. Hence row W is dominated by row B and can be deleted

Table 15.10

		Q	
		W	B
P	B	2	5
	R	3	-3

The above reduced game can be solved using the following arithmetic method.

Note: (i) Always look for dominance when solving a game.

(ii) In cases where there is no saddle point and dominance has been used to reduce the game matrix, players will resort to mixed strategies. A few different methods will be described to optimize the winning of each player and to solve the game. One of the players must determine what proportion of time to play each row while the other must know what portion of the time to play each column. The payoffs obtained will be the expected payoffs and the value of the game will be the expected value of the game.

Arithmetic Method for Finding Optimum Strategies and Game Value:

It provides an easy method for finding the optimum strategies for each player in a 2×2 game. It consists of the following steps

Step (i): Subtract the two digits in column 1 and write them under column 2, ignoring sign.

Step (ii): Subtract the two digits in column 2 and write them under column 1, ignoring sign.

Step (iii): Similarly proceed for the two rows.

These values are called oddments

Example

In a game of matching coins, player A wins Rs. 2 if there are two heads, wins nothing if there are two tails and loses Re. 1 when there are one head and one tail. Determine the payoff matrix, best strategies for each player and the value of game to A.

Solution:

The payoff matrix for A will be

Table 15.11

		Player B	
		H	T
Player A	H	2	-1
	T	-1	0

Since there is no saddle point, the optimal strategies will be mixed strategies. Using the steps described above we get

Table 15.12

		Player B		
		H	T	
Player A	H	2	-1	1 $\frac{1}{1+3} = \frac{1}{4} = 0.25$
	T	-1	0	3 $\frac{3}{1+3} = \frac{3}{4} = 0.75$
		1 $\frac{1}{1+3}$ = 0.25	3 $\frac{3}{1+3}$ = 0.75	

Thus for optimum gains, player A should use strategy H for 25% of the time and strategy T for 75% of the time, while player B should use strategy H 25% of the time and strategy T 75% of the time.

To obtain the value of the game any of the following expressions may be used:

Using A’s oddments:

B plays H; the value of the game: $V = \text{Rs. } \left(\frac{1 \times 2 - 3 \times 1}{3 + 1} \right) = \text{Rs. } (-1/4).$

B plays T; the value of the game, $V = \left(\frac{1 \times -1 + 3 \times 0}{3 + 1} \right) = \text{Rs. } (-1/4).$

Similarly, we

A plays H; value of the game $V = \left(\frac{1 \times 2 - 1 \times 3}{3 + 1} \right) = \text{Rs. } (-1/4).$

A plays T; value of the game $V = \left(\frac{-1 \times 1 + 0 \times 3}{1 + 3} \right) = \text{Rs. } (-1/4).$

This is the value of the game to A, that is, A gains Rs. (-1/4), that is, he loses Rs. 1/4 which B, in turn, gets. Arithmetic method is easier than algebraic method but it cannot be applied to larger games.

Example

Reduce the following game by dominance and find the game value:

Table 15.13

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0

	IV	0	4	0	8
--	----	---	---	---	---

Solution: This matrix has no saddle point. We reduce the size of the matrix by the principle of dominance.

From player's A's point of view, row I is dominated by row III. Therefore, row I is deleted and the reduced matrix is

Table 15.14

		Player B			
Player A		I	II	III	IV
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

From B's point of view, column I is dominated by III. Therefore, column I is deleted and so the matrix becomes

Table 15.15

	II	III	IV
II	4	2	4
III	2	4	0
IV	4	0	8

In the above matrix no single row (or column) dominates another row (column). But column II is dominated by the average of column III and IV which is

$$\left[\begin{array}{c} \frac{2+4}{2} \\ \frac{4+0}{2} \end{array} \right] = \left[\begin{array}{c} 3 \\ 2 \end{array} \right]$$

Hence column II is deleted. Therefore, the reduced matrix is

Table 15.16

	III	IV
II	2	4
III	4	0
IV	0	8

Again, row II is dominated by the average of III and IV rows, which gives

$\left(\frac{4+0}{2}, \frac{0+8}{2}\right) = (2,4)$. Therefore, row II is deleted and 2×2 matrix results.

Table 15.17

	III	IV
III	4	0
IV	0	8

The above 2×2 matrix has no saddle point. It can be solved by the arithmetic method.

Table 15.18

Player B				
		III	IV	
Player A	III	4	0	8 2/3
	IV	0	8	4 1/3
		8 2/3	4 1/3	

Therefore, the complete solution to the given problem is

Optimal strategy for player A: $(0, 0, 2/3, 1/3)$.

Optimal strategy for player B: $(0, 0, 2/3, 1/3)$.

The value of the game is (for A) $= \left(\frac{8 \times 4 + 0 \times 4}{8 + 4}\right) = 8/3$.

Problem:

Reduce the following game by dominance and solve it.

Table 15.19

Player B						
		1	2	3	4	5
Player A	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1

Solution: Here row IV is dominated by row III. Delete row IV we get

Table 15.20

		Player B				
Player A		1	2	3	4	5
	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5

Now column 4 is dominated by column 1 and 2, also column 5 is dominated by column 2. Therefore, delete column 4 and 5 we have

Table 15.21

	1	2	3
I	1	3	2
II	3	4	1
III	6	5	7

In the above matrix row I as well as II are dominated by row III. Therefore, we delete rows I and II and get

Table 15.22

	1	2	3
III	6	5	7

Out of three strategies available to player B, he will use strategy 2 (column 2) in order to minimize his losses. Therefore, the solution to the problem is,

Optimal strategy for A: III

Optimal strategy for B: 2

Game value is (for A): 5.

15.5 GRAPHIC METHOD FOR $2 \times n$ OR $m \times 2$ GAMES

We assume that x represents the fraction of time (frequency) for which player uses strategy 1 and $(1-x)$ represents the fraction of time (frequency) for which he uses strategy 2. Similarly, y and $(1-y)$ represent the fraction of time for which player B uses strategies 1 and 2 respectively.

Graphic method is applicable to only those games in which one of the players has two strategies only. The advantage of this method is that it is relatively fast. Consider the following $2 \times n$ game:

Table 15.23

		Player B			
		y₁	y₂	...	y_n
Player A	x₁	a₁₁	a₁₂	...	a_{1n}
	x₂ = 1 - x₁	a₂₁	a₂₂	...	a_{2n}

It is assumed that the game has no saddle point.

Player A has two strategies x_1 and $x_2 (= 1-x_1)$, where $x_1 \geq 0, x_2 \geq 0$.

Expected payoffs for A corresponding to the pure strategies of B are given below.

Table 15.24

B's pure strategies	A's expected payoff
1	$a_{11}x_1 + a_{21}(1 - x_1) = (a_{11} - a_{21})x_1 + a_{21}$
2	$a_{12}x_1 + a_{22}(1 - x_1) = (a_{12} - a_{22})x_1 + a_{22}$
.	
.	
.	
n	$a_{1n}x_1 + a_{2n}(1 - x_1) = (a_{1n} - a_{2n})x_1 + a_{2n}$

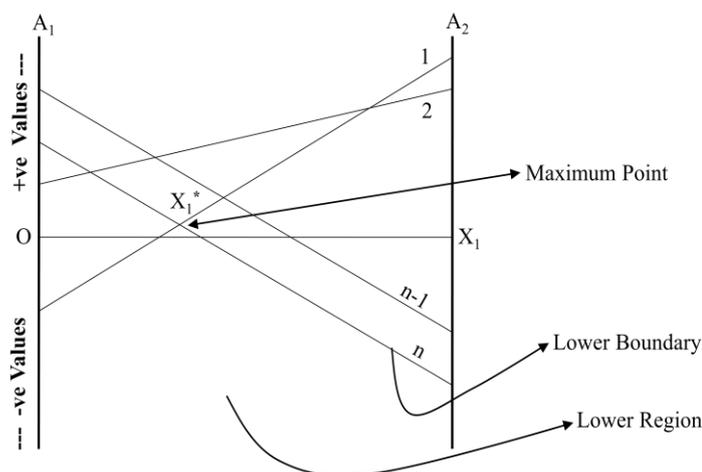
Thus A's expected payoff varies linearly with x_1 . Now, according to the maxi-min criterion for mixed strategies, A should select that value of x_1 which maximizes his minimum expected payoff. This may be done by plotting the above lines as a function of x_1 . This is shown in figure. A number is allotted, to each line corresponding to B's pure strategy.

The lower boundary of these lines (shown by heavy lines) gives the minimum expected payoff to A as a function of x_1 .

The highest point on this lower boundary (shown by a dot), then gives the maxi-min expected payoff to A and hence the optimum value $x_1 = (x_1^*)$.

The two optimum strategies for B are given by the two lines which pass through this maxi-min point. Thus the $2 \times n$ game is reduced to 2×2 game which can be easily solved by the methods already described.

The importance of the maxi-min point is that it is the highest level, on the average, at which B can hold A's winnings.



Graph 15.1

Similarly, it is the level at which A can hold B to minimize his losses. In other words, it just indicates how far one player can go before he is restrained by his opponent's defensive strategy. It is the average payoff around which the game revolves.

Example:

Solve the game given in table by graphic method.

Table 15.25

		B			
		y1	y2	y3	y4
A	x1	19	6	7	5
	x2	7	3	14	6
	x3	12	8	18	4
	x4	8	7	13	-1

Solution:

Step (i): Look for a saddle point. It does not exist in this problem.

Step (ii): Use the principle of dominance.

The entire cell values in column 2 are less than the corresponding values in columns 1 and 3. Hence columns 1 and 3 are dominated by column 2 and the reduced matrix becomes

Table 15.26

		y2	y4
		x1	6
A	x2	3	6
	x3	8	4
	x4	7	-1

Again all the cell values for row 3 are higher than those for row 4. Hence row 3 dominates row 4 and the matrix is reduced to

Table 15.27

		y_2	$y_4=1-y_2$
A	x_1	6	5
	x_2	3	6
	x_3	8	4

This matrix can be solved now by graphic method. B's expected payoffs corresponding to A's pure strategies are given below.

Table 15.28

A' pure strategies	B's expected strategies
1	$6y_2 + 5(1-y_2) = y_2 + 5$
2	$3y_2 + 6(1-y_2) = -3y_2 + 6$
3	$8y_2 + 4(1-y_2) = 4y_2 + 4$

These three straight lines can be plotted as functions of y_2 as follows:

Procedure to draw graph:

Step (i): Draw two lines B_2 and B_4 parallel to each other one unit apart and mark a scale on each of them. These two lines represent the two strategies available to B.

Step (ii): To represent A's first strategy, join mark 6 on B_2 with mark 5 on B_4 ; to represent A's second strategy, join mark 3 on B_2 with mark 6 on B_4 ; and so on and bound the figure from above as shown.

Step (iii): Since player B wishes to minimize his maximum expected losses, the two lines which intersect at the lowest point of the upper bound show the two courses of action A should choose in his best strategy i.e., A_1 and A_2 .

We can, thus, immediately reduce the 3×2 game to 2×2 game which can be easily solved by arithmetic method. The resulting 2×2 game is shown in table.

Table 15.29

		B		
		2	4	
A	1	6	5	3 $\frac{3}{4}$
	2	3	6	1 $\frac{1}{4}$
		1	3	
		$\frac{1}{4}$	$\frac{3}{4}$	

Therefore, the optimum strategies are

15.7 GLOSSARY

- **Competitive situations:** It occurs when two or more parties with conflicting interests operate.
- **n-person game:** A game in which n players participate is called n-person game.
- **Finite and Infinite game,** zero sum Game.

15.8 CHECK YOUR PROGRESS

A. State the following as T (True) or F (False).

- In a two-person game, both the players must have an equal number of strategies.
- In a competitive game, a participant may have infinite number of possible courses of action.
- Graphic method is applicable to only those games in which one of the players has two strategies only.
- In a two-person zero sum game, the total payoff to the two players at the end of each play is zero.
- A game with two players where a gain of one player equals the loss to the other is known as two-person zero-sum game.

15.9 ANSWERS TO CHECK YOUR PROGRESS

A. (i) False (ii) False (iii) True (iv) True (v) True

15.10 TERMINAL QUESTIONS

- Explain the terms
 - Saddle point
 - Max-min and min-max principle
 - Principle of Dominance
 - Competitive game; Zero-sum game; two-person zero sum game.
- Solve the following game by using the principle of dominance.

		Player B					
		I	II	III	IV	V	VI
Player A	I	4	2	0	2	1	1
	II	4	3	1	3	2	2
	III	4	3	7	-5	1	2
	IV	4	3	4	-1	2	2
	V	4	3	3	-2	2	2

- Solve the following game by reducing them to 2×2 games by graphical method.

	B				
A	3	0	6	-1	7
	-1	5	-2	2	1

(IV) Solve the following game by reducing them to 2×2 games by graphical method.

	B				
A	0	4	-8	-5	1
	1	5	8	-4	0

Answers

- (ii) Optimal strategies for A: $(0, 6/7, 1/7, 0, 0)$; optimal strategies for B: $(0, 0, 4/7, 3/7, 0, 0)$; and the game value: $13/7$.
- (iii) A $(3/7, 4/7)$, B $(3/7, 0, 0, 4/7, 0)$, game value $V = 5/7$.
- (iv) A_2, B_4 ; game value $V = -4$

15.11 SUGGESTED READINGS

Mehta, P. L., Managerial Economics – Analysis, Problem and Cases, Sultan Chand & Sons, New Delhi.

H. L. Ahuja, Business Economics Micro- S. Chand & Co. Ltd., New Delhi, 1999.

S. K., Mishra and V. K. Puri, Advanced Microeconomic Theory, Himalaya Publishing House, Mumbai, 2001.

UNIT: 16 BASIC CONCEPTS AGGREGATE DEMAND, SUPPLY, INVESTMENT, INFLATION AND UNEMPLOYMENT

Structure

- 16.1 Introduction**
- 16.2 Effective Demand**
 - 16.2.1 Aggregate Demand Factor**
 - 16.2.2 Aggregate Supply**
 - 16.2.3 Equilibrium of the Economy**
- 16.3 Investment**
- 16.4 Inflation**
- 16.5 Unemployment**
- 16.6 Summary**
- 16.7 Glossary**
- 16.8 Check Your Progress**
- 16.9 Answer to Check Your Progress**
- 16.10 Terminal Questions**
- 16.11 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to understand the concepts of:

- Effective Demand, Aggregate demand, Aggregate Demand Curve, Aggregate supply, Forms of Supply
 - Investment, Inflation; and Unemployment.
-

16.1 INTRODUCTION

This unit would derive an analysis and explanation of Aggregate demand, Aggregate supply, Investment, Inflation and Employment, which form integral parts of the General Theory postulated by J.M. Keynes. Keynesian economics represents a genuine break with classical economics which is based on the pillars of free trade and government's non-intervention in the economic field. However, the Keynesian approach is not absolutely unaffected by the classical ideology in that its underlying assumption of perfect competition has classical features.

16.2 EFFECTIVE DEMAND

Effective demand, as has been conceptualized by J. M. Keynes denotes the total demand for goods and services at various levels of employment. Different levels of employment represent different levels of aggregate demand. But there can be a level of employment where aggregate demand equates aggregate supply. Thus the point of intersection of both aggregate demand function and aggregate supply function may be called as the point of effective demand. The term effective demand distinguishes between mere desire to buy and the desire accompanied by the ability and willingness to buy, and hence stands more valid for determining volume and extent of employment. Effective demand comprises (i) Consumption demand and (ii) investment demand. While former covers the demand for consumers' goods, the latter specifies demand for capital goods.

Since employment is governed by the effective demand, it is clear that unemployment is due to lack of sufficient effective demand and if the problem of unemployment is to be solved, the only remedy is an increase in effective demand. Effective demand, in turn, is determined by two factors – Aggregate Demand Factor (ADF) and Aggregate Supply Factor (ASF). You are aware that price is determined by the interaction of the market forces of demand and supply as per the Marshallian approach, Keynesian approach, holds that effective demand is determined by a aggregate demand and aggregate supply.

16.0.1 Aggregate Demand Factor

Aggregate Demand Factor is a schedule of the various amounts of money which all the entrepreneurs taken together in an economy expect from the sale of their output at varying levels of employment. The figure given further would give you an idea of how an Aggregate Demand Curve behaves.

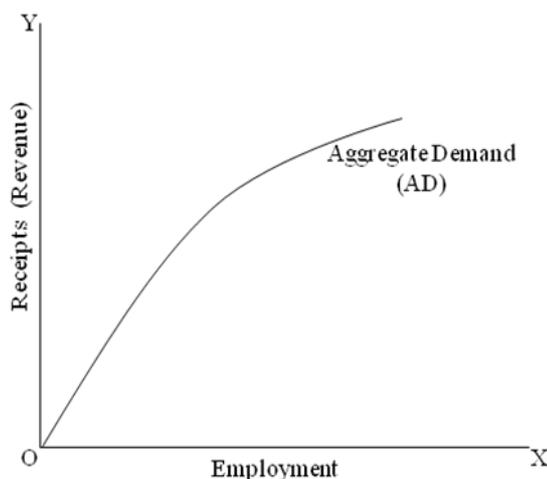


Figure 16.1

In the figure 16.1, employment has been shown on OX axis whereas the OY axis shows receipts. With the increase in employment, there is an increase in receipts from sales. It is also clear from the figure that the AD is moving upward sharply, but later it does not rise with the same pace as employment reaches beyond certain level. This happens because when the employment is low, the economic condition of the community is so pitiable that it spends the entire income earned by it and saves nothing.

16.0.2 Aggregate Supply

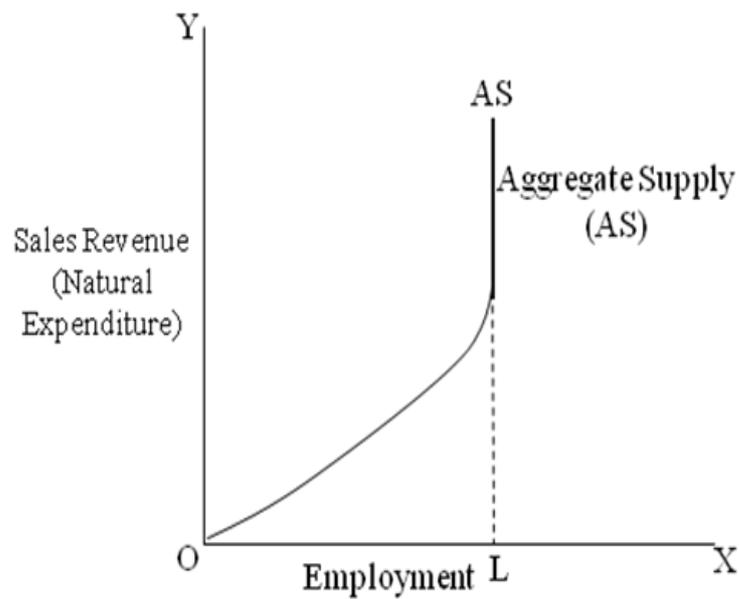


Figure 16.2

Employment alone can't produce anything, it would need the contribution of the factors like land, capital, raw materials, etc. in order to complete the process. All these factors are to be paid by entrepreneur for their cooperation. Thus, the Aggregate supply price, when any given number of men is employed, is the total cost of producing the output by that number of men. It follows that if more labour is to be employed, enough extra

receipts must be expected to make it worthwhile employing them. The Aggregate Supply Curve will therefore, slope upwards to the right. Thus, AS curve reflects condition in both commodity and the factor (especially labour) market. The figure given further exhibits this situation.

In the figure 16.2, employment is shown on the OX axis while OY shows the sale revenue (receipts) or national expenditure. It is clear from the figure that AS curve also rises like the AD curve. It follows that when the revenue from sales is zero, both output and employment also will be zero. As the sales revenue increases, both output and employment will tend to rise. It thus signifies that both employment and sales revenue move in the same direction together. In extreme cases the AS curve can be a vertical curve, but in actual practice it slopes upward the right. The fundamental reason for this trend of AS is that due to improvement in technology and accumulation of resources the potential GDP will grow over time and as a result the AS curve will shift to the upward.

It would be clear from the figure that the AS curve rises slowly in the beginning – the reason being, the first that the cost of production does not increase at a quick pace but as there is an increase in the sales revenue, subsequent rise in employment will lead to a situation when no labour will be left unemployed. Now after this stage, employment will not increase even if sales revenue keeps increasing and therefore the AS curve will be vertically shaped. In the figure No.

16.2. Once OL number of labour are given employment, the AS curve starts moving in a vertical form. Though sales revenue i.e. national expenditure and employment are likely to fall together the proportion in which they vary may not essentially be identical. It, therefore, implies that the AS function which relates the number of labour employed to the level of natural expenditure is most likely to be non-linear like the one shown in the figure.

16.0.3 Equilibrium of the Economy

The level of employment is set at the intersection of the aggregate demand curve with the aggregate supply curve. It means that the point of intersection of both these curves is the state of equilibrium i.e. at this point, $AD = AS$. This is also the point of Effective Demand. Now if, at any particular level of employment, the entrepreneurs find that the receipts are less than costs, they shall stop production and refuse to offer employment to the particular number of workers. It, thus, implies that so long as the costs remain less than the receipts, the employment in an economy shall go on increasing till both of them are equalized. In no case, would the employers offer employment to workers, if the costs are greater than the receipts. You can understand this through the figure given further.

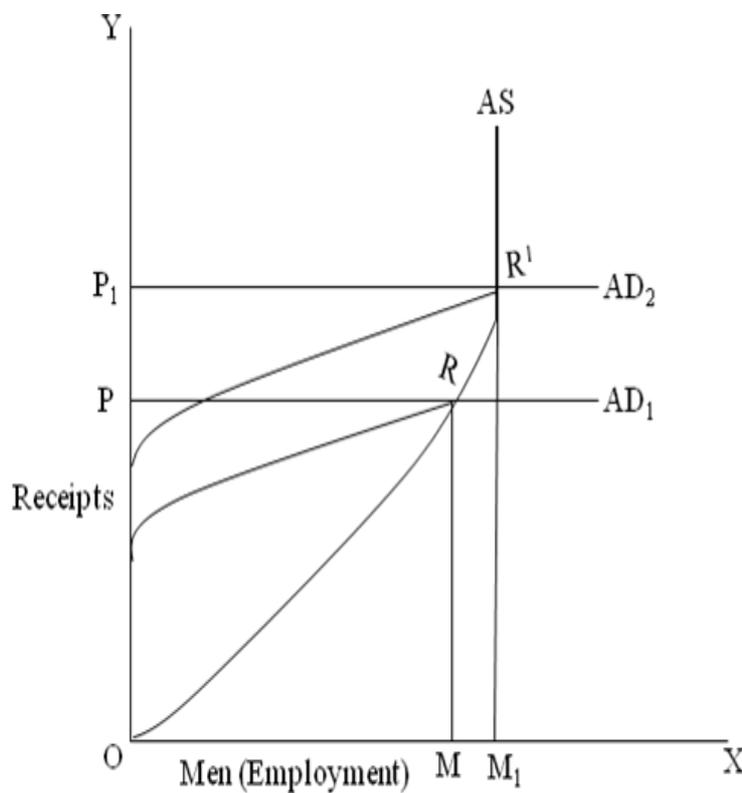


Figure 16.3

In the figure 16.3, there is only one aggregate supply curve but two aggregate demand curves with the curve AD_1 the economy is in equilibrium with the expected receipts of producers at OP and employment at OM . Since there are OM_1 men (i.e. labour) who want work, there is employment of MM_1 in this position. In this case, although there is equilibrium people are out of job. Now OM_1 men can be employed only if aggregate demand is expected to be OP_1 . AD_2 curve shows the situation where employers do expect to receive just enough money to make it worthwhile to give a job to everyone

who wants one. Here OM_1 men are employed and OP_1 sum is received by the firms. AS the figure shows, there would not be any further employment beyond OM_1 even if receipts increase to any level. This is why the AS curve is vertical after a certain level (i.e. M_1) which is point of equilibrium.

16.3 INVESTMENT

Investment is related to saving or deferring consumption. Investment is involved in many areas of the economy, such as business management and finance whether for households, firms, or governments. To avoid speculation an investment must be either directly backed by the pledge of sufficient collateral or insured by sufficient assets pledged by a third party. A thoroughly analyzed loan of money backed by collateral with greater immediate value than the loan amount may be considered an investment. A financial instrument that is insured by the pledge of assets from a third party, such as a deposit in a financial institution insured by a government agency may be considered an investment. In economic theory or in macroeconomics, investment is the amount purchased per unit time of goods which are not consumed but are to be used for future production (i.e. capital). Examples include rail, road or factory construction. Investment in human capital includes costs of additional schooling or on-the-job training. Inventory investment is the accumulation of goods inventories; it can be positive or negative, and it can be intended or unintended. In measures of national income and output, "gross investment" (represented by the variable I) is also a component of gross domestic product (GDP), given in the formula $GDP = C + I + G + NX$, where C is consumption, G is government spending, and NX is net exports. Thus investment is everything that remains of total expenditure after consumption, government spending, and net exports are subtracted (i.e. $I = GDP - C - G - NX$).

Non-residential fixed investment (such as new factories) and residential investment (new houses) combine with inventory investment to make up I . "Net investment" deducts depreciation from gross investment. Net fixed investment is the value of the net increase in the capital stock per year. Fixed investment, as expenditure over a period of time ("per year"), is not capital. The time dimension of investment makes it a flow. By contrast, capital is a stock- that is, accumulated net investment to a point in time (such as December 31). Investment is often modeled as a function of Income and Interest rates, given by the relation $I = f(Y, r)$. An increase in income encourages higher investment, whereas a higher interest rate may discourage investment as it becomes more costly to borrow money. Even if a firm chooses to use its own funds in an investment, the interest rate represents an opportunity cost of investing those funds rather than lending out that amount of money for interest.

16.4 INFLATION

Inflation is defined as a rise in the general level of prices of goods and services in an economy over a period of time. When the general price level rises, each unit of currency buys fewer goods and services. Consequently, inflation also reflects an erosion in the purchasing power of money—a loss of real value in the internal medium of exchange and unit of account in the economy. A chief measure of price inflation is the inflation rate, the annualized percentage change in a general price index (normally the Consumer Price Index) over time. Inflation's effects on an economy can be positive and negative. Negative effects of inflation include a decrease in the real value of money and other monetary items over time, uncertainty over future inflation which may discourage investment and savings, and if inflation is rapid enough, shortages of goods as consumers begin hoarding out of concern that prices will increase in the future. Positive effects include ensuring that the commercial banks would adjust nominal interest rates (intended to mitigate recession), and encouraging investment in non-monetary capital projects.

Economists generally agree that high rates of inflation or hyperinflation are caused by an excessive growth of the money supply. Views on which factors determine low to moderate rates of inflation are more varied. Low or moderate inflation may be attributed to fluctuations in real demand for goods and services, or changes in available supplies such as during scarcities, as well as to growth in the money supply. However, the consensus view is that a long sustained period of inflation is caused by money supply growing faster than the rate of economic growth. Today, most economists favor a low, steady rate of inflation. Low (as opposed to zero or negative) inflation reduces the severity of economic recessions by enabling the labor market to adjust more quickly in a downturn, and reduces the risk that a liquidity trap prevents monetary policy from stabilizing the economy. The task of keeping the rate of inflation low and stable is usually given to monetary authorities. Generally, these monetary authorities are the central banks that control monetary policy through the setting of interest rates, through open market operations, and through the setting of banking reserve requirements.

Other economic concepts related to inflation include: deflation – a fall in the general price level; disinflation – a decrease in the rate of inflation; hyperinflation – an out-of-control inflationary spiral; stagflation – a combination of inflation, slow economic growth and high

unemployment; and reflation – an attempt to raise the general level of prices to counteract deflationary pressures.

When the general level of prices rises, each monetary unit buys fewer goods and services. The effect of inflation is not distributed evenly in the economy, and as a consequence there are hidden costs to some and benefits to others from this decrease in the purchasing power of money. For example, with inflation, lenders or depositors who are paid a fixed rate of interest on loans or deposits will lose purchasing power from their interest earnings, while their borrowers benefit. Individuals or institutions with cash assets will experience a decline in the purchasing power of their holdings. Increases in payments to workers and pensioners often lag behind inflation, especially for those with fixed payments. Increases in the price level (inflation) erode the real value of money (the functional currency) and other items with an underlying monetary nature. Debtors who have debts with a fixed nominal rate of interest will see a reduction in the "real" interest rate as the inflation rate rises. The real interest on a loan is the nominal rate minus the inflation rate. The formula $R = N - I$ approximates the correct answer as long as both the nominal interest rate and the inflation rate are small. The correct equation is $r = n/i$ where r , n and i are expressed as ratios (e.g. 1.2 for +20 per cent, 0.8 for -20 per cent). As an example, when the inflation rate is 3 per cent, a loan with a nominal interest rate of 5 per cent would have a real interest rate of approximately 2 per cent. Any unexpected increase in the inflation rate would decrease the real interest rate. Banks and other lenders adjust for this inflation risk either by including an inflation risk premium to fixed interest rate loans, or lending at an adjustable rate.

High or unpredictable inflation rates are regarded as harmful to an overall economy. They add inefficiencies in the market, and make it difficult for companies to budget or plan long-term. Inflation can act as a drag on productivity as companies are forced to shift resources away from products and services in order to focus on profit and losses from currency inflation. Uncertainty about the future purchasing power of money discourages investment and saving. And inflation can impose hidden tax increases, as inflated earnings push taxpayers into higher income tax rates unless the tax brackets are indexed to inflation. With high inflation, purchasing power is redistributed from those on fixed nominal incomes, such as some pensioners whose pensions are not indexed to the price level, towards those with variable incomes whose earnings may better keep pace with the inflation. This redistribution of purchasing power will also occur between international trading partners. Where fixed exchange rates are imposed, higher inflation in one economy than another will cause the first economy's exports to become more expensive and affect the balance of trade. There can also be negative impacts to trade from an increased instability in currency exchange prices caused by unpredictable inflation.

There are three major types of inflation, as part of what Robert J. Gordon calls the "triangle model":

- (a) Demand-pull inflation is caused by increases in aggregate demand due to increased private and government spending, etc. Demand inflation is constructive to a faster rate of economic growth since the excess demand and favourable market conditions will stimulate investment and expansion.
- (b) Cost-push inflation, also called "supply shock inflation," is caused by a drop in aggregate supply (potential output). This may be due to natural disasters, or increased prices of inputs. For example, a sudden decrease in the supply of oil, leading to increased oil prices, can cause cost-push inflation. Producers for whom oil is a part of their costs could then pass this on to consumers in the form of increased prices. Another example stems from unexpectedly high Insured Losses, either legitimate (catastrophes) or fraudulent (which might be particularly prevalent in times of recession).
- (c) Built-in inflation is induced by adaptive expectations, and is often linked to the "price/wage spiral". It involves workers trying to keep their wages up with prices (above the rate of inflation), and firms passing these higher labor costs on to their
- (d) customers as higher prices, leading to a 'vicious circle'. Built-in inflation reflects events in the past, and so might be seen as hangover inflation.
- (e) Demand-pull theory states that the rate of inflation accelerates whenever aggregate demand is increased beyond the ability of the economy to produce (its potential output). Hence, any factor that increases aggregate demand can cause inflation. However, in the long run, aggregate demand can be held above productive capacity only by increasing the quantity of money in circulation faster than the real growth rate of the economy.

Issues in Measuring Inflation

Measuring inflation in an economy requires objective means of differentiating changes in nominal prices on a common set of goods and services, and distinguishing them from those price shifts resulting from changes in value such as volume, quality, or performance. For example, if the price of 10 pencils can changes from Rs. 90 to Rs. 100 over the course of a year, with no change in quality, then this price difference represents inflation. This single price change would not, however, represent general inflation in an overall economy. To measure overall inflation, the price change of a large "basket" of representative goods and services is measured. This is the purpose of a price index, which is the combined price of a "basket" of many goods and services. The combined price is the sum of the weighted average prices of items in the "basket". A weighted price is calculated by multiplying the unit price of an item to the number of those items the average consumer purchases. Weighted pricing is a necessary means to measuring the impact of individual unit price changes on the economy's overall inflation. The Consumer Price Index, for example, uses data collected by surveying

households to determine what proportion of the typical consumer's overall spending is spent on specific goods and services, and weights the average prices of those items accordingly. Those weighted average prices are combined to calculate the overall price. To better relate price changes over time, indexes typically choose a "base year" price and assign it a value of 100. Index prices in subsequent years are then expressed in relation to the base year price. While comparing inflation measures for various periods one has to take into consideration the base effect as well. Inflation measures are often modified over time, either for the relative weight of goods in the basket, or in the way in which goods and services from the present are compared with goods and services from the past. Over time, adjustments are made to the type of goods and services selected in order to reflect changes in the sorts of goods and services purchased by 'typical consumers'. New products may be introduced, older products disappear, the quality of existing products may change, and consumer preferences can shift. Both the sorts of goods and services which are included in the "basket" and the weighted price used in inflation measures will be changed over time in order to keep pace with the changing marketplace. Inflation numbers are often seasonally adjusted in order to differentiate expected cyclical cost shifts. For example, home heating costs are expected to rise in colder months, and seasonal adjustments are often used when measuring for inflation to compensate for cyclical spikes in energy or fuel demand. Inflation numbers may be averaged or otherwise subjected to statistical techniques in order to remove statistical noise and volatility of individual prices. When looking at inflation, economic institutions may focus only on certain kinds of prices, or special indices, such as the core inflation index which is used by central banks to formulate monetary policy. Most inflation indices are calculated from weighted averages of selected price changes. This necessarily introduces distortion, and can lead to legitimate disputes about what the true inflation rate is. This problem can be overcome by including all available price changes in the calculation, and then choosing the median value.

16.5 UNEMPLOYMENT

Unemployment (or joblessness), as defined by the International Labour Organization (ILO), occurs when people are without jobs and they have actively sought work within the past four weeks. The unemployment rate is a measure of the prevalence of unemployment and it is calculated as a percentage by dividing the number of unemployed individuals by all individuals currently in the labor force. These theories argue against interventions imposed on the labour market from the outside, such as unionization, minimum wage laws, taxes, and other regulations that they claim discourage the hiring of workers. Keynesian economics emphasizes the cyclical nature of unemployment and recommends interventions it claims will reduce unemployment during recessions. This theory focuses on recurrent supply shocks that suddenly reduce aggregate demand for goods and services and thus reduce demand for workers. Keynesian models recommend government interventions designed to increase demand for workers; these can include financial stimuli, publicly funded job creation, and expansionist monetary policies. Georgists, half a century before Keynes, also noted the cyclical nature but focused on the role of speculation in land which pushes up economic rent. Economic activity cannot be sustained in the rent bubble because rent must be paid mostly from wages (yield of labor) as well as from interest (yield of capital). Once the speculation is wrung out of system the cycle of land speculation begins again. Henry George therefore advocated the taxation of land values (Single Tax) to stop land speculation and in order to eliminate taxation of labor and capital. George opposed land nationalization and Marx's theories. Marxism focuses on the relations between the owners and the workers, whom, it claims, the owners pit against one another in a constant struggle for jobs and higher wages. The unemployment produced by this struggle is said to benefit the system by reducing wage costs for the owners. For Marxists the causes of and solutions to unemployment require abolishing capitalism and shifting to socialism or communism.

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In addition to these three comprehensive theories of unemployment, there are a few categorizations of unemployment that are used to more precisely model the effects of unemployment within the economic system. The main types of unemployment include structural unemployment which focuses on structural problems in the economy and inefficiencies inherent in labour markets including a mismatch between the supply and demand of laborers with necessary skill sets. Structural arguments emphasize causes and solutions related to disruptive technologies and globalization. Discussions of frictional unemployment focus on voluntary decisions to work based on each individual's valuation of their own work and how that compares to current wage rates plus the time and effort required to find a job. Causes and solutions for frictional unemployment often address barriers to entry and wage rates. Behavioral economists highlight individual biases in decision making and often involve problems and solutions concerning sticky wages and efficiency wages.

Measurement of Unemployment

There are also different ways through which national statistical agencies measure unemployment. These differences may limit the validity of international comparisons of unemployment data. To some degree these differences remain despite national statistical agencies increasingly adopting the definition of unemployment by the International Labour Organization. To facilitate international comparisons, some organizations, such as the OECD, Eurostat, and International Labor Comparisons Program, adjust data on unemployment for comparability across countries. Though many people care about the number of unemployed individuals, economists typically focus on the unemployment rate. This corrects for the normal increase in the number of people employed due to increases in population and increases in the labour force relative to the population. The unemployment rate is expressed as a percentage, and is calculated as follows:

$$\text{Unemployment rate} = \frac{\text{Unemployed workers}}{\text{Total labour force}}$$

As defined by the International Labour Organization, "unemployed workers" are those who are currently not working but are willing and able to work for pay, currently available to work, and have actively searched for work. Individuals who are actively seeking job placement must make the effort to: be in contact with an employer, have job interviews, contact job placement agencies, send out resumes, submit applications, respond to advertisements, or some other means of active job searching within the prior four weeks. Simply looking at advertisements and not responding will not count as actively seeking job placement. Since not all unemployment may be "open" and counted by government agencies, official statistics on unemployment may not be accurate.

The ILO describes four different methods to calculate the unemployment rate:

- i) Labour Force Sample Surveys are the most preferred method of unemployment rate calculation since they give the most comprehensive results and enables calculation of unemployment by different group categories such as race and gender. This method is the most internationally comparable.
- ii) Official Estimates are determined by a combination of information from one or more of the other three methods. The use of this method has been declining in favor of Labour Surveys.
- iii) Social Insurance Statistics such as unemployment benefits, are computed base on the number of persons insured representing the total labour force and the number of persons who are insured that are collecting benefits. This method has been heavily criticized due to the expiration of benefits before the person finds work.
- iv) Employment Office Statistics are the least effective being that they only include a monthly tally of unemployed persons who enter employment offices. This method also includes unemployed who are not unemployed as per the ILO definition.

In the early stages of an economic boom, unemployment often rises. This is because people join the labour market (give up studying, start a job hunt, etc.) because of the improving job market, but until they have actually found a position they are counted as unemployed. Similarly, during a recession, the increase in the unemployment rate is moderated by people leaving the labour force or being otherwise discounted from the labour force, such as with the self-employed.

16.6 SUMMARY

In total, aggregate demand is the total demand for final goods and services in the economy at a given time and price level and aggregate supply is the total supply of goods and services that firm in a national economy plan on selling during a specific time period. Investment is involved in many areas of the economy, such as business management and finance whether for households, firms, or governments. Inflation is a rise in the general level of prices of goods and services in an economy over a period of time. Unemployment occurs when people are without jobs and they have actively sought work within the past four weeks.

16.7 GLOSSARY

- **Effective Demand:** Refer to the existence of prior demand for

goods at various levels of employment.

- **Inflation:** Inflation is defined as a rise in the general level of prices of goods and services in an economy over a period of time.
- **Unemployment:** When people are without work or job.

16.8 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- (i) Effective Demand consists of consumption demand and
- (ii) The Aggregate Demand curve rises fast at the outset, but does not rise
- (iii) The effect of inflation is distributed among the people.
- (iv) Most inflation indices are calculated from
- (v) Marxism centres around the relations between owners and

(B) State whether the following statements are true or false:

- (i) In actual practice the Aggregate Supply curve slopes upward to the left.
- (ii) Fixed investment as expenditure over a period of time is capital.
- (iii) A long run continuous inflation is caused by money supply growing faster than the rate of economic growth.
- (iv) In view of economists rate of unemployment is, a more appropriate parameter to measure the quantum of unemployment than the number of unemployed people.

16.9 ANSWERS TO CHECK YOUR PROGRES

- (A) (i) Investment demand
- (ii) with the same pace
- (iii) Evenly
- (iv) weighted averages
- (v) Workers
- (B) (i) False
- (ii) False
- (iii) True
- (iv) True

16.10 TERMINAL QUESTIONS

1. Explain aggregate demand and aggregate supply.
2. What do you mean by investment? Explain.
3. Define unemployment. Discuss its demerits.
4. Discuss negative and positive effects of inflation.
5. Discuss the ways through which unemployment can be measured.

16.11 SUGGESTED READINGS

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UNIT: 17-NATIONAL INCOME

Structure

17.1 Introduction

17.2 Definition

17.3 Structure of National Income

17.4 Relation between different Aggregates of National Income

17.5 Measurement of National Income

17.6 Difficulties in the Measurement of National Income

17.7 Per capita Income or Output

17.8 Summary

17.9 Glossary

17.10 Check you Progress

17.11 Answers to Check your Progress

17.12 Terminal Questions

17.13 Suggested Readings

OBJECTIVES

After studying this unit, you should be able to understand:

- The meaning of national income
- Structure of national income; and
- Measurement of national income.

17.1 INTRODUCTION

National income is the basic measure of economic activity of a nation. It is one of the key indicators of economic progress of any nation. Other things remaining constant, higher national income implies higher level of economic activity and rising standard of living of the individuals and households constituting an economy.

17.2 DEFINITION

National income is the sum of incomes accrued to all the factors of production - wages, interest, rent and profit received by the owners of these factors, labour, capital, land and entrepreneurship of a nation during the year. Thus,

national product and national income are two different measures of the level of economic activities of an economy. National income measures factor incomes that are earned by owners of factors of production, while national product measures market value of the goods and services produced on account of the use of factor services rendered by the owners of the factors of production.

17.3 STRUCTURE OF NATIONAL INCOME

This section focuses on the structure and measurement of national product, but the subject matter can be understood in a better way if you have the understanding of the following concepts:

17.3.1 Gross Domestic Product at Market Price (GDP_{MP})

Gross Domestic Product (GDP) is the value of the final goods and services produced during a year by all resources located in the nation. In other words, Gross Domestic Product at market price is defined as the market value of the output of final goods and services currently produced in the domestic territory of a country during an accounting year. Gross Domestic Product at market price is the market value of the final goods and services produced both by normal residents as well as non-residents within the domestic territory of the country.

In order to calculate the value of gross domestic product, the quantum of goods and services produced is multiplied by their price. Thus :

$$GDP = P \times Q$$

Where GDP = Gross Domestic Product; P = Market Price and Q = Quantity of Final Goods and Services produced in a given year.

It is to be noted for calculating GDP only the market value of goods and service is taken into account, not the intermediate goods and services. Because, the value of intermediate goods (goods used as raw material) is reflected in the value of final goods.

17.3.2 Gross National Product at Market Price (GNP_{MP})

Gross national product at market price is the market value of final goods and services produced during a year by the normal residents of the country in domestic territory as well in any foreign country.

It includes all the constituents of gross domestic product at market price and net factor income from abroad. Net factor income from abroad is the difference between the factor income earned from aboard by the normal residents of a country and income paid for the factor services rendered by non-residents within the domestic territory of the country.

Thus, Gross National Product at Market Price = Gross Domestic Product at Market Price + Net Factor Income from Abroad

Net factor income from abroad may be positive or negative. If it is positive, national product would be greater than domestic product; if it is negative, national product would be lesser than domestic product.

17.3.3 Net National Product at Market Price (NNP_{MP})

Net National Product at market price measures the value of new final goods and services produced by the normal residents in the domestic territory and abroad in an accounting year after worn out capital goods have been replaced. Some capital goods are used up in the production process through natural wear, obsolescence and accidental destruction (for example, the machinery that breaks down and no longer works). The cost to replace these capital goods is called the capital consumption allowance or depreciation. Replacing depreciated capital does not actually represent new production; therefore, we reduce the value of total production by this amount to show net production of the year.

17.3.4 Net Domestic Product at Market Price (NDP_{MP})

Net domestic product at market price is the difference between market value of final goods and services produced in the domestic territory of a country during an accounting year and consumption of fixed capital.

Net Domestic Product at Market Price = Value of Currently produced Final Goods and Services -- Capital Consumption or Depreciation.

17.3.5 Net Domestic Income or Net Domestic Product at Factor Cost [NDP_{FC}]

The payment made to the factors of production for their contribution to the production process is called factor cost and the result of production is called product at factor cost. Net Domestic Product at Factor cost is also called net domestic income. Net domestic income measures the income earned by the suppliers of all factors of production used to produce the economy's total output of final goods and services for the year.

Thus, net domestic product at factor cost or net domestic income includes: wages or compensation of employees, rent, interest, profit or operating surplus, and mixed Income earned within the domestic territory of a country.

17.3.6 Gross Domestic Product at Factor Cost or Gross Domestic Income [GDP_{FC}]

Gross domestic product at factor cost or gross domestic income is the sum of the compensation of employees, operating surplus and mixed income earned by the factors of production in an accounting year and depreciation or consumption of fixed capital.

Peterson defines "The Gross Domestic Product at factor cost is the sum of wages, rent, interest and profit earned by the normal residents in the domestic territory of the country and the consumption of capital in an accounting year."

Gross Domestic Product at Factor Cost = Wages + Rent + Interest + Profit + Consumption of Capital

Net National Product (NNP)

GNP includes the value of total output of consumption goods and investment goods, but, process of production utilizes a certain amount of fixed capital. Fixed equipments are subject to constant wear and torn, some of them are damaged or destroyed or become obsolete due to new technologies to replace

them. All these result in what is termed as capital consumption allowance or depreciation. If depreciation is deducted from GNP, we find NNP. Hence $NNP = GNP - \text{Depreciation}$.

Net National Product at Market Prices (NNP_{MP})

Net National Product at market prices is the net value of final goods and services evaluated at market prices during one year in a country. After deducting depreciation from GNP at market prices we get NNP at market prices (NNP_{MP}). It may also be expressed as :

$$NNP_{MP} = GNP_{MP} - \text{Depreciation}$$

17.3.7 Net National Product at Factor Cost or National Income [NNP_{FC}]

Net national product at factor cost is total earning of all factors of production in the form of interest, wages, rent and profit and net factor income from abroad. It is this concept which is popularly called National Income. In other words, net national product at factor cost is the sum total of net domestic product at factor cost and net factor income from abroad.

Net national income or net national product at factor cost is equal to sum total of net domestic product at factor cost (Compensation of Employees + Operating Surplus + Mixed Income) and net factor income from abroad.

Net National Product at Factor Cost or National Income =

Net Domestic Product at Factor Cost (Rent + Wages + Interest

+ Profit) + Net Factor Income from abroad.

17.3.8 Gross National Product at Factor Cost or Gross National Income [GNP_{FC}]

The gross national product at factor cost is also called gross national income. Gross national product at factor cost is the sum total of compensation of employees, operating surplus, mixed income, depreciation and net factor income from abroad.

In the words of Peterson, "Gross national product at factor cost is the sum of factor cost of the gross product attributable to the factor of production supplied by the normal residents of the country during a year and net factor income from abroad."

**Gross National Product at Factor Cost or Gross National Income =
Wages + Rent + Profit + Interest + Depreciation
+ Net Factor Income from abroad.**

Factor income from net domestic product accruing to private sector is estimated by deducting from net domestic product at factor cost, the income from property and entrepreneurship accruing to government and saving of non-departmental enterprises.

Thus, Factor Income from Net Domestic Product accruing to the Private Sector = Net Domestic Product at Factor Cost – Income from Property and Entrepreneurship accruing to the Government – Saving of non-Department Enterprises.

17.3.9 Private Income

Private income is the income earned by the private individuals from any source, productive or otherwise. It can be earned at by making certain adjustments in the NNP at Factor Cost. Additions to NNP_{FC} may include pensions, unemployment allowances, social security benefits, gifts and remittances from abroad gains from horse reciting and interest on public debt. The deduction may include income from government departments as well as surpluses from public undertakings and employee's contribution in social security schemes like P.F., Life insurance etc.

Thus private Income = $NI (NNP_{FC}) + \text{Transfer payments} + \text{Interest on public debt} - \text{Social Security} - \text{Profits and Surpluses of Public undertakings}$

17.3.10 Personal Income

Personal Income is the total of all current income received by households from all sources. It is the sum total of all types of factors income actually received by the households and current transfers. Personal Income includes the income actually received by the households. Some part of the income earned by the firms or corporations is not distributed among the shareholders. It is retained by the firms as undistributed profit. It is used (a) to pay corporation tax and (b) to effect the corporate saving (Reserve Fund). Thus, these are not included in personal income.

Thus, Personal Income – National Income – Contribution to Social Security Schemes – Corporate tax – Corporate retained profits + Transfer Payments + Interest on public debt.

17.3.11 Personal Disposable Income

Disposable income is the total income of the households minus personal taxes that the household can use to spend or save. Disposable income is the personal income minus personal income taxes and miscellaneous receipts of government administrative departments (fees and fines). It is the amount which the households can spent or dispose of as they like. Disposable income is indicative of the purchasing power of the households. Personal Disposable Income is either consumed or saved, therefore,

$$\text{Personal Disposable Income} = \text{Consumption} + \text{Saving}$$

Thus,

$$\text{Disposable Income} = \text{Personal Income} - \text{Direct Taxes (Income Tax and Property Tax)} - \text{Miscellaneous Receipts of the Government Administrative Departments (fees and fines paid by the individuals)}$$

Some important concepts of national income are illustrated with the help of the following diagram:

Less (-) Saving of Non-departmental Enterprises
 Less (-) Net Factor Income from Abroad
 Equals (=) **9. Factor Income from Net Domestic Product Accruing to Private Sector**
 Plus (+) Interest on National Debt
 Plus (+) Net Current Transfer Payments from the Government
 Plus (+) Net Current Transfer Payment from Abroad
 Plus (+) Net Factor Income from Abroad
 Equals = **10. Private Income**
 Less (-) Corporate Tax
 Less (-) Saving of Corporations (less Net Retained Earnings of Foreign Companies)
 Equals = **11. Personal Income**
 Less (-) Direct Taxes
 Less (-) Miscellaneous Receipts of Government administrative departments i.e. Fees, fines, etc.
 Equals (=) **12. Personal Disposable Income**
 Equals (=) Household Consumption + Household Saving.

17.5 MEASUREMENT OF NATIONAL INCOME

Structure and measurement of national product are the related concepts. In fact one cannot be separated from the other. Measurement of national product inevitably implies appreciation of the structure of national product. The structure of national product refers to the elements or components making up national product. It depends upon the way or the method that you adopt for the measurement of national product. If, for example, output or value added method is used, structure of national product would mean value added or the value of goods and services produced across different sectors of the economy. It would also mean studying the nature of the goods and services produced in the economy. Likewise, if national product is estimated using income method, structure of national product would reveal the relative significance of wages on the one hand and operating surplus (comprising rent, interest and profit) on the other. And, if the expenditure method is used, structure of national product would show the relative significance of various types of expenditures in the economy, mainly the consumption expenditure and investment expenditure or that the structure of national product reveal how much of national product is used for current consumption and how much of it used for further investment. Thus, study of the structure of national product is just a reflection of the measurement of national product. Hence, the focus of this unit is on the measurement of national income. National income involve a circular flow of economic activities Production distribution and expenditure. Corresponding to these phases of economic activities. There are three methods of measuring National income developed by the U.N. These three methods are being explained further :

17.5.1 Income Method

Income Method is that method, which measures national income from the side of payments made in the form of wages, rent, interest and profit to the primary

factors of production i.e. labour, land, capital and entrepreneurship, also called Factor Payment Method. These factor incomes are classified as (a) wages and salaries, (b) rental income, (c) interest, (d) corporate profits and (e) non-corporate proprietor's or self-employed income or Mixed Income. Thus, the main components of factor income are as follows:

(1) Wages and Salaries or Compensation of Employees: Income earned by working for others is called wages or salaries. The income from work for others is also known as compensation of employees. Thus, the compensation of employees includes (i) wages and salaries, bonus, commission and dearness allowance, (ii) imputation of payment in kind e.g. free accommodation, uniforms and medical facilities, (iii) employer's contribution to social security measures and (iv) pension to retired persons.

(2) Rental Income: Rental income is income derived solely from the ownership of land or building. Thus, the owners of land and building receive rental-income for allowing others the use of their property for a specific period of time. Certain durable use goods such as buses, tractors and machinery may also be let out to others for a specific period of time. The income thus received would be deemed as rental income. It may be noted that rent of self-occupied houses, that is imputed rent, is also a part of rental income and, therefore, included in national income. Rental income also includes royalties received by persons from copyright, patents right and rights to natural resources like mines.

(3) Interest: Interest includes income that is earned on bank deposits, on loans to firms and miscellaneous other investment income. In national income only net interest is included. It is the difference between interest paid by business for the use of borrowed financial capital and interest paid to them. Interest paid both by government and by consumers is not included in national income because these are not regarded as payment for current economic production.

(4) Profit: The income earned for entrepreneurship is known as profit. An entrepreneur or corporation does not distribute all the profits of the enterprise among the shareholders, some part of the profit is distributed (called dividends) and some remained undistributed (and is retained by the companies as corporate saving), while some of the profit goes to the government by way of corporate profit tax.

(5) Mixed Income or Income of Non-corporate Sector: Mixed income of the self-employed like that of doctors, engineers, retailers is the total income of own account workers as well as profits generated in the unincorporated enterprises. Mixed income includes income from work as well as income from property and entrepreneurship. Mixed incomes accrue to those persons who as households render factor services and as producers utilize their own factor services for the production of goods and services. These are self-employed persons and earn self-employed income which includes wages, rent, interest and profit. In the enterprises, where the concept of mixed income of the self employed has to be used, net value added at factor cost is equal to the mixed income of the self employed. The Net Domestic Income can be measured from the sum total of the above types of income.

(6) Net Factor Income from Abroad: The net factor income from abroad is the difference between the income received from abroad for rendering factor services, and the income paid for the factor services rendered by non-residents in the domestic territory of a country. The national income is measured by adding net factor income from abroad to net domestic income.

Thus,

$$\text{Net National Income} = \text{Compensation of Employees} + \text{Operating Surplus} \\ (\text{Rest} + \text{Interest} + \text{Profit}) + \text{Mixed Income} \\ + \text{Net Factor Income from abroad.}$$

17.5.2 Product Method or Value Added Method

Product Method is that method, which measures the national income by estimating the contribution of each producing enterprise, in the domestic territory of the country in an accounting year. It is also known as Value Added Method, Industrial Origin Method or Net Output Method. According to this method national income is estimated by finding the market value of final goods and services produced in the economy in an accounting year. As far as an enterprise concerned its sales are treated as final sales or sales of final goods and services. For example, a farmer produces one tonne of wheat and sells it for Rs. 400 in the market to a flour mill. As far as the farmer is concerned, the sale of wheat is a final sale and he gets Rs. 400 for it. If he does not have to incur any expenditure on the cultivation of wheat, Rs. 400 becomes the value of his contribution. The purchase of wheat by the flour mill is intermediate goods. It converts wheat into flour and sells it at Rs. 600 to a baker. The flour mill treats the flour as a final product, but the baker uses it as an intermediate good and manufactures bread. The baker sells the bread to the shopkeeper at Rs. 800. For the baker, the bread is a final good but, for the shopkeeper, it is intermediate good. The shopkeeper sells the entire bread for Rs. 900. Thus,

$$\text{Value of Output} = \text{Rs. 400} + \text{Rs. 600} + \text{Rs. 800} + \text{Rs. 900} = \text{Rs. 2,700}$$

What is Value Added?

Value added is the excess of value of output over and above the value of intermediate goods and services used in the process of production.

Thus, in the previous example, the farmer has added value of Rs. 400; flour mill of Rs. 600 - Rs 400 = Rs. 200 and the baker making breads of Rs. 800 - 500 = Rs 200. The shopkeeper selling the bread of Rs. 900 - Rs. 800 = Rs. 100. The total value added is Rs. 400 + Rs. 200 + Rs. 200 + Rs. 100 = Rs. 900. This is equal to the market price of breads which are a final product or the sum total of value added at different stages of production. By using the value added method, one can avoid the problem of double counting; therefore, value added technique widely used in the estimation of national income.

Thus,

$$\text{Value Added} = \text{Value of Output} - \text{Cost of Intermediate Goods}$$

17.5.3 Expenditure Method

Expenditure Method is the method which measures the final expenditure on gross domestic product at market price during an accounting year. It is also

called income Disposal Method or Consumption investment Method. This method calculates the final expenditure or expenditure on domestic product.

In expenditure method, all expenditure in the country which accounts for or induces the production of goods and services in the domestic territory of the country in an accounting year are added up. For convenience, these are grouped into four categories according to the type of expenditure undertaken.

Structure of National Product in terms of Components of Final Expenditure

(1) Financial Consumption Expenditure: It includes the following two components:

(i) Private Final Consumption Expenditure: To measure private final consumption expenditure, the volume of final sale of the durable goods, semi-durable goods, non-durable goods and services to the consumer household and non-profit institutions serving households is multiplied by prices. The direct purchase of non-resident households in the domestic market is deducted from it and direct purchases of resident households made abroad are added. The resultant figure will be equal to private final consumption expenditure. The production for self consumption is also a part of private final consumption expenditure. The volume of production for self consumption has to be multiplied with the prices prevailing in the neighborhood market of the producer. The imputed rent of owner's occupied houses is also included in private final consumption expenditure in the domestic market.

(ii) Government Final Consumption Expenditure: To measure government consumption expenditure (a) the total volume of sales to the government by the enterprises is multiplied by retail prices. (b) compensation of employees is added to it. (c) purchases from abroad is also added.

(iii) Gross Domestic Capital Formation: It includes the investment of the following types:

(I) Gross Domestic Fixed Capital Formation: It includes the following two types of formation:

(a) Expenditure on Construction; To measure the expenditure on construction, the volume of material inputs like steel, cement, bricks and labour is multiplied by the price paid by the builders way of calculating expenditure is called commodity flow approach. The following items are included in the expenditure on construction: (i) own account production of fixed capital assets, (ii) purchase of new house by consumer households. (iii) work in progress at the site of construction and (iv) capital repairs like major changes in an old building.

(b) The Final Expenditure on Machinery and Equipments: The expenditure on machinery and equipments is calculated in two ways: (i) the volume of their final sales is multiplied by the retail prices prevailing in the market, (ii) following commodity flow approach, the volume of machinery and equipment produced in the current year is found and it is multiplied with the prices paid by the purchasers. From both methods, you get the same total. Own account production of machinery and added to it.

(II) The Expenditure on Change in Stock or Inventories: The change in stocks inventories is measured by multiplying the volume of physical change with the market price of the stock. You must include in GNP any of the products which are produced but not sold this year.

(2) Net Exports: Finally, the value of net exports (Export-Imports) is calculated. It refers to the difference in the value of goods and services exported and services exported and imported. Exports are produced with factors of production owned by a particular country. The fact that the output is sold abroad does not affect the rewards paid to the factors of production. It is for this reason that the value of exports is a part of national income. Exactly the opposite reasoning tells you why expenditure on imports although undertaken by domestic residents is not included in calculation of national income. Such expenditure provides rewards for factors of production abroad. The value of imports is subtracted to avoid an overstatement of total production in the country. If the value of total imports is more than the value of total exports, or net exports is negative, it will be deducted in the estimation of gross national expenditure. One other hand, if the value of total exports is more than total imports (or net exports is positive), it will be added in the estimation of national income.

Thus,

$$\begin{aligned} \text{Gross Domestic Product at Market Price} = & \text{Private Final Consumption} \\ & \text{Expenditure} + \text{Government Final Consumption Expenditure} + \text{Gross} \\ & \text{Domestic Capital Formation (Gross Fixed Capital} + \text{Change Inventories)} \\ & + \text{Net Exports (Exports - Imports)} \end{aligned}$$

The sum of (i), (ii) and (iii) provides gross domestic product at market prices. After adding net factor income from abroad you will obtain gross national product at market price. Net Indirect taxes and depreciation are deducted from gross national product at market prices to obtain net national product factor cost or national income.

17.6 DIFFICULTIES IN THE MEASUREMENT OF NATIONAL INCOME

Many difficulties are faced to estimate national income properly. These difficulties are conceptual as well as practical. These are as under:

(1) Conceptual Difficulties

The theoretical difficulties for measuring national income are as follows:

(i) Difference between Final and Intermediate Goods: As you know, final goods and services alone are included in national income, but many a time it becomes difficult to decide which goods are final and which are intermediate. It is so because a good may be final at a given place but intermediate at another. For example, paper used as an item of stationery in an office is a final good but if used in a book it becomes an intermediate product.

(ii) Change in Price: Continuous change in the prices of goods renders the measurement of national income inconsistent. When the good is under the process of production, it may have a particular price but when it comes to the market for sale it may have different price altogether. Then the difficulty arises regarding the price which is to be taken into account for the purpose of calculating national income.

(iii) Services without Reward: Generally, only those services are included in the national income that are measured in terms of money, In other words, which are paid for. But, in real life there are several services which cannot be measured in terms of money. For example, services of lecturers in colleges are paid for, but when the same lecturers teach their own children at home they do not get any reward in return. Thus, we find that the same kind of service is rewarded and so is included in the national income under certain circumstances, but is neither rewarded nor included in the national income under different circumstance.

(iv) Double Counting: Many a time, one faces problem of double counting while estimating national income. Such double counting renders inflated the value of national income estimate falsely. With a view to avoiding the mistake of double counting one must take into account only the value of final goods while estimating national income.

(v) Income of Foreign Companies: There may be foreign companies controlling good deal of business in a country. The difficulty in such a country is how to count the income of such companies in the national income because a part of their income will go to the country of their origin as dividend and another part will remain in the country where they are operating.

(2) Practical Difficulties

The main practical difficulties in the context of national income estimate are as follows. These have special significance in under developed countries.

(i) Existence of Barter System of Exchange: Barter system continues to exist in backward regions of underdeveloped nation. Thus, goods are exchanged for goods and even services are paid in kind. Under these circumstances it becomes difficult to make correct estimate of the final goods and services produced in the country.

(ii) Unreliable Statistics: In underdeveloped countries, because of mass illiteracy no accounts are maintained in respect of production and expenditure etc. It renders the estimate of national income difficult. Besides, to evade income tax etc. Producers give false account of their income. National income estimates based on incorrect data render the accuracy of nation income estimate doubtful.

(iii) Lack of Occupational Classification: In underdeveloped countries there is no clear-cut classification of occupations. In order to earn their livelihood people have to engage themselves in more than one occupation. For instance, at the time of drought or famine, agricultural labourers go to urban areas in search of some odd jobs. It is difficult to assess as to how much income they earned from agriculture and how much from non-agricultural pursuits.

(iv) Production for Self-consumption: In predominantly agricultural underdeveloped countries like India, a large part of agricultural production is used for self-consumption. It is not recorded anywhere. Accordingly, this part is not included in the total output. It makes the correct measurement of national income all the more difficult.

17.7 PER CAPITA INCOME OR OUTPUT

For many purposes the most meaningful measure of economic well being is per capita income. It is the average income of the people of a country in a year. It is the ratio of the national income and population of the country.

$$\text{Per Capita Income} = \frac{\text{National Income}}{\text{Population}}$$

Because, GNP measures the size of the total output, it may misrepresent the changes in the standard of living of individual households in the economy. For example, GNP may rise significantly but if population is also growing rapidly per capita standard of living may be relatively constant or may even be declining. Thus, increase in real per capita income is a more appropriate measure of economic welfare.

17.8 SUMMARY

National product is the total market value of the final goods and services currently produced by a nation in one year. Whenever, output is produced somebody receives an income for producing it. Thus, corresponding to every flow of output there is an equivalent flow of factor income. The aggregate of factor income that is earned by the owners of the factors of production in producing national product in one year is called National Income. It is measured by income, value added and expenditure methods in India. There are the various conceptual and statistical problems are being faced while estimating national income.

17.9 GLOSSARY

- **National income:** National income is the sum of incomes accrued to all the factors of production - wages, interest, rent and profit received by the owners of these factors, labour, capital, land and entrepreneurship of a nation during the year.
- **Net national product at factor cost:** Net national product at factor cost is total earning of all factors of production in the form of interest, wages, rent and profit and net factor income from abroad.

- **Personal Income:** Personal Income is the total of all current income received by households from all sources.
- **Profit:** The income earned for entrepreneurship.

17.10 CHECK YOUR PROGRESS

(A) Fill in the blanks:

- Net National Product at ----- is called National Income.
- GDP is the quantum of goods and services produced multiplied by -----.
- Payment made to factors of production for their contribution is called
- can be avoided through value added method of estimating national income.
- Income method of estimating national income is also called as -----.
- In national income only ----- interest is included.

(B) Point out whether the following statement is true or false :

- Production for self-consumption is not a part of private fund consumption expenditure
- Negative net exports is deducted in the estimation of gross national expenditure.
- Per capita income is the ratio of the national income and population of the country.

(C) Find the correct combination:

National Income =

- Consumption & Savings
- Consumption & Products
- Consumption & Investment
- Savings & Investment

(D) Match the following sets correctly :

Set I

- Land
- Capital
- Establishment
- Entrepreneurship

Set II

- Wages
- Rent
- Profit
- Interest

17.11 ANSWER TO CHECK YOUR PROGRESS

- (A) (i) Factor Cost (ii) Their price (iii) Factor cost (iv) Double counting (v) Factor Payment Method (vi) Net
- (B) (i) False (ii) True (iii) True
- (C) (i)
- (D) (i) – b (ii) – d (iii)– a (iv)– c

17.12 TERMINAL QUESTIONS

- (A) **Short Answer Questions:**
1. Distinguish between GNP and NNP
 2. Explain transfer earnings
 3. What is mean by GDP?
- (B) **Long Answer Questions:**
- (1) Define national income and expenditure method of estimating it.
 - (2) Explain the method of calculating Personal Income and Disposable Income.
 - (3) What are the difficulties in calculating national income? Describe in detail.

17.13 SUGGESTED READINGS

Dillard Dudley – The Economic of John Maynere Keynes, 1960.

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Keynes, J. M., General Theory of Employment, Interest and Money, (1936).

Jhingan, M. L. Advanced Economic Theory, Vrinda Publications (P) Ltd., New Delhi.

UNIT 18-CONSUMPTION FUNCTION AND ITS DETERMINANTS

Structure

- 18.1 Introduction**
- 18.2 Consumption Function**
- 18.3 Features of Propensity to consume**
- 18.4 Technical Attributes of Consumption Function**
- 18.5 Propensity to save and Saving Function**
- 18.6 Determinants of Propensity to consume**
- 18.7 Psychological Law of Consumption**
- 18.8 Measures to Increase the Propensity to consume**
- 18.9 Cyclical and Secular Consumption Function**
- 18.10 Summary**
- 18.11 Glossary**
- 18.12 Check Your Progress**
- 18.13 Answers to Check Your Progress**
- 18.14 Terminal Questions**
- 18.15 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to understand:

- Consumption function;
- Saving function;
- Characteristics of propensity to consume;
- Determinants of propensity to consume;
- Psychological law of consumption and its implications.

18.1 INTRODUCTION

Consumption and Investment are two vital components of aggregate demand in the Keynesian Theory of Income and Employment. The amount of money that people spend out of national income on the purchase of goods and services for the direct satisfaction of their wants is called aggregate consumption expenditure or consumption. Consumption expenditure depends on several factors like income, price level, demonstration effect, etc. However, income is the most important influencing factor to the consumption. Therefore, Keynes opined that total consumption expenditure of an economy mainly depends on income, or it can be said that consumption is a function of income. Study of consumption function thus relates to the mutual relationship between aggregate consumption expenditure and national income.

18.2 CONSUMPTION FUNCTION

Consumption function or propensity to consume refers to schedule that shows the relationship between different levels of income and different levels of consumption. Just as demand schedule shows different quantities of a good demanded at different prices, consumption function shows different levels of consumption expenditure by the people at different income levels. It can be expressed in the form of following equation:

$$C = f(y)$$

Where consumption (C) is a function (f) of income (Y). Here (f) shows functional relation between consumption and income. If you are able to know the propensity to consume of the consumer then you can learn how much a person will spend on consumption out of his given income. The consumption function indicates functional relationship between consumption and determinants of consumption such as income, saving, rate of interest, windfall gains and losses, etc. This can be explained through the figure given further.

Table 18.1: Propensity to Consume (Rs. Crore)

Income (y)	Consumption (y)	Saving (s)
0	10	-10
100	100	0
200	190	10
300	280	20
400	370	30
500	460	40

Table 18.1 shows that when income is zero, people spend Rs. 10 Crore on consumption. This expenditure is met either from their past savings or by borrowing. When income increases to Rs. 100 Crore, consumption expenditure also increased to Rs. 100 Crore. Saving, therefore, is zero. Table also shows that when income increases then both consumption expenditure and saving are also increasing, but increase in consumption expenditure is less than increase in income. In Figure 18.1, income is shown of OX-axis and consumption and saving on OY-axis. AS curve is aggregate supply curve. This curve is drawn on 45° angle. This curve represents equality of aggregate income and aggregate

expenditure of the economy. CC curve is aggregate consumption curve and SS curve is saving curve. Consumption curve has constant slope. It shows that at different levels of income, propensity to consume remains constant. Consumption curve does not start from point of origin 'O'. It is so because when income is zero even then consumption expenditure is Rs. 10 Crore, as is shown in table 18.1. Consumption curve CC slopes upward from left to right. It implies that with increase in income there is also increase in consumption. At point P, income and expenditure are equal because consumption curve is intersecting aggregate supply curve AS. At this point saving will be zero; therefore, SS saving curve is touching OX-axis at point M. To the left of point P consumption curve CC is above aggregate supply curve AS. It means that consumption expenditure is more than income, therefore, saving is negative. It also explains why saving curve SS is below OX-axis before OM level of income. SM part of saving curve expresses negative saving. At the right of point P consumption curve CC is below aggregate supply curve AS. It means that consumption expenditure is less than income. In other words, saving is positive. MS part of the saving curve SS expresses positive saving.

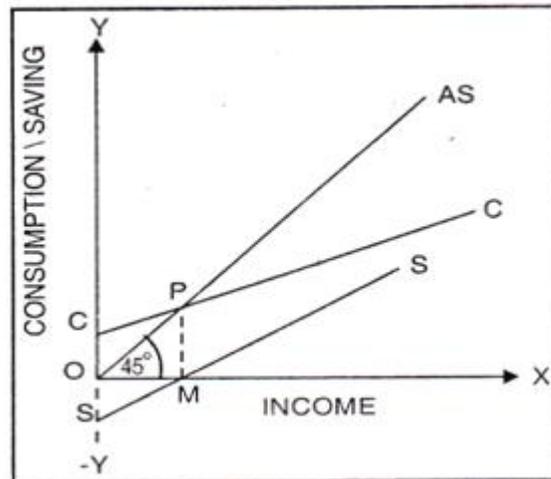


Figure 18.1

Different Shapes of Consumption Curve

Consumption curves can be of different shapes which are discussed as under :

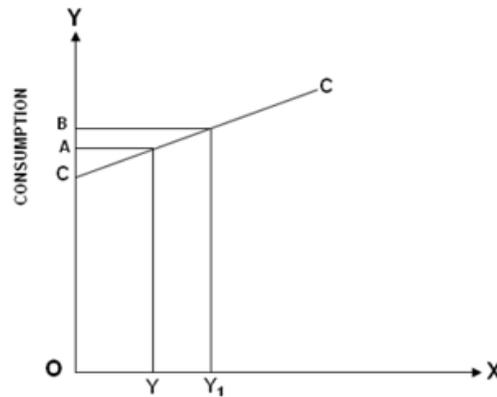


Figure 18.2

18.2.1 Linear Consumption Curve which does not start from the Point of Origin:

Consumption curve can be linear as shown in Figure 18.2. This curve does not start from the point of origin O. It shows that even when the income of the consumers is zero they are spending OC amount on consumption. That is,

$$C = C_0 + by$$

Here C_0 = autonomous consumption, which must be incurred even if income is zero, 'b' refers to marginal propensity to consume or the slope of CC curve. Marginal propensity to consume is the ratio of change in consumption as a result of change in income, i.e.,

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

CC curve also shows that when income increases from OY to OY₁, then consumption expenditure increases from OA to OB. But AB increase in consumption curve CC, that is, marginal propensity to consume (MPC) is constant, but it is not equal to average propensity to consume (APC). Average propensity to consume (APC) is the ratio of consumption to total income i.e. $APC = \frac{C}{Y}$

In this, APC is diminishing but it is more than (APC > MPC). Such a consumption curve is found in the short period.

18.2.2 Linear Consumption Curve which starts from the Point of Origin : In Figure 18.3, consumption curve starts from the point of origin O. It shows that consumption increases or decreases in the same proportion as the income increases or decreases. When income is zero, consumption expenditure is also zero; i.e. $C = bY$. Here, marginal propensity to consume remains constant. OC consumption curve shows that marginal and average propensity to consume are equal to each other (APC = MPC), i.e., APC is also constant. Such a consumption

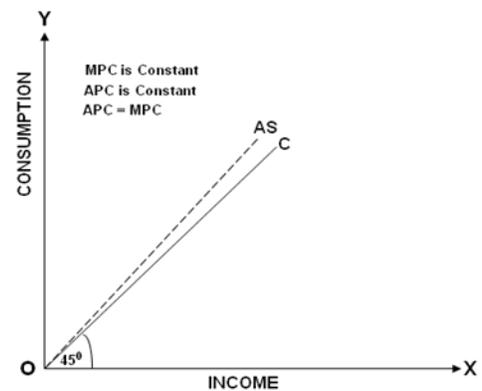
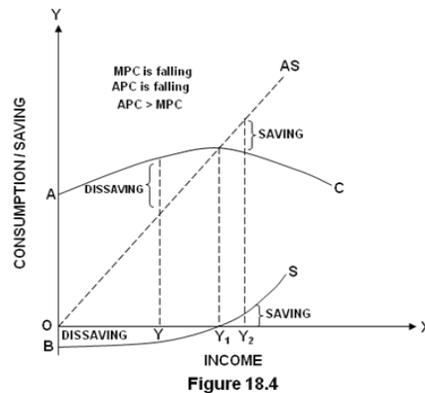


Figure 18.3

curve is found in the long period.

18.2.3 Non-linear Consumption Curve : As shown in Figure 18.4 consumption curve can be non-linear. In this figure, AC curve is a non-linear consumption curve and BS curve is a non-linear saving curve. In this case, marginal propensity to consume does not remain constant; rather it goes on falling with increase in income. According to Keynes, consumption curve must conform to this shape, but most of the followers of Keynes recognize only linear consumption curve. Non-linear consumption curve which does not start from point of origin 'O' is a short period consumption curve.



18.3 FEATURES OF PROPENSITY TO CONSUME

Following are the main characteristics of propensity to consume:

- (i) **Psychological Concept:** Propensity to consume is a psychological concept. It is influenced by many subjective factors like, tastes of a man, his habits, etc. These factors remain constant in the short period. As such, propensity to consume remains constant in the short period.
- (ii) **Unequal Propensity to Consume:** Propensity to consume of the poor class is greater than the propensity to consume of the rich class. The reason being, that due to low income of the poor they are forced to spend their entire income on consumption; whereas the income of the rich class being more they meet their entire consumption expenditure by spending only a part of it.
- (iii) **Income and Employment depend on Propensity to Consume:** Income and employment are directly related to propensity to consume. With increase in propensity to consume there is increase in total consumption, as a result of it there is increase in income and employment. Contrarily, with decrease in propensity to consume there is decrease in total consumption, as a result, there is decrease in income and employment.
- (iv) **Consumption in the short-run:** Consumption expenditure in the short run depends on autonomous consumption and marginal propensity to consume. Autonomous consumption means that minimum consumption that an individual must make even when his income is zero. Hence,

$$C = C_0 + by$$

You are already aware that in this equation, C = Consumption expenditure; C_0 = autonomous consumption; b = marginal propensity to consume; Y = income. On the basis of this equation, you can find that in the short period, consumption (C) increases less than increase in income. Hence, propensity to consume goes on falling with increase in income.

- (v) **Long run Consumption Function:** In the long run, consumption depends entirely on marginal propensity to consume. It is because in the long run, no individual can

spend without income. As such, there is no autonomous consumption in the long run. Hence,

$$C = by$$

In the long-run, propensity to consume does not fall with increase in income. It remains constant.

18.4 TECHNICAL ATTRIBUTES OF CONSUMPTION FUNCTION

Consumption function or propensity to consume is of two kinds:

(a) Average Propensity to Consume

Suppose the national income of India in 2011 was Rs. 1,000 Crore. Out of it, Rs. 800 Crore were spent on consumption. It means that Indians spent $800/1000 = 80$ percent of the income on consumption, called as average propensity to consume. Thus, the ratio of total consumption expenditure to total income is called average propensity to consume. It explains what part of their total income people will spend on consumption.

Average propensity to consume can be explained with the help of the following formula:

$$\text{Average propensity to consume} = \text{Consumption} \div \text{Income or APC} = C \div Y$$

For instance, if out of a total income of Rs. 100 Crore, a sum of Rs. 80 Crore is spent on consumption then $APC = \frac{C}{Y} = \frac{80}{100} = \frac{8}{10} = 0.8$. Average propensity to consume can be expressed in the form of a table as under.

Table 18.2: Average Propensity to Consume

Income (Rs.)	Consumption Expenditure	$APC = \frac{C}{Y}$
100	80	$\frac{80}{100} = 0.8$
200	120	$\frac{120}{200} = 0.6$

It is clear from the above table that average propensity to consume can be calculated by dividing total consumption expenditure by total income. APC is also expressed diagrammatically, as shown in Figure 18.5. In this figure, income is shown on OX-axis and consumption on OY-axis. CC is consumption curve. This curve indicates that at point A, $APC = \frac{C}{Y} = \frac{80}{100} = \frac{8}{10} = 0.8$ and at point B, $APC = \frac{120}{200} = 0.6$. As this curve is sloping upwards, APC is falling.

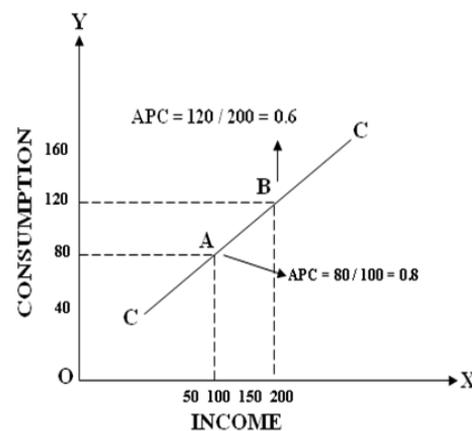


Figure 18.5

(b) Marginal Propensity to Consume

Supposing the national income of India increases from Rs. 1000 Crore to Rs. 1200 Crore and consumption expenditure increases from Rs. 800 Crore to Rs. 900 Crore, then the ratio of change in consumption expenditure by Rs. 100 Crore as a result of change in income by Rs. 200 Crore will be called marginal propensity to consume (MPC). Here, India's MPC will be $100/200=0.5$ or 50 percent.

Thus, "The Marginal Propensity to consume may be defined as the change in consumption expenditure, divided by the change in income that causes it."

Marginal propensity to consume is explained with the help of the following formula:

Marginal Propensity to Consume = Change in Consumption / Change in Income

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

For example, if income increases from Rs. 100 Crore to Rs. 200 Crore then change in income is of Rs. 100 Crore ($\Delta Y = \text{Rs. } 200 \text{ Crore} - \text{Rs. } 100 \text{ Crore}$). On account of change in income consumption increase from Rs. 80 Crore to 120 Crore. Thus, change in consumption is of Rs. 40 Crore ($\Delta C = \text{Rs. } 120 \text{ Crore} - \text{Rs. } 80 \text{ Crore}$).

Hence,

$$\text{MPC} = \frac{\Delta C}{\Delta Y} = \frac{\text{Rs. } 40 \text{ Crore}}{\text{Rs. } 100 \text{ Crore}} = 0.4$$

Table 18.3 and Figure 18.6 further illustrate the concept of Marginal Propensity to Consume.

Table 18.3: Marginal Propensity to Consume

Income	ΔY	Consumption	ΔC	$\text{MPC} = \frac{\Delta C}{\Delta Y}$
100		80		
200	$200-100=100$	120	$120-80=40$	$\frac{40}{100} = 0.4$
300	$300-200=100$	150	$150-120=30$	$\frac{30}{100} = 0.3$

In Figure 18.6 income is shown on OX-axis and consumption on OY-axis. CC is consumption curve. Marginal propensity to consume shown by point 'A' on this curve = $\frac{\Delta C}{\Delta Y} = \frac{40}{100} = 0.4$.

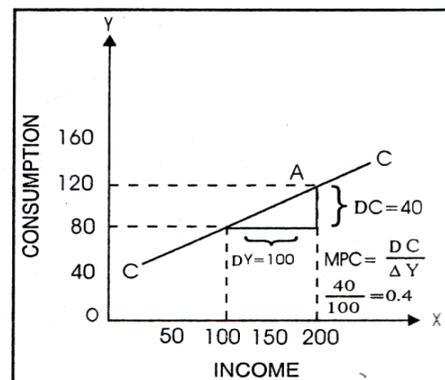


Figure 18.6

Characteristics of MPC

Main characteristics of the concept marginal propensity to consume are as follow:

(i) It is always Positive: Marginal propensity to consume is always positive. It means that consumption expenditure must increase when there is increase in income. It is not possible that increase in income may lead to fall in consumption expenditure.

(ii) Generally it is greater than zero and less than Unity: Marginal propensity to consume is generally greater than zero and less than unity. It is so because with an increase in income there must be some increase in consumption. However, only a part of the increased income will be spent on consumption.

The entire income is not spent on consumption; hence marginal propensity to consume is less than unity. It can be expressed in the form of an equation as follow:

$$\frac{\Delta C}{\Delta Y} > 0; \frac{\Delta C}{\Delta Y} < 1$$

It will be read as: Marginal propensity to consume is greater than zero $\left(\frac{\Delta C}{\Delta Y} > 0\right)$ but less than unity $\left(\frac{\Delta C}{\Delta Y} < 1\right)$

(iii) MPC of the poor class is Higher: Marginal propensity to consume of the poor class is higher than marginal propensity to consume of the rich class. It is so because the income of the poor class is low and this class spends a large part of increased income on consumption. Likewise, marginal propensity to consume in the underdeveloped countries is higher than the developed countries.

(iv) Constant MPC in the long period: Marginal propensity to consume tends to remain constant in the long run. It means that change in income is followed by change in consumption almost in the same ratio.

(v) Falling MPC in the short period: Marginal propensity to consume tends to fall with increase in income in the short run. It means that ratio of increase in consumption in the short period is less than increase in income.

(vi) MPC can be greater than unity in abnormal conditions: Those who are extremely poor have more expenditure than income. Their marginal propensity is greater than unity $\left(\frac{\Delta C}{\Delta Y} > 1\right)$. They are obliged to borrow.

18.5 PROPENSITY TO SAVE AND SAVING FUNCTION

Another concept corresponding to propensity to consume is propensity to save. Propensity to save is a schedule showing the relation between income and saving at different levels of income. According to Keynes, saving is also a function of income.

Saving increases with increase in income and decreases with decrease in income, i.e. saving is income elastic.

$$S = f(Y)$$

It will be read: Saving (S) is a function (f) of income (Y).

As per definition, "Saving function or propensity to save may be defined as a schedule showing amounts that will be saved at different levels of income." -----**Peterson**

(a) Kinds of Propensity to Save

Like propensity to consume, propensity to save is also of two kinds:

(i) Average Propensity to Save: Average propensity to save is the ratio of saving to income at a given level of income. That is,

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

Income is either consumed or saved, hence

$$C + S = Y$$

$$\frac{C}{Y} + \frac{S}{Y} = 1 \text{ or } APC + APS = 1$$

It is thus clear that at each level of income, aggregate of APC and APS will be unity. Suppose APC is 0.8 then APS will be 0.2. $APC + APS = 0.8 + 0.2 = 1$.

Note: Negative saving refers to the saturation when consumption exceeds incomes. $Y = C + S$. Obviously, S is negative only when $C > Y$. This happens when the minimum level of consumption exceeds the level of income.

(ii) Marginal Propensity to Save : Marginal propensity to save is the ratio of change in saving to change in income. That is,

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

(Here ΔS = change in saving ; ΔY = change in income)

(b) Relation between MPC and MPS

Marginal propensity to consume is less than unity. It means that part of increase in income which is not spent on consumption is equal to saving. Thus, the total of marginal propensity to consume and marginal propensity to save is equal to unity. Or,

$$MPS + MPC = 1, \text{ Or } MPS = 1 - MPC, \text{ Or } \frac{\Delta S}{\Delta Y} = 1 - \frac{\Delta C}{\Delta Y}$$

If one-half of the increase in income is spent on consumption then $MPC = \frac{1}{2}$

As such $MPS = 1 - MPC = 1 - \frac{1}{2} = \frac{1}{2}$

(c) Relationship between APC and APS

Following relationship show that how $APC + APS = 1$.

As you know that,

$C + S = Y$ (Income is either saved or consumed)

Dividing both sides of the equation by Y, you will get,

$$\frac{C}{Y} + \frac{S}{Y} = \frac{Y}{Y} \text{ or } APC + APS = 1$$

18.6 DETERMINANTS OF PROPENSITY TO CONSUME

Determinants of propensity to consume may be broadly classified as:

18.6.1 Subjective Factors

Subjective Factors are those factors which relate to psychological characteristics of human nature and social practices and institutions. These factors relate to the circumstances when individuals and business institutions would consume less and save more. These factors determine the position and slope of consumption curve. These factors are divided into two parts:

(i) Individual Factors

Following factors influence consumption and saving of an individual:

- (1) **Foresightedness:** Future is uncertain. Hence individuals gifted with foresight always save in order to fulfill their anticipated future needs, cutting down their consumption.
- (2) **Economic Independence:** Some individuals spend less and save more so that they may not depend on others financially.
- (3) **Enlarged Income in Future:** People also save more and consume less so that they may invest their saving and earn more wealth or lend it and earn interest.
- (4) **Occupation Motive:** In order to start a new occupation people save more and spend less.
- (5) **Providing a better Fortune:** Some people save more and spend less in order to provide a better fortune for the children.
- (6) **Miserliness:** Some people are miserable by nature. Hence, they tend to save more and consume less.
- (7) **Status in the Society:** In the present day world, man's status in the society is governed by the wealth that he possesses. No wonder, people accumulate wealth by saving more and spending less.
- (8) **Precautionary Motive:** People save to meet unforeseen contingencies and spend less on consumption.

(ii) Business Factors

Subjective factors influencing saving and consumption of business sector are as under:

- (1) **Extension of Business:** Business firms affect savings in order to accumulate capital for the extension of their business.
- (2) **Liquidity Preference:** In order to face future contingencies, business firms prefer to hold their wealth in cash form and curtail their consumption expenditure.

- (3) **Financial Prudence:** Careful businessmen always lay aside money to meet depreciation and obsolescence of their machines.
- (4) **Modernization:** Business firms save more in order to install new machines in place of outdated ones.

In the short period, psychological factors remain stable. As Keynes himself observes, “Those psychological characteristics of human nature and those social practices and institutions which, though not unalterable, are unlikely to undergo a material change over a short period of time except in abnormal or revolutionary circumstances.”

(iii) Objective Factors

Under the impact of objective factors propensity to consume undergoes such a change that consumption curve shifts upwards or downwards. In other words, there is change in consumption curves. These factors are as under:

- (1) **Change in Money Income:** When income increases consumption also increases and when income decreases consumption also decreases. However, consumption increases less than increase in income. It is so because after the basic needs of the people are fulfilled, they are in a position to save more and more.
- (2) **Change in Real Income:** When prices of goods fall then value of the monetary income of the people rises. In other words, their real income increases. Consequently, they begin to spend more on consumption. When prices of the goods rise then the value of monetary income falls. In other words, real income of the people decreases and consequently their consumption expenditure also decreases.
- (3) **Change in the Distribution of Income:** Propensity to consume is also influenced by the change in the distribution of income. If the distribution of income is equal, propensity to consume will be more. On contrary, if the distribution of income is unequal, rich people will have a large chunk of national income. Hence, propensity to consume will be less because the rich people have less propensities to consume than the poor people.
- (4) **Windfall Gains and Losses:** Propensity to consume increases as a result of windfall gains and decreases as a result of windfall losses.
- (5) **Financial Policy of the Corporations:** Propensity to consume is also influenced by the financial policy of the corporations. If the policy of the corporation is to distribute the entire profit among the shareholders then propensity to consume will increase. On the other hand, if the entire profit is not distributed among the shareholders and a part of it, is kept as a reserve then the income of the shareholders will remain restricted, restricting their propensity to consume.

- (6) **Change in Expectations:** People's expectations regarding future events also influence their propensity to consume. If people apprehend war or shortage of goods in future, they will start stock-piling of the goods in the present with the result that propensity to consume will increase.
- (7) **Fiscal Policy:** If the government adopts such as fiscal policy as levying of progressive taxes or large-scale spending on social security schemes then there will be a tendency for more equitable distribution of income. Equitable distribution leads to higher propensity to consume.
- (8) **Change in the Rate of Interest:** Change in the rate of interest may also cause change in the propensity to consume. But, it cannot be said whether propensity to consume will rise or fall. It is possible that rise in the rate of interest may induce the people to save more and consume less and fall in it may serve as a disincentive to save and encourage consumption. On contrary, it is also possible that those who want a fixed income by way of interest may save more and consume less when the rate of interest is low and save less and consume more when the rate of interest is high. It is certain that change in the rate of interest will have its effect on the propensity to consume.
- (9) **Wages:** Classical economists held the view that wage-cut leads to higher propensity to consume. Their argument was that reduction in wages would bring about reduction in prices and hence increase in propensity to consume. But, according to Keynes, theory of wage-cut may be relevant to the workers of a firm, but its application to the entire economy will be counter-productive. As a matter of fact, wage-cut has an adverse affect on propensity to consume. On account of wage-cut, income of the labourers and the poor goes down and distribution of income goes in favour of the rich whose propensity to consume is low. Consequently, propensity to consume falls, on the whole.
- (10) **Liquid Assets:** Neo-classical economists, especially Pigou, are of the opinion that when prices fall, real balances of those who possess large number of liquid assets (such as cash, saving accounts, government bonds or shares) tend to increase. As such, they will spend more and their propensity to consume will increase. It is called Pigou Effect or Real Balance Effect. Modern economists, particularly Keynes, have criticized it.

According to Keynes (i) most of the people do not have cash money or bank deposits (ii) Even if you assume that people have cash balances they may like to multiply it instead of spending it on consumption. Hence, they will spend less of it. It cannot therefore be said with certainty that propensity to consume will increase, as envisaged by Pigou.

- (11) **Social Security and Life Insurance:** In order to secure their lives, people contribute a part of their income towards provident fund or towards payment of installments of life insurance premium. As such, their propensity to consume falls.
- (12) **Attraction of New Products:** When any new products appear in the market, people buy it in large quantity. Arrival of new products in the market has its demonstration effect due to which propensity to consume increases.
- (13) **Credit and Installment Facilities:** If people get credit and installment facilities for the purchase of goods, their propensity to consume will increase, because they start making liberal purchases.
- (14) **Expectations of Future Income:** Propensity to consume also depends on expectations of future income. If people expect more income in future then they will save less and spend more out of the current income increasing their propensity to consume. On the contrary, if they expect less income in future their propensity to consume in present will fall.
- (15) **Availability of Goods:** If the supply of certain commodities is rationed, then people cannot consume more than the fixed quantity of the concerned commodities. Possibility of more expenditure on consumption will become remote and propensity to consume decreases. On the contrary, if new products are available in any quantity, the propensity to consume will tend to rise.
- (16) **Development of the Means of Transport:** Propensity to consume is also influenced by the development of the means of transport. When goods are easily available in all parts of the country propensity to consume is bound to increase.
- (17) **Stock of Consume Durables:** When people already have stock of consumer durable like refrigerator, cooler, air-conditioner, TV set, computer, furniture, etc. they will have no desire to buy any more of them. Hence, propensity to consume will fall.
- (18) **Change in Fashion and Tastes:** Change in fashion and tastes of the people also cause change in propensity to consume. A fashion that is widely prevalent encourages propensity to consume.
- (19) **Change in Population:** Increase in population means increase in aggregate demand and as a result propensity to consume also increases. Change in the composition of population also influences consumption function. If the number of young persons increases as against old persons, the propensity to consume will increase.
- (20) **Stable and Variable Income:** It is observed that those persons who have variable income (agriculturists) usually have less propensities to consume than those having stable income.

18.7 PSYCHOLOGICAL LAW OF CONSUMPTION

The law propounded by Keynes on the relationship between aggregate consumption and income is called Keynes' Fundamental Law of Consumption or Psychological Law of Consumption. According to this law when income increases consumption also increases but increase in consumption is less than increase in income. In the words of Keynes, "The Psychology of the community is such that when aggregate real income is increased, aggregate consumption is also increased, but not by so much as income."

18.7.1 Assumptions

Keynes' Psychological Law is based on the following three assumptions.

- (1) **No change in Psychological and Institutional Complex:** It implies that except change in income there is no change in psychological and institutional complex, such as, population, habits of the people, tastes, fashions, custom, distribution of income, process, etc.
- (2) **Normal Conditions:** It implies that there is no danger of war or cold war, depression, boom, political upheaval, revolution, etc. In other words, this law applies under normal conditions alone.
- (3) **Prosperous Capitalist Economy based on Laissez-faire:** The law applies to free and prosperous economy. It means that the law does not hold good in case of socialist and underdeveloped economies. In a free economy people can consume goods according to their needs and desires. There is no government interference in the economic affairs.

18.7.2 Explanation

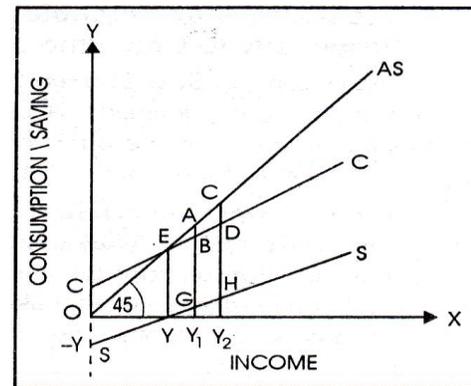
The law is explained with the help of Table 18.4 and Figure 18.7 given further.

Table 18.4: Psychological Law of Consumption

Income (Y) (Rs. Crore)	Consumption (C) (Rs. Crore)	Saving (S) (Rs. Crore)
0	50	-50
50	75	-25
100	100	0
150	125	25
200	150	50
250	175	75
300	200	100
350	225	125

It is clear from the above table that proportionate increase in consumption is less than proportionate increase in income. Initially, when income is low, the consumer meets his consumption expenditure either by drawing on past savings or by borrowing. Subsequently, you will find that increase in consumption observes a diminishing rate. In Figure 18.7 income is shown on OX-axis and consumption/saving on OY-axis. CC, is a consumption curve and SS is a saving curve. AS is aggregate supply curve. When income is zero, consumption is more than zero, i.e. OC and saving is negative. When the level of income is OY then consumption is equal to income and so saving is zero. Afterwards, when income increases to OY₁ level then consumption increases to BY₁, and saving is GY₁, (AB). As income increases further to OY₂ level, consumption expenditure also rises to DY₂ and saving increases to HY₂ (CD). It is clear that proportionate increase in consumption is less than the proportionate increase in income; consequently, saving goes on increasing.

Figure 18.7



18.8.3 Propositions of the Law

It is evident from the above table and figure that there are three main propositions of the psychological law of consumption:

- (1) **Increased aggregate income leads to increased aggregate consumption but by a somewhat smaller amount:** When there is increase in aggregate income there is increase in aggregate consumption also, but increase in consumption is less than increase in income. The reason is that when the basic needs of the people are fulfilled then additional income attracts less consumption. Consequently, more saving leads to less consumption and more saving.
- (2) **Increased income is divided between consumption and saving:** This proposition is based on the first one. When aggregate income increases then increase in consumption is less than proportionate increase in income. That part of income which is not spent is called saving. It is therefore said that increase in income is divided between consumption and saving.

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

- (3) **An increase in aggregate income is unlikely to lead either to less consumption or less saving than before:** It implies that increase in aggregate income will lead to increase in saving and consumption. It is impossible that saving and consumption may fall when income rises.

Of the three propositions of Keynes' Law, the first one is most important and fundamental. The other two propositions are its natural corollaries.

Importance of Consumption Function

The following details would give you an idea about the significance of Consumption Function.

- (1) **Strategic importance of Investment:** This law explains the strategic significance investment in an economy. As you know, income or employment depends on consumption and investment. In the short-run, consumption remains constant, hence to increase employment it is necessary to increase investment. It is very essential to make investment in the economy equivalent to the difference between income and expenditure, otherwise demand will remain deficient and unemployment will spread in the economy.
- (2) **Possibility of General Over-production and Unemployment:** According to this law, with increase in aggregate income, consumption expenditure does not increase as much as the income increases. It means, there are some goods in the economy which do not have any buyer. Marginal propensity to consume being less than unity also testifies to the fact that total output produced in the country is not bought. Hence, there is always a possibility of over-production. General over-production leads to general unemployment.
- (3) **Refutation of Say's Law:** Keynes' Psychological Law of Consumption refutes Say's Law of Markets. According to Say, "supply creates its own demand." In other words, marginal propensity to consume is equal to unity. But, according to Psychological Law of Consumption, marginal propensity to consume is less than unity, that is, the demand for consumption does not increase in the same ratio in which income or supply does. It is, therefore, not necessary that aggregate demand should always be equal to aggregate supply.
- (4) **Decline in Marginal Efficiency of Capital:** The law also corroborates the hypothesis to declining marginal efficiency of capital. When on account of increase in investment there is increase in income and output, people do not increase their consumption in the same proportion as the increase in income. As a result, aggregate demand falls. Deficiency of aggregate demand compels the producers to sell their unsold products at low price. It lowers the expected profitability which leads to fall in marginal efficiency of capital.
- (5) **Under-employment Equilibrium:** Psychological Law of Consumption can also explain the possibility of under-employment equilibrium. Under-employment equilibrium refers to that situation in which aggregate demand becomes equal to aggregate supply before reaching the level of full employment. It happens when aggregate demand tends to fall to become equal to aggregate supply at the level lower than full employment. There are two reasons of fall in aggregate demand: (a) fall in investment due to fall marginal efficiency of capital; (b) consumption does not increase in the same ratio as the income does. On account of falling consumption and investment, aggregate demand matches aggregate supply prior to the full employment level.
- (6) **Over-Saving Gap:** The law also explains the over-saving gap found in advanced economies. In these economies income increases rapidly but increase in consumption expenditure is less than increase in income. Hence, saving goes on accumulating. On account of excessive increase in saving, aggregate demand falls short of aggregate supply. Excessive saving leads to depression and unemployment according to Keynes.

- (7) **Turning Points of Trade Cycles:** On the basis of this law, you can explain the turning point to trade cycles. When a trade cycle reaches at the highest limit, income is the maximum but consumption lags behind. Consequently, demand for goods falls and the trade cycle takes a downward turn. When it reaches at the lower limit, income falls considerably but people try their best to maintain their previous standard of living. So that, consumption expenditure does not fall as much as income does. Demand cannot fall beyond a minimum level. Hence, trade cycle once again takes an upward turn.
- (8) **Secular Stagnation:** The Law also offers an explanation of secular stagnation. According to this law, consumption expenditure increases less than increase in income. Consequently, saving increases rapidly. A time comes when the entrepreneurs do not find enough opportunities to invest large savings. From investment point of view, economy reaches saturation point. When there is no investment, level of employment cannot be maintained. This state is called secular stagnation.
- (9) **State Intervention:** The law also refutes laissez-faire policy. Because of consumption falling short of income, self-adjustment in the economy is not possible. State intervention becomes inevitable in case of depression or boom.
- 10) **Unique process of Income Generation:** Concept of marginal propensity to consume is the under-current of the process of income generation. An initial investment in the economy results into increase in income which is many times more than increase in investment called multiplier. The concept of multiplier is based on marginal propensity to consume. That is,

$$K(\text{Multiplier}) = \frac{1}{1 - \text{MPC}}$$

Higher the marginal propensity to consume, greater is the size of multiplier, that is, increase in income will be more. You came to know marginal propensity to consume is less than unity. Hence, the process of income generation is not unending. When initial investment is made, then because of leakages in it, income does not increase as much as it could. If marginal propensity to consume is unity, then the process of income generation will be unending, on account of which economy will transcend the full employment state and enter into an explosive situation.

- (11) **Inducement to Invest:** According to this law, marginal propensity to consume is more in underdeveloped countries, so the opportunities of investment in these countries are also numerous. No wonder these countries have enough opportunities of investment.

18.8 MEASURES TO INCREASE THE PROPENSITY TO CONSUME

In order to increase income and employment it is also necessary to raise the propensity to consume. In the words of Keynes, “While aiming at a socially controlled rate of investment with a view to a progressive decline in the marginal efficiency of capital, I should support at the same time all sorts of policies for increasing the propensity to consume.” Main measures to raise the propensity to consume are as under:

- (1) **Redistribution of Income:** Propensity to consume among of the poor people is more than that of the rich class. Hence, if income is redistributed in a manner that some part of the income of the rich is transferred to the poor, the marginal propensity to consume will rise.
- (2) **Social Security:** People save some part of their current income for the old-age or to tide-over unemployment period or for medical-care during illness, etc. If government or any other social institution provides unemployment allowance or old-age pension or social insurance facilities to people then their marginal propensity to consume will increase. In the words of Kurihara, “In the wealthy-industrial countries there is increasing recognition that an extensive system of social security is needed for achieving a high consumption or low-saving economy. A social security programmes is considered as a solution to the paradox of thrift, common to all wealthy capitalist countries.”
- (3) **Credit Facilities:** If people get credit facilities for buying consumer durables like car, TV, air conditioner, computer, etc. their marginal propensity to consume will increase.
- (4) **Wage Policy:** Propensity to consume can be raised by pursuing appropriate wage policy. This measure needs be studied in the context of (i) short period and (ii) long period. In the short period if wages are increased then it is possible that consumption may increase for once but propensity to consume will not increase. It is so because in the short-period productivity of the labourers does not increase, hence increased wages will tend to raise cost of production and employers will employ less number of labourers. Thus, unemployment will increase and propensity to consume will fall. But, in the long-run increased wages will be accompanied by increased marginal productivity and there will be neither rise in cost of production nor will the profits of the entrepreneurs fall. As such income and employment will not fall. In long run, therefore, such a wage policy should be followed as may transfer the income of the non-labour class to the labour class. It can be done by levying more progressive taxes. As a result of it propensity to consume will increase.
- (5) **Increase in Population:** Demand for all commodities increase with increase in population. Propensity to consume will rise accordingly.
- (6) **Demonstration Effect:** Propensity to consume also increases under the impact of demonstration effect. People belonging to poor class begin to consume the same goods as are used by the rich people. They spend large sums of their income on speculation resulting into high propensity to consume. Demonstration effect is stimulated through media.
- (7) **Urbanisation and Colonisation:** Urban people have higher propensity to consume than rural people, because in urban areas there are many avenues of conspicuous consumption. Urbanisatic and colonisation will therefore stimulate the propensity to consume.
- (8) **Advertisement:** In modern times, advertisement and publicity are considered as important means to encourage propensity to consume. If expenditure on advertisement is made in an organised way, it will promote propensity to consume.

In modern times, industrialists spend a lot on the advertisement and publicity of their products. As a result of it consumers will come to know the new products and they are tempted to buy the same. It favourably influences propensity to consume.

- (9) **Means of Transport:** If cheap means of transport are developed then goods can be moved from one place to the other easily and their prices can also fall. Consequently, propensity to consume may increase.

18.9 CYCLICAL AND SECULAR CONSUMPTION FUNCTION

Psychological law of consumption says that when income increases consumption also increases but by less than the increase in income. It means that increase in income is followed by decrease in marginal and average propensity to consume. With a view to verifying the authenticity of this law, the economists have compiled short term and long term statistical data relating to income and consumption. On the basis of factual data they concluded that this concept is valid in the short-run but has little relevance in the long-run. In other words, in the long run, increase in income does not lead to fall in marginal and average propensity to consume. It remains constant in the long-run. In order to know the real nature of propensity to consume, you must study both short-run and long-run consumption function.

(a) Cyclical Consumption Function

Lord Keynes had propounded only short-run consumption function. According to him following relations are found between income and consumption in the short period:

- (i) **No proportional relation between Consumption and Income:** Keynes believed that change consumption is not in the same proportion as change in income. Upto a limit, consumption expenditure is more than income. After that limit, consumption expenditure becomes equal to income and subsequent to that as income goes on increasing consumption expenditure goes on diminishing. It can be expressed through the following equation which has already been explained and discussed earlier.

$$C = C_0 + bY$$

Supposing $C_0 = \text{Rs. } 100 \text{ Crore}$; $b = 0.5$; and $Y = \text{Rs. } 100 \text{ Crore}$

$$C = 100 + 0.5 \times 100 = 100 + 50 = \text{Rs. } 150 \text{ Crore}$$

If income increases four times i.e. $\text{Rs. } 400 \text{ Crore}$ then

$$C = 100 + 0.5 \times 400 = 100 + 200 = \text{Rs. } 300 \text{ Crore}$$

It means increase in consumption is less than proportionate increase in income. In Figure 19.2, CC consumption curve expresses short-run consumption function.

- (ii) **Declining MPC and APC:** Second feature of consumption function is that as income increases, marginal propensity to consume and average propensity to consume go on declining.
- (iii) **APC is greater than MPC:** Third feature of short-run consumption function is that average propensity to consume is greater than marginal propensity to consume, that is, $APC > MPC$.

Many economists like, Tobin, Smithies, etc. compiled statistics regarding income and consumption pertaining to a short period ranging from 1929 to 1940. These statistics confirmed Keynes' concept that short-run consumption function is non-proportional.

(b) Secular Consumption Function

Relationship between income and consumption over a period of about 100 years or more is called long-run or secular consumption function. Prof. Kuznets, Goldsmith, Duesenberry, Friedman, etc. concluded on the basis of long-run statistics of income and consumption that in the long run there is a proportional relation between income and consumption. Secular consumption function has the following features:

- (i) Proportional Relationship between C and Y:** In the long run, there is proportional relationship between consumption and income. It implies that in the long run consumption changes in the same proportion as change in income. It can be expressed in the form of an equation as under:

$$C = bY$$

It means there is no autonomous consumption (C_0) in the long run. There is a constant relationship between consumption and income and it is governed by marginal propensity to consume i.e. by the value of 'b'.

Supposing, $b = 0.5$ and $Y = \text{Rs. } 100 \text{ Crore}$

$$C = 0.5 \times 100 = \text{Rs. } 50 \text{ Crore}$$

If income increases 4 times i.e. Rs. 400 crore, then consumption will also increase in the same proportion, that is $C = 0.5 \times 400 = \text{Rs } 200 \text{ crore}$. Fourfold increase in income is accompanied by fourfold increase in consumption. In Fig. 3, CC curve represents long run consumption function.

- (ii) Constant APC and MPC:** Long-run average propensity to consume and marginal propensity to consume remain constant. There is no fall in them when income increases.
- (iii) APC and MPC are equal:** In the long-run, average propensity to consume and marginal propensity to consume are equal ($APC = MPC$).

(c) Criticism of Propensity to Consume

Keynes' concept of propensity to consume has been severely criticized by modern economists like **Hutt, Hazlitt**, etc. on the following grounds:

- (1) No proper use of the word Propensity:** To propensity means tendency only, while Keynes has used the term propensity to express a given part of the income. Besides, propensity to consume does not represent the entire amount of expenditure out of a given income. That part of the income which is spent on capital goods cannot be included in consumption.
- (2) Simple Truism:** Keynes says that poor people have greater propensity to consume and rich have greater propensity to save. Nothing is new in it. Everybody knows that because of its low-income poor spends all its income on consumption whereas because of high income rich class does not spend all its income on consumption.

- (3) **Unrealistic:** Hazlitt had also proved that the theory did not stand the test. He made it clear with the help of consumption, income and saving statistics of America for the period 1944-55 that despite increase in income there was decrease instead of increase, in saving.
- (4) **Not Secular:** The law has also been criticised on the ground that it is only a short-period law. In the long period, psychological and institutional factors also undergo change. As such, the law does not apply to secular period.
- (5) **It is a Fraud:** Hazlitt treats this law as a fraud. Its expression in mathematical equation cannot impart precision to it. It is a vague concept.

In short, notwithstanding the criticism by Hazlitt, modern economists acknowledge that the concept of consumption function is the most important parameter of Keynesian Economics. It is through this concept that Keynes highlights the reality that the consumption expenditure does not increase in the same proportion as the income does. Hence, effective demand falls. Deficiency of effective demand is the sole cause of unemployment in a country. It is therefore essential that in order to maintain full employment condition in the country, propensity to consume should not be allowed to decrease. If propensity to consume declines, it should be counterbalanced by increase in investment.

18.10 SUMMARY

Consumption and Investment are two main components of aggregate demand. The amount of money that people spend out of national income on the purchase of goods and services for the direct satisfaction of their wants is called aggregate consumption expenditure or consumption. Consumption expenditure depends on several factors like income, price level, demonstration effect, etc. However, income is the most important influencing factor to the consumption. According to Ackley Gardner, "If we view the whole history, it is obvious the consumption fluctuates in proportion to income." Its main reason is that in the long run psychological and institutional factors undergo a change. Most significant difference between long-run and short-run propensity to consume is, that in the long run marginal propensity to consume is equal to average propensity to consume ($MPC = APC$). Hence, at each level of income in the long-run people tend to consume a constant fraction of it. However, in the short-run, MPC is less than APC ($MPC < APC$), as such, when income increases APC decreases.

18.11 GLOSSARY

- **Consumption function:** Consumption function or propensity to consume refers to schedule that shows the relationship between different levels of income and different levels of consumption.
- **Subjective Factors:** Subjective Factors are those factors which relate to psychological characteristics of human nature and social practices and institutions.

18.12 CHECK YOUR PROGRESS

- (A) **Fill in the blanks :**

- (i) Propensity to consume refers to schedule that shows the relationship between different levels of income and
- (ii) In the equation $C = f(y)$, f denotes
- (iii) Marginal Propensity to consume is generally greater than
- (iv) The Psychological Law of consumption assumes that when aggregate income increases then increase in consumption is less than increase in income.
- (v) induce people to spend more on consumer durables.
- (vi) There is no consumption in the long run.

(B) State whether the following statements are true or false:

- (i) Average Propensity to consume (APC) is the ratio of consumption to total income.
- (ii) Propensity to consume of the rich class is greater than that of the poor class.
- (iii) Business men save money in order to accumulate funds for the expansion of business.
- (iv) The Psychological law of consumption applies under normal conditions alone.
- (v) Productivity of labour tends to increase in short period.
- (vi) Upto a certain limit consumption expenditure is less than income.

18.13 ANSWERS TO CHECK YOUR PROGRESS

- (B)** (i) Different levels of consumption (ii) functional relation between consumption and income (iii) zero (iv) proportionate (v) credit facilities (vi) Autonomous
 (i) True (ii) False (iii) True (iv) True (v) False (vi) True

18.14 TERMINAL QUESTIONS

1. What do you understand by the term consumption function? Give its main features.
2. Distinguish between Marginal propensity to consume and Average propensity to consume. Discuss the factors which determine the propensity to consume.
3. Explain Keynes' Psychological Law of Consumption and bring out its importance in macro-economic analysis.
4. Explain the relationship between APC and MPC. Why does MPC generally fall ?
5. Discuss the concept of marginal propensity to consume. Why does marginal propensity to consume decline with increase in income?
6. Distinguish between marginal propensity to consume and marginal propensity to save.
7. Explain the concept of the consumption function with the help of numerical examples and diagrams. How is it related to the multiplier?

18.15 SUGGESTED READINGS

Dillard Dudley – The Economic of John Maynere Keynes, 1960.

Edward Shaprio, Macroeconomic Analysis (1960).

Hansen, Alvian H., A Guide to Keynes, (1953).

Keynes, J. M., General Theory of Employment, Interest and Money, (1936).

Jhingan, M. L. Advanced Economic Theory, Vrinda Publications (P) Ltd., New Delhi.

UNIT: 19 INVESTMENT FUNCTION AND IS-LM FRAMEWORK

Structure

- 19.1 Introduction**
- 19.2 Meaning of Investment**
- 19.3 Classification of Investment**
- 19.4 Propensity to invest**
- 19.5 Kinds of Propensity to invest**
- 19.6 Determinants of Investment**
- 19.7 Check your Progress-I**
- 19.8 Investment Function**
- 19.9 LM Model**
- 19.10 General Equilibrium**
- 19.11 Glossary**
- 19.12 Check your Progress**
- 19.13 Answers to Check your Progress**
- 19.14 Terminal Questions**
- 19.15 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to :

- Understand the meaning of investment;
- Classify investment;
- Identify the determinants of investment;
- Understand IS-LM Framework.

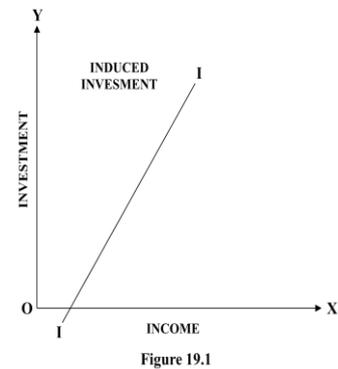
19.1 INTRODUCTION

In every economy, investment plays a key role in achieving the objectives of economic development and full employment. Increase in investment results in increase not only in aggregate demand but also in aggregate supply. Investment therefore is the under-current of growth in national income of an economy. This unit would analyse the various dimensions of investment and explain alongwith this, the IS-LM model postulated by Hicks and Hansen.

19.2 MEANING OF INVESTMENT

Ordinarily, the term investment means purchasing of different kinds of shares and stocks and investing capital in such activities that are likely to yield income.

However, Keynes has used the term investment to convey a special meaning and according to him, a man can invest his resources in two ways: (i) he may buy shares and stocks of an existing company or he may buy an old company, etc. and (ii) he may invest his wealth in buying new machines, in setting-up new factory premises, in promoting a new company, etc. Investment of the first kind has no effect on total employment. Such an investment only signifies change of ownership. This kind of investment has significance only from individual's point of view; it has no importance from social point of view. Supposing, Ram owns shares worth Rupees 1,00,000 of a company. If Mohan purchases all these shares from Ram then it will mean investment for Mohan, but as a result of this transference of shares there will be no change in total investment of the society. It is a kind of financial transaction. Keynes treats such investment as Financial Investment. No productive capacity is created as a result of financial investment. In other words, there is no addition made to the capital stock of the economy. It is the investment of the second kind that is considered by Keynes as Real Investment. Real investment refers to that investment which is made in order to set-up a new factory or to open a new enterprise. This kind of investment results in net addition to the total investment capital stock of the society, causing increase in employment. Thus, the term investment, in Keynesian economics, is used to denote real investment, which refers to the addition made to the existing capital asset which results in an increase in employment. In fine, investment is the expenditure incurred for real capital formation. It includes three kinds of items: (i) building of new machines and new capital equipments (ii) construction of new buildings and (iii) Increase in stocks.

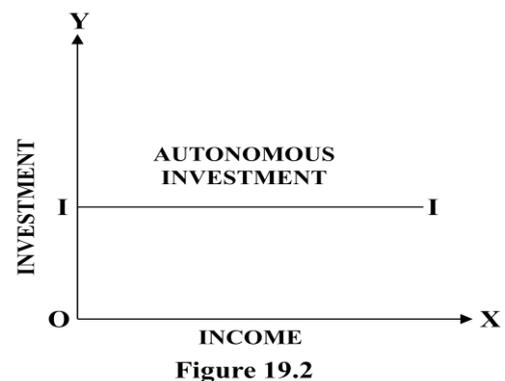


19.3 CLASSIFICATION OF INVESTMENT

Investment can mainly be classified into the following categories:

(A) From economic point of view, investment can mainly be divided into two categories:

(i) **Induced Investment:** Induced investment is that investment which is governed by income and amount of profit. The factors which motivate investment include charges, prices, the wages affect profit. Induced investment increases with increase in the possibility of income and profit and decreases with decrease in the possibility of income and profit. In fact, when income increases, consumption demand also increases and to meet this investment tends to increase. Induced investment has been expressed diagrammatically in Figure 19.1. In this figure, income is shown on OX-axis and



investment on OY-axis. II curve represents Induced investment. It slopes upward (positive) signifying that investment increases when there is increase in income. According to Kurihara, at a very low level of income investment may be negative, as is shown by that part of II curve which is below OX-axis.

(ii) Autonomous Investment:

Autonomous investment is that investment which is independent of the level of income or output. It is not induced by income. It refers to that investment which is influenced by exogenous factors like innovation, inventions, growth of population and labour force, research, social and legal institutions weather changes, war and revolution etc or enhancing the level of effective demand during the period of depression and unemployment. Figure 19.2 explains the concept of autonomous investment as shown by the autonomous investment curve which is horizontal straight line parallel to OX-axis, signifying that there will be no change in investment whether income increases or decreases, Investment will remain OI irrespective of any change in income. Keynes has mainly referred to this kind of investment in his theory of employment.

(B) On the basis of ownership of investment, it is divided as follows:

- (i) Private Investment:** Private investment refers to that investment which is made by private individuals with the sole objective of earning profit. This is also known as induced investment.
- (ii) Public Investment:** Public investment is that investment which is made by the central, provincial or local-self-government of a country. The objective behind such an investment is welfare of the people, defence of the country and economic development. It is not induced by profit motive,

(C) On the basis of changes in the existing stock of capital goods as a result of change in investment, it can be divided into two categories:

- (i) Gross Investment:** The total expenditure incurred on capital goods at any given time in an economy is called gross investment. It includes two kinds of investment: (i) Net Investment and (ii) Replacement Investment. Hence, **Gross Investment = Net Investment + Replacement Investment.**

When capital goods like machines, tools, etc are used continuously, depreciation occurs therein. Consequently, existing stock of capital goes on diminishing. Whatever investment is made in order to maintain it at its existing level is called replacement investment. In the words of Peterson, "Replacement investment is that investment which maintains Intact a given stock of capital." There is increase in capital stock when gross investment is more than replacement investment.

- (ii) Net Investment:** Net investment is that investment as a result of which there is increase in capital stock. In the words of Peterson, "Net investment is investment that enlarges economy's stock of real capital assets thereby adding to productive capacity." Gross investment minus replacement investment is called net investment. Thus,

Net Investment = Gross investment - Replacement Investment

From the point of view of objective of investment, it can be classified as under:

- (A) Intended or Ex-ante or Planned Investment:** When the entrepreneurs make investment according to a definite plan in order to achieve a given objective, it is called Intended or Ex-ante or Planned Investment. Thus, Ex-ante Investment is that investment which is voluntarily made by the investors to achieve a definite plan. There are several causes of this type of investment, for example (i) when the entrepreneurs anticipate increase in demand and are keen to make a definite increase in the amount of investment in order to make profit it be called Ex-ante investment (ii) such an investment is also made to bring down the cost of production. Better type of machines can be installed in an industry with the help of investment of capital. Such an investment reduces cost of production and is therefore, called Cost-Oriented investment. (iii) when the government of a country plans investment of a given order with a view to achieving a set target of employment or economic growth, it is called Voluntary investment.
- (B) Unintended or Ex-post or Unplanned or Involuntary Investment:** Unplanned investment is that Investment which is involuntarily incurred by an investor. Many a time, on account of sudden fall in demand, stocks of goods accumulate with the entrepreneurs. These stocks accumulate against their will or plan, or they have to make Investment in these stocks against their will. It is, therefore, called unintended investment. Actual investment made by an entrepreneur is called Ex-post Investment.

19.4 PROPENSITY TO INVEST

Investment is related to income. Ordinarily, investment increases with an increase in income and decreases with fall in income. Propensity to invest is the ratio between aggregate investment and aggregate income It can be expressed in the form of an equation as under:

$$PI = \frac{I}{Y}$$

(Here, PI = Propensity to Invest; I = Investment; Y= Income)

Propensity to invest can be expressed in the form of a schedule showing the amount invested at different levels of income.

19.5 KINDS OF PROPENSITY TO INVEST

Propensity to invest can be of two kinds:

(i) Average Propensity to Invest

Average Propensity to invest is the ratio of total income and total investment. In the form of an equation, it is expressed as: $API \frac{I}{Y}$. If the total income of a country is Rs 20 Crore and total investment is Rs. 5 Crore, then average propensity to invest will be:

$$A \quad PI \frac{5}{20} = \frac{1}{4} = 0.25$$

(ii) Marginal Propensity to Invest

Marginal Propensity to invest is the ratio of change in investment and change in income, that is, $MPI \frac{\Delta I}{\Delta Y}$. If income increases (ΔY) by Rs. 10 Crore and as a result of it investment increases (ΔI) by Rs 5 Crore, then marginal propensity to invest will be:

$$MPI \frac{\Delta I}{\Delta Y} = \frac{5}{10} = 0.5$$

19.6 DETERMINANTS OF INVESTMENT

Decision regarding investment in a new capital asset depends on whether the rate of return on the new investment is equal to, greater or less than the rate of interest to be paid on the funds to be required to purchase this asset. There is only when the expected rate is higher than the rate of interest that investment will be made in acquiring new asset. Thus, the factors which are to be considered for making investment decision include cost of capital asset, the expected rate of return from it during its life time and the market rate of interest. Keynes has termed all these factors taken together as Marginal Efficiency of Capital. Thus, there are two determinants of investment which are as follows:

(A) Marginal Efficiency of Capital

Marginal efficiency of capital refers to the expected profitability by the use of one more unit of capital. It depends upon two factors:

- (i) Prospective Yield:** Prospective yield of capital goods like machine means net income which is available during the full life-time of that machine. In order to estimate net income, cost is deducted from the annual output of machine. Total prospective yield is arrived at by aggregating net income of every year of a machine throughout its life-time.
- (ii) Supply Price:** Supply price refers to the cost of a machine, but it is not the cost of existing machine but that of a brand new machine. It is also called Replacement Cost of that machine.

Marginal efficiency of capital can be ascertained by deducting supply price from prospective yield. Supply price remains fixed at any given time, hence marginal efficiency of capital is influenced more by prospective yield which is uncertain. It is uncertain because it is mainly influenced by short term and long term expectations. Besides being unstable, marginal efficiency of capital also depends upon the mental tendencies of the people. That is the reason why trade cycles operate. If a wave of optimism runs marginal efficiency of capital is estimated to be high. Consequently, tendency to invest will be high. On the contrary, if pessimism pervades marginal efficiency of capital will be estimated to be low dampening the spirit of investment. It normally happens during depression. Even if rate of interest is lowered it will not stimulate investment. In fact, it is of no use to reduce rate of interest when marginal efficiency of capital is falling. Explaining the declining marginal efficiency of capital, Keynes pointed out that in advanced countries of the West tendency of secular stagnation of marginal efficiency of capital is noticeable. Because of this secular stagnation in those

countries, if investment continues to rise then marginal efficiency of capital may fall to zero.

(B) Rate of Interest

If money is borrowed from others to invest, interest will have to be paid on it. On the contrary, if the investor has his own money that he uses in buying government securities, bonds, etc. he will get regular interest on it. But, if he invests his funds he will have to forego this interest. In other words, interest is the cost of money invested. According to Keynes, rate of interest is determined on the one hand by supply of money and on the other, demand for money i.e. liquidity preference. In the short of period supply of money is assumed to be constant. Hence, rate of interest according to Keynes, is mainly determined by the demand for money. According to him, "Interest is the reward for parting with liquidity." Higher the rate of interest, greater will be the keenness on the part of people to part with liquidity and lower the rate of interest greater will be their preference for liquidity. On the other hand, liquidity preference has also its effect on rate of interest. Greater the liquidity

preference higher will be the rate of interest and smaller the liquidity preference lower will be the rate of interest. It may be added that, other things being equal, rate of interest will also be high or low if the supply of money is less or more. Every entrepreneur at the time of making any new investment compares the marginal efficiency of capital i.e., rate of profit with the rate of interest. He will go on making investment till the marginal efficiency of capital

or rate of profit becomes equal to rate of interest. If expected profitability is greater than rate of interest, the entrepreneur will make more investment. On contrary, if rate of interest is greater than expected profitability, there will be no inducement to investment. Inducement to investment can be further clarified with the help of the following equations:

- (1) $MEC > r$ (Investment will be made)
- (2) $MEC < r$ (No investment will be made)
- (3) $MEC = r$ (Break-even point)

(Here, MEC = marginal efficiency of capital; r = rate of interest; > greater than; < less than)

It has been explained diagrammatically by Figure 19.3. In this figure, investment is shown on OX-axis and marginal efficiency of capital (MEC) and rate of interest on OY axis. RR curve represents rate of interest and MEC curve represents marginal efficiency of capital. Supposing, rate of interest OR is fixed, as such RR curve represents fixed rate of interest. When the amount of investment is OL_1 , then MEC (E_1L_1) is greater than AL_1 rate of interest. Hence,

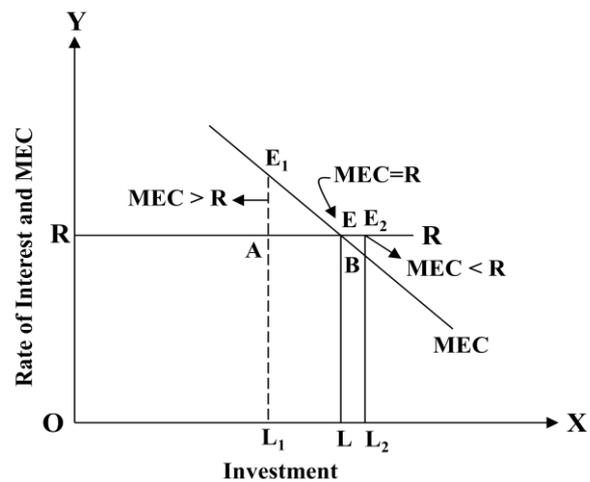


Figure 19.3

more investment will be made. It will increase to OL . In this situation, MEC intersects RR curve at point E. i.e., $MEC = OR$. After this, there will be no inducement to investment. If due to certain reasons, investment increases to OL_2 , then MEC (BL_2) will be less than rate of interest (E_2L_2). Hence, the investor will suffer loss.

A pertinent question that arises here is which one of these two factors has greater influence on investment. In this regard, Keynes and post-Keynesian economists like Hicks, Hansen etc. were of the opinion that having discussed separately both the factors determining inducement to investment you can conclude: (i) given the rate of interest, the higher the marginal efficiency of capital, the larger shall be the volume of investment. (ii) the lower the rate of interest, the larger will be volume of investment, given the marginal efficiency of capital.

19.7 INVESTMENT FUNCTION

Investment function refers to the functional relation between investment and its various determinants. According to Prof. Peterson, McConnell and Norman and F. Keiser etc., in a capitalist economy, investment is mainly influenced by the following factors:

- (i) **Technological Advance and Innovation:** Technological changes influence inducement to investment to a large extent. For the last many years, for example, due to the introduction and development of labour-saving and capital-intensive machines in agriculture as well as manufacturing industries, the volume of investment in these sectors has increased tremendously. These are empirical evidences that new inventions have led to an increase in the volume of investments. Similarly, innovations like, mobile phone, scooter, television, refrigerator etc., have also helped in raising the volume of investment. In short, according to Prof. McConnell., “A rapid rate of innovation is conducive to a high level of investment.”
- (ii) **Discovery of Natural Resources:** As a result of discovery of new sources of natural resources like minerals, petrol etc., investment increases. Investors will invest more in order to make use of the new sources of natural resources and vice versa.
- (iii) **Government Policies:** Investment is also affected by the monetary and fiscal policies of the government. Investment increases when the government pursues cheap money policy and expands credit. On the contrary, investment decreases when the government pursues dear money policy and contracts credit. Investment is also affected by government's policy relating to taxation and expenditure. Taxes are a part of business costs. If the number of such taxes is large, expectation of profit will be low, constricting the volume of investment. On the other hand, if taxes are few, investment will be encouraged. Similarly, when government initiates new projects and spends large amount of funds on them, the volume of investment expenditure increases.
- (iv) **Foreign Trade:** If the possibility of expansion of a country's foreign trade increases, it will have a favourable effect on investment, i.e., more

investment will take place. On contrary, fall in the volume of foreign trade will have an unfavourable effect on investment.

- (v) **Political Environment:** If the political environment of the country is peaceful and there is internal and external peace, it will have a favourable effect on investment i.e., investment will increase. On the contrary, if there are disturbances in the country and law and order situation is grave, danger of foreign aggression looms large, it will have adverse affect on investment, i.e., investment decreases.
- (vi) **Expectations:** Business investment is very much dependent on expected profit. Capital goods are durable. Hence, expectation of profit from any investment depends on the further sales of the goods produced by that capital. If the existing business conditions are pretty goods, then business community will be optimistic about future and be willing to invest more. But, if the existing business is passing through a period of depression, it will make business community pessimistic about future and they will cut down investment.
- (vii) **Rate of Population Growth:** If the population of a country is growing at a rapid rate, it will necessitate new houses, schools, public services, roads, motor vehicles, furniture, consumer goods etc. Moreover, population growth leads to increased labour supply. As a result of it, wage-rate will fall and hence prospective yield of invested capital will increase.
- (viii) **Territorial Expansion:** If, on account of growth of population, new territories are opened then it will need more private and public investment in order to meet the requirement of houses, means of transport, etc.
- (ix) **Price Level:** Investment is also influenced by the prevailing price- level in the economy. If there is a tendency for the price-level to rise, it will increase the possibility of the profits of investors and so they will go on for more investment. On contrary, if the price level is likely to decrease it will discourage investment, accordingly.
- (x) **Market Structure:** By market structure is meant the nature of competition found in the market. If there are several producers of a commodity in the market competing with one another, then to cut down their cost of production they will make increasing use of new machines and latest technology of production. Consequently, investment will increase. On the contrary, if there is lack of competition in the market and monopoly conditions prevail, the monopolist may continue his production with the old and obsolete machines. It will have an unfavourable effect on investment.
- (xi) **Availability of Finance:** Investment is also influenced by the availability of finance. Two main sources of finance of a firm are: (i) internal sources and (ii) External sources. If a firm has enough internal sources in form of reserve fund, undistributed profit, etc. then it will be able to invest more. Hence, if internal sources are available in plenty, as against external sources, it will have favourable effect on investment. However, if external finance is available adequately, even then investment will increase.
- (xii) **Conditions in the Labour Market:** Conditions prevailing in the labour market also have their affect on investment. If trained and skilled labourers

are available in the labour market, investment will be favourably affected. If the mutual relations between the labourers and the employers are cordial and industrial disputes like strikes and lock-outs etc. are few investment increases.

(xiii) Present Stock of Capital Goods: Present stock of capital goods in an economy also has its effect on investment. If the existing stock of capital goods is in excess of the need, that is, there exists excess capacity; very little investment will be made. On the other hand, if the existing stock of capital is insufficient, the possibility of investment will be more.

(xiv) Aggregate Demand: If the aggregate demand is continuously increasing then investment is stimulated.

19.8 IS AND LM FRAMEWORK

The IS-LM model, also known as Hicks-Hansen diagram, shows that the economy is in equilibrium with the rate of interest (r) and X a level of income of Y .

The term IS denotes the equality of investment and savings which represents the product market equilibrium. On the other hand, LM expresses the equality of money demand (L) and money supply (M) representing the money market equilibrium.

Deriving the IS curve

Since saving is a direct function of level of income, it may be expressed as :

$$S = f(y) \quad (i)$$

And investment is a decreasing function of the rate of interest, thus :

$$I = f(r) \quad (ii)$$

From (i) and (ii) we have $S = I$

The IS schedule shows the combination of interest rate and income level where saving investment equality takes place so that the product market of the economy is in equilibrium.

The figure given further shows how IS curve can be derived.

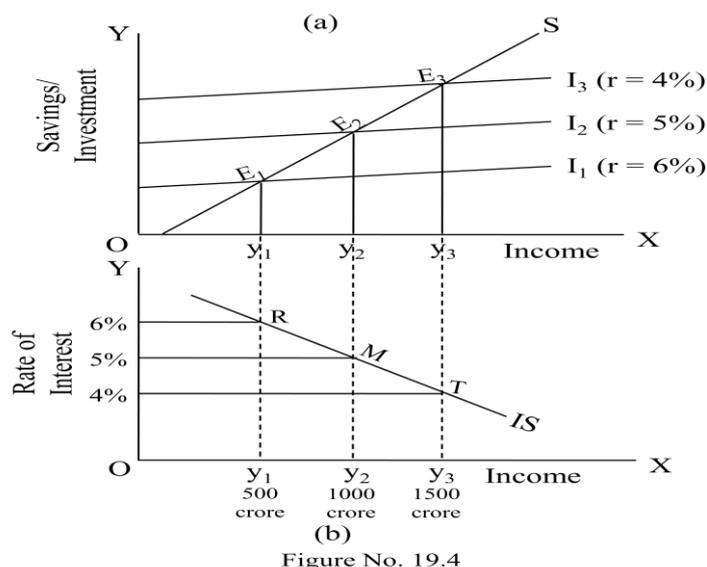


Figure No. 19.4

In the segment (a) of the figure No.19.4, S curve represents savings in relation to income drawn in a fixed position with the Keynesian assumption that the rate of interest has a nominal effect on savings. Thus, as the savings curve shows, savings increase with the increase in income. On the other hand, investment depends on the rate of interest and the level of income. Given a rate of interest, investment increases with the level of income. You can see that with 5% rate of interest, the investment curve is I_2 , now if the rate of interest is lowered to 4%, the investment curve shift upward to I_3 . The rate of investment will have to be raised to reduce the Marginal Efficiency of Capital (MEC) to equality with the lower rate of interest. When the rate of interest is 6%, the investment curve will slope downward to I_1 .

In segment (b) of the figure, each point of IS curve represents a level of income at which savings equal investment of various interest rates, the rate of interest is shown on OY axis, while the level of income is shown on the OX axis. You can observe that at the rate of 6% interest, the S curve intersects the I_1 curve at E_1 which determines OY_1 income. From the income level (i.e. Rs. 500 crore) we draw a dotted line downward to intersect the extended line from 6% at point R. A 5% rate of interest, the S curve crosses the I_2 curve at E_2 so as to determine OY_2 income (1000 crore). Point M corresponds to 5% rate of interest and Rs. 1000 crore income level, whereas point T corresponds to the equilibrium of S and I at 4% rate of interest. By connecting the points R, M and T through a line we get IS curve. Thus IS curve has the tendency to move from left to right which means that there is an inverse relationship between income and interest rate.

Deriving the LM Curve

The LM schedule shows the combination of rates of interest and levels of income where the demand for money (L) and the supply of money (M) are equal. LM curve is based on the Keynesian theory of liquidity preference.

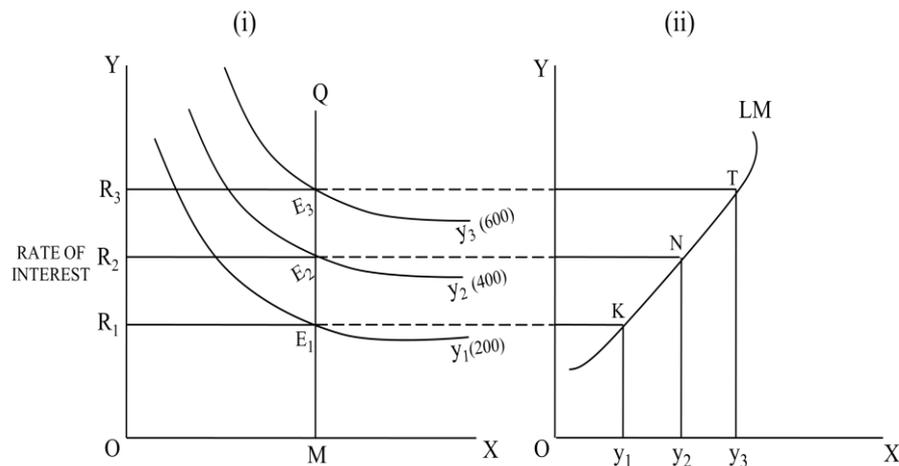


Figure No.19. 5

The figure 19.5 shows that LM curve is formed by a series of points, each point representing an interest income level of which the demand for money (L) equals the supply of money (M). Thus the supply of money, liquidity preference, the level of income and the rate of interest provide the data for LM curve. You may see in the part (ii) of the figure that Rs. 200 crore income generates a demand for money represented by the liquidity preference curve L_1y_1 . From the point E_1 where L_1y_1 curve intersects MQ curve, a horizontal line is drawn to meet the line drawn upward from y_1 and K . Points N and T can also be determined in the same way connecting points K , N and T . We can find LM curve.

19.9 GENERAL EQUILIBRIUM

General equilibrium between product market and money market is exhibited in the following diagram.

You can observe in the figure 19.6 that while money market is in equilibrium at y_1 of LM are as its income level and R_2 rate of interest, the product market is not in equilibrium since the rate of interest R_2 is lower. The product market can be in equilibrium at y_1 income level only at a higher rate of interest R_1 corresponding to point B on the IS curve. At point A , therefore, there is an excess of investment over savings since point A lies to the left of the IS curve. The excess of I over S indicates excess demand for goods which raises the level of income. On the other hand, rising interest rate R reduces investment and savings tend to increase through the rise in income. This makes I to become equal to S at E where IS and LM are also equal.

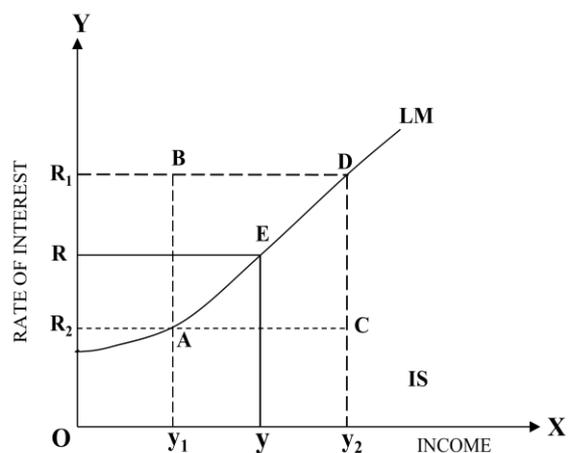


Figure No. 19.6

19.10 SUMMARY

Ordinarily, the term investment means purchasing of different kinds of shares and stocks and investing capital in such activities which are likely to yield income. Investment can mainly be classified into: Induced and Autonomous Investment, Private Investment and Public Investment, Gross Investment and Net Investment; Intended or Ex-ante or Planned or Voluntary Investment and Unintended or Ex-post or Unplanned or Involuntary Investment. Inducement to investment is influenced by so many factors in private and public sector.

19.11 GLOSSARY

- **Induced Investment:** Induced investment is that investment which is governed by income and amount of profit.
- **Autonomous Investment:** Autonomous investment is that investment which is independent of the level of income or output.
- **Public Investment:** Public investment is that investment which is made by the central, provincial or local-self-government of a country.

19.12 CHECK YOUR PROGRESS

(A) Fill in the blanks:

- (i) Investment increases when increases.
- (ii) The investment which is not induced by income is called.....
- (iii) Planned investment is made by the entrepreneurs.
- (iv) Supply prices is also called
- (v) Investment decreases when the government credit.
- (vi) Investment depends on the rate of interest and
- (vii) The situation in which I becomes equal to S is known as

(B) State whether the following statements are true or false :

- (i) Excess of gross investment over replacement investment implies increase in capital stock.
- (ii) Propensity to invest is the ratio between aggregate consumption and aggregate income.
- (iii) Marginal efficiency of capital denotes the expected propensity by the use of one or more units of capital.
- (iv) Low tax rates encourage investments.
- (v) LM expresses the money market equilibrium.
- (vi) According to Keynesian assumption, rate of interest has a significant impact on savings.

19.13 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Income (ii) Autonomous (iii) Voluntarily (iv) Contracts (v) The level of income (vi) General equilibrium
- (B) (i) True (ii) False (iii) True (iv) True (v) True (vi) False

19.14 TERMINAL QUESTIONS

1. What is meant by investment? Analyze the factors which govern the inducement to invest.
2. Differentiate between autonomous investment and induced investment. Discuss the factors which govern the inducement to invest in a capitalist economy.
3. What do you mean by inducement to invest? Discuss the methods of stimulating private investment in an economy.
4. Distinguish between Public and Private Investment. How can these be stimulated?
5. Explain the interaction between IS and LM with the help of suitable diagrams.

19.15 SUGGESTED READINGS

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UNIT 20-ECONOMICS OF INFORMATION

Structure

- 20.1 Introduction**
- 20.2 Data and Information**
- 20.3 Types of Information**
- 20.4 Information as a resource**
- 20.5 Uses of Information**
- 20.6 E-Commerce**
- 20.7 Summary**
- 20.8 Glossary**
- 20.9 Check Your Progress**
- 20.10 Answers to Check Your Progress**
- 20.11 Terminal Questions**
- 20.12 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to :

- Understand the concept of economic information.
- Be aware of the nature and types of information.
- Identify the significance of information as a resource.
- Learn about the e- commerce

20.1 INTRODUCTION

Information is a term which is very commonly used in our daily life more particularly in reference to managerial decisions. Information creates an intelligent human response in the mind. It has the following features :

- (i) It updates knowledge.
- (ii) It reduces uncertainty.
- (iii) It improves representation of an entity.
- (iv) It helps in decision making.

The quality of information could be good or bad depending on mix of these features. Information can serve as a substitute to physical entities. It could be a

product, a service or a capital resource. Thus, as David and Olson define, information is the data that have been processed into a form which is meaningful to the recipient and is of real or perceived value in the current or the prospective actions or images or voice representing quantities, action and objects.

20.2 DATA AND INFORMATION

Information is meaningless if it is not communicated and the science which discusses and examines this communication is known as Management Information System (MIS). MIS serves as a transmitter which provides information and sends it through reports to the various receivers, which are decoded or interpreted by the receiver at the destination. The poor quality of an information due to various factors may create confusion and misunderstanding, which is equivalent to a 'noise'. Information has come to be recognized as an increasingly valuable commodity required by management in order to plan and control business operation effectively. Data are the stuff of management system just as material is the stuff of production systems.

Data are the raw material from which useful information is derived. The word Data is the plural of Datum. It is defined as raw facts or observations, typically about physical phenomena or business transactions. For example, a sale of a machine tool or an automobile would generate a lot of data describing those events. Data are objective measurements of attributes (the characteristics) of entities (such as people, place, things and events). These measurements are usually represented by symbols such as numbers, words, codes, composed of a mixture of numerical, alphabetical and other characters. It takes a variety of forms, including numeric data, text, voice and images.

Data denote the collection of facts, which are unorganized but can be organized into useful information. The term data and information come across in our daily life and are often interchanged. Dates, weights, prices, costs, number of items sold, employees' names, product names etc. are some of the examples of data.

Information

The data which have been converted into a useful and meaningful form is information. As already mentioned, the terms data and information are used interchangeably. Data are raw material resources that are processed into finished information products. Information can be defined as data that have been converted into a meaningful and useful context for specific end users. Data are usually not useful until subjected to a "Value added" process where

- (i) Its form is aggregated, manipulated and organized.

- (ii) Its content is analysed and evaluated.
- (iii) It is placed in a proper context for a human user.

Information is processed data, placed in a context that gives it value for specific end users.

Data Processing

The conversion of facts into meaningful information is known as data processing. It is also called in general as information processing. It is the processing of data to make it more usable and meaningful, thus transforming it into information.

Data Processing Vs Information Processing

Data Processing is the execution of a systematic sequence of operations performed upon data to transform it into information whereas a concept that covers both the traditional concept of processing numeric and alphabetic data, and the processing of text, images and voices is information processing. Information processing further emphasizes that the production of information products for users should be the focus of processing activities.

Management of Information

The information management control problems are faced not only by large international organizations, but also by smaller organizations, which are experiencing information management difficulties. As the problems of information management increase, new information technologies provide organizations with such tools as decision support systems, expert systems, artificial intelligence, transaction processing systems, telecommunications, automated offices, electronic mail, voice mail, networking and database management systems.

This proliferation of information technology can be effectively overwhelming, unless managers learn to understand and manage the basic skills of designing, implementing and controlling the information system.

Nature of the Information

Understanding complex information systems begins with a clear understanding of information and its general characteristics. Information can be considered as the very blood of an organization, but it must be properly understood and appropriately distinguished from data. Too many times, the terms 'data' and 'information' are used interchangeably, but the terms most clearly mean entirely different things. Data should be defined as raw, unsummarised and unanalyzed facts. Information is data that has been

presented in such a way as to alter the receiver's understanding. Data are the raw material from which information is derived. This is a necessary distinction for the manager to make, because loads of data can be generated, without producing one iota of useful information.

Manager and Information

Management needs only information but not data, to help it make effective decisions. Every manager is deluged with both data and information, sometimes to the point of information overload. The manager may do various things with that data information including:

- (i) Storing it for further use. (ii) Disseminating it to others.
- (iii) Putting it to immediate use (iv) Discarding it.

20.3 TYPES OF INFORMATION

Information may be classified as under:

(i) Action Versus No action information

The information which induces action is termed as action information, but the information which communicates only the status of a situation is called as a 'no action information'. For example, a report containing information about no stock and suggesting purchase is an action report but, a report showing store transactions is a no action report.

(ii) Recurring Versus Non-Recurring Information

Information created at regular intervals are called recurring information. They may include periodical sales reports, stock statements and trial balance etc. The information which are generated on irregular basis are called non-recurring information which may include report on the marketing research study and financial analysis etc.

(iii) Internal Versus External Information

The information generated through the internal sources of the organization is termed as an **internal information**, while the information generated through the Government reports, the industry surveys, etc. is termed as an **external information**, as the sources of the data are outside the organisation.

The action information, the recurring information and internal information are the prime areas for computerization and they contribute qualitatively to the MIS.

The timing and accuracy of the action information is usually important. The mix of the internal and the external information changes, depending on the level of the management decisions. At the top management level, the stress is more on the internal information.

The information can also be classified as under, in terms of its application.

Planning Information

Certain standards, norms and specifications are used in the planning of any activity. Hence, such information is called the planning information. The time standards, the operational standards, the design standards are the examples of the Planning Information.

Control Information

Reporting the status of an activity through a feedback mechanism is called the control information. When such information shows a deviation from the goal or the objective, it will induce a decision or an action leading to control.

Differences between Planning and Control Information

- (i) Planning information cuts across all organizational divisions and provides information about a few divisions or the entire organization.
- (ii) Planning information covers a wider time span whereas the control information relates to a short time span, say a shift to a few months at the most.
- (iii) Trends and patterns are more important in planning information. Finer details are important in control information.
- (iv) In case of planning information, the purpose is to guide planning by projecting trends and patterns whereas that of control information is to invite managerial intervention to correct a deviation if any.

20.4 INFORMATION AS A RESOURCES

Information provides important input to the manages for decision making. It enlightens the manager in making of both operational and strategic decisions. It serves as a critical resource because it :

- (i) aids in decision making,
- (ii) reduces uncertainties,
- (iii) updates the level of knowledge ; and
- (iv) adds value to the organization

Information has a cost for acquisition, storage and maintenance. It is regarded as a resource and its value depends on the difference between the gain which

results from its use and its cost. Only if the difference is positive, acquisition of that information is economically justified.

Cost and Utility of Information

Information as a resource involves certain costs and on the one hand, and generates utility for organizations on the other. The pay-off of information will be positive, if the total cost of information is less than the total utility derived therefore. On the contrary, if the total cost exceeds total utility of information, the pay-off shall be negative. It pays to the organization to use the information that yields positive pay-off.

Cost of Information

The cost considerations involve the combination of the following three costs :

- (i) Acquisition cost of data
- (ii) Storage and Maintenance Cost of data
- (iii) Cost of access data

Utility of Information

The value or utility of information depends upon the following characteristics.

- (i) Quality
- (ii) Timeliness
- (iii) Completeness
- (iv) Relevance

Quality information is that which accurately represents reality. It is the quality or accuracy of information that makes the information system function properly. If the managers come to know that the information system is having errors in it, they will avoid using it and its value to the decision-making process is severely limited.

Quality of information is difficult to measure. One may have to ask the user about the quality of information he is getting and ask him to rate it. The user should be asked when the current information provided to him is to his satisfaction.

Roman R. Andrus suggests that information can be evaluated in terms of its utilities. Four utilities are as under :

- (i) **Form utility:** The closer the form matches the decision maker's requirement, greater is its value.
- (ii) **Place utility:** If it can be had or accessed easily, information has greater value.

- (iii) **Time utility:** If information is available when needed, its value is greater.
- (iv) **Possession utility:** The possessor of information influences its value by controlling its flow to others in the organization.

Timeliness means that information is available when it is needed. Most managers function in a dynamic environment of change, demanding updated and current information. Computerized information systems have the ability to gather, sort, analyse, store, retrieve, and transmit large amounts of information in a very short period of time.

Completeness of information is the extent to which it is all there. Information that is complete means, information that covers key issues and is sufficient to support the decision-making situation at hand without critical omissions. The more complete a body of information, is obviously the more expensive it is to develop and maintain. Care must also be taken not to provide extra information then needed, due to its expense, and not to provide so much information that the recipient will suffer from information overload or information indigestion.

Relevance – Information relevance refers to the extent to which information is appropriate for the decision-making situation facing the manager. Extraneous information distracts the decision maker from the assigned task and information overload frustrates the decision maker and impairs the decision-making process. Relevant information must pertain to the problems, decision and responsibilities of the recipient.

Parameters of Effective Information System

The parameters of good quality are difficult to determine, however, the information can be termed as of a good quality if it meets the norms of impartiality, validity, reliability, consistency and age. The quality of information has another dimension of utility from the user's point of view. The users being many, this is difficult to control. Therefore, if one can develop information with due regards to these parameters, one can easily control the outgoing quality of the information with the probable exception of the satisfaction at the user's end.

Impartiality

An impartial information contains no bias and has been collected without any distorted view of the situation. The partiality creeps in, if the data are collected with a preconceived view, a prejudice, and a pre-determined objective or a certain motive.

Validity

The validity of the information relates to the purpose of the information. In other words, it is the answer to the question – does the information meet the purpose of decision making for which it is being collected ?

The validity also depends on how the information is used. Since the information and the purpose need not have one to one correspondence, the tendency to use it in a particular situation may make the information invalid. For example, if the quality of the manufactured product is deteriorating and it is decided to select the causes of poor quality, then one must collect all the possible causes which may affect the quality. Quality is a function of the raw material, the process of manufacture, the tools applied, the measures of the quality assessment, the attitude of the people towards the control of quality. However, if the information collected talks only about raw material and the process of manufacture, then this information is not sufficient and hence it is not valid for all the decisions which are required to control the quality.

Reliability

It is connected to the representation and the accuracy of what is being described. For example, if the organization collects the information on the product acceptance in the selected market segment, the size of the sample and the method of selection of the sample will decide the reliability. If the sample is small, the information may not give the correct and a complete picture and hence it is not reliable. The reliability is also affected, if the data are not collected from the right source.

Consistency

The information is termed as inconsistent if it is derived from a data which does not have consistent pattern of period. Somewhere, the information must relate to a consistent base or a pattern.

For example, you have collected the information on the quantity of production for the last twelve months to fix the production norms. If in this twelve months period the factory has worked with variable shift production, the production statistics of the twelve months for comparison is inconsistent due to the variable shift production. The consistency can be brought in by rationalizing the data to per shift production per month. The regularity in providing the information also helps in assessing the consistency in the information.

Age

If the information is old, it is not useful today. The currency of the information makes all the difference to the users. If the information is old then it does not

meet any characteristics of the information viz., the update of knowledge, the element of surprise and the reduction of uncertainty, and the representation.

Maintaining these parameters at a high degree always poses a number of problems. These problems are in the management of the operations, the sources, the data processing and the systems in the organization. A failure to maintain the parameters to a high degree affects the value of the information to the decision maker.

20.5 USES OF INFORMATION

Information that is generated (acquired) stored and accessed serves very useful purpose both within and outside the organization. It is internally used in the following segments of the organization.

Users of Information within the organization

(i) Accounting: The accounting department creates, maintains, processes and retrieves quantitative data related to the amount of profit or loss, cash flow, inventory control, payroll, cost allocation, and expense classification. Management seeks information relevant to its decision making such as data on investments in new projects, the current financial position of the firm and the control of expenses. Plant managers seek information relevant to material, labour and overhead costs. Sales managers are anxious to know the amount of contribution margin of different products.

(ii) Finance: The finance department is in charge of activities related to borrowing, funding and ascertaining necessary liquidity. Therefore, data related to capital structure, the number of outstanding shareholders, the degree of leverage, and the maturity dates of debits and treasury stocks must be available. Data related to prime interest rates, capital and each market condition must be constantly maintained. Top management seeks information relevant to decisions that would maximize the ultimate welfare of the outstanding shareholders.

(iii) Personnel : Service contracts, fringe benefits, hourly/monthly rates, service seniorities and aptitude tests are a few examples of the duties of the personnel department. Personnel information is provided to other responsibility centres. For example, the payroll division is furnished with periodic reports containing names of current authorized employees and members; plant managers receive similar updated weekly reports. Management seeks information pertaining to the number of full time and part-time employees, supervisor's reports and the ratio between male and female personnel along with their ethnic background.

(iv) Public relations: The public relations department bridges the gap between the outside world and the organization. Union contract negotiations,

scholarship and educational contributions and service rendered to the community are typical information aspects maintained by the public relations department.

(v) Sales: The sales department is the major revenue generating responsibility centre where efforts are geared towards sound planning and control of sales. Data in the sales department are used to produce a flow of indicative information pertaining to regional and total sales forecasts actual sales, performance reports. Sales managers use periodic sales reports with breakdown sales by products in evaluating the contribution margin of each territory. The management must be given information on any significant deviations from pre-determined forecasts along with justification for these differences. The accounting department receives daily documentary evidences and information related to cash and credit sales.

(vi) Market research: The market research department gathers information pertaining to the firm's market potential, consumer behavior and competitive circumstances. Management must be furnished with information pertinent to market strategy and trends. To illustrate, a manufacturer has designed software for the users of a major hardware manufacturer. The firm's ability to achieve its sales forecasts was greatly hindered when the marketing research department failed to predict and account for a major modification that took place in the hardware feature which made the firm's products quite obsolete.

(vii) Production: In this department, data must be maintained relative to utilization, scheduling priority number of machines, equipments and facilities. Periodic reports are generated and provided to the plant managers to inform them of their production status. The control of manufacturing costs is a prime objective of the production department. Therefore, data concerning the physical flow of direct labour, and actual overhead costs are processed, maintained and transmitted to other responsibility centres involved in either the constant flow of input factors of production or the receipt of finished goods. The quality control department must be furnished with periodic reports containing the number of units produced and number of production batches in order to determine the sample size for quality inspection.

(viii) Purchasing: The purchasing department is responsible for receiving a constant flow of raw materials, machinery, equipment and office supplies. Purchasing department are interested in information relevant to such areas as sources of supplies, favourable bids, terms of delivery and quantity discounts. The accounts payable division needs documentary evidence supporting various supplier claims. Warehouse-keepers must be furnished with copies of purchase acquisition forms relating to the inflow of raw materials and supplies.

Users of Information outside the organization

A variety of external information users seek pertinent data from the firm as a business entity.

(i) Government: The government requires various reports from time to time about income tax matters and other regulations.

(ii) Auditor: An external auditor or a certified public accountant is responsible for determining the validity of the firm's financial statements. He seeks multipurpose information to serve as supporting evidence in his course of investigation. Accounts receivable and accounts payable balance, petty cash vouchers, depreciation schedules and inventory evaluation sheets are some examples of processed data tailored to satisfy the auditor's needs.

(iii) Shareholders and prospective Investors: Outstanding shareholders and prospective investors are interested in information relating to the interim and annual earnings, price earnings ratios, earmarking of retained earnings, end projections for future expansion. Investors generally want to be informed of material decisions affecting the firm, asset valuation, and income determination.

(iv) Customer : A customer requires unlimited amounts of information depending upon the type of business firm with which he deals. For example, a prospective airline traveller needs to know the timings and types of flights available and he may require the terms of excess luggage payments and the time of arrival. A customer of a savings bank wants to know the amount due to him and the interest accrued on his account at any given time. The purchaser of an automobile needs to know pertinent information regarding warranty clauses, safety and economy features.

20.6 E-COMMERCE

E-Commerce essentially deals with buying and selling of goods. With the advent of internet and web technology, E-commerce today covers an entire commercial scope online including design and developing, marketing, selling, delivering, servicing, and paying for goods. Some E-commerce applications add order tracking as a feature for customer to know the delivery status of the order.

E-commerce process model can be viewed in four ways and categories.

- **B 2 C** : Business Organisation to Customer
- **B 2 B** : Business Organisation to Business
- **C 2 B** : Customer to Business Organisation
- **C 2 C** : Customer to Customer

In B 2 C model, business organization uses websites or portals to offer information about product, through multimedia clippings, catalogs, product configuration guidelines, customer histories and so on. A new customer interacts with the site and uses interactive order processing system for order placement. On placement of order, secured payment systems comes into operation to authorize and authenticate payment to seller. The delivery system then takes over to execute the delivery to customer.

In B 2 B model, buyer and seller are business organizations. They exchange technical & commercial information through websites and portals. Then model works on similar line like B 2 C. More advanced B 2 B model uses Extranet and conducts business transactions based on the information status displayed on the buyers application server. Auto component industry uses this model for supplying parts and components to auto manufacturer based on the inventory levels and production programme.

In C 2 B model, customer initiates actions after logging on to seller's website or to server. On the server of the selling organization. E-commerce applications are present for the use of the customer.

20.7 SUMMARY

All factors relating to the economic aspects of information in the discipline of information science is collectively called information economics or economics of information. Thus, information economics covers the economic aspects related to information

This unit discusses the nature and concepts of information economics characteristics of information economics contribution of information to the economy of a country, marketing and pricing of information economic and electronic economics.

20.8 GLOSSARY

- **Data:** Data are the raw material from which useful information is derived.
- **Data Processing:** Data Processing is the execution of a systematic sequence of operations performed upon data to transform it into information.
- **Recurring information:** Information created at regular intervals are called recurring information.

20.9 CHECK YOUR PROGRESS

(A) Fill in the blanks:

- (i) Data are the ----- of management system.
- (ii) An information communicating only a situation is -----.
- (iii) The information generated through industry survey is called ----- .

- (iv) Data collected with a prejudice are ----- information.
- (v) ----- department receives information related to credit sales.
- (vi) In E-commerce, the model which links customer to business organization is termed as -----.
- (B) State whether the following statements are true or false:**
- (i) Data when processed take the forms of information.
- (ii) Managers usually prefer data to information for decision making.
- (iii) The information which are generated regularly are called non-recurring information.
- (iv) The information which shows deviation from the target is called control information.
- (v) If the total utility of information is more than its cost the pay off will be negative.
- (vi) An auditor seeks single purpose information.

20.10 ANSWERS TO CHECK YOUR PROGRESS

- (A)** (i) stuff (ii) No-action report (iii) External information (iv) Partial (v) Accounting (vi) C to Be models
- (B)** (i) True (ii) False (iii) False (iv) True (v) False (vi) False

20.11 TERMINAL QUESTIONS

- (1) Distinguish between Data and Information.
- (2) Explain the various types of information.
- (3) Discuss properties of information as a resource.
- (4) What are the parameters of effective information system ?
- (5) What do you mean by E-commerce ?

20.12 SUGGESTED READINGS

Desai, Ashok, V., Technology Absorption in Indian Industry, New Delhi, Wiley Eastern, 1998.

Lall, Sanjaya, Technology Development and Export Performance in LDCs: Leading Engineering and Chemical Firms in India, Review of World Economics, Vol. 122(1), pp. 80, 1996.

UNIT 21-TECHNOLOGICAL CHANGE, PRODUCTIVITY AND GLOBAL ECONOMY

Structure

- 21.1 Introduction**
- 21.2 Technological Change and Economic Development**
- 21.3 Technology and Productivity**
- 21.4 Technological Change in Indian Economy**
- 21.5 The race of Technology at the Global Level**
- 21.6 Technological Change – A Global Approach**
- 21.7 Summary**
- 21.8 Glossary**
- 21.9 Check Your Progress**
- 21.10 Answers to Check Your Progress**
- 21.11 Terminal Questions**
- 21.12 Suggested Readings**

OBJECTIVES

After reading this unit you should be able to:

- Learn about Technological change,
- Understand the importance and role of technological change in Indian economy,
- Know about the sectoral productivity change in India,
- Be aware of the global approach of Technological Change

21.1 INTRODUCTION

Technology is an inevitable instrument of development. As a vehicle of change, it is a major focus of attention of the world over. Technological changes affect all aspects of economic and social life directly and indirectly, immediately or ultimately. The industrial sector, however, is the primary and immediate point of impact.

Technology has long been recognized by social scientists as a factor of economic and social change. It has always been an aid in human existence and development, though its form and contribution have been undergoing a change.

The term 'technology', in its narrow sense refers to machines and equipments that are employed in production. In this sense, there are several levels of its development much as the use of hand tools as an aid to muscular power and human skill; mechanization, substitute machines for muscle power; and automation as a continuous and integrated operation using electronic and other equipments. In its wider sense, technology includes knowledge and ideas that helps the development and use of such machines and equipments. Yet another approach to technology, within the frame work or socio technical system, encompasses cultural, social, and psychological aspects as well.

Technological change amounts to "setting up of a new production function" which stresses the crucial role of the state of technology in input output relationship. With a given state of technology, the obtainable outputs from available input have an upper limit. Therefore, technological change is a means to raise the output. All such changes in physical conditions, managerial know-how, labour skill etc. which helps in multiplying the outcome of efforts are collectively expressed as technological change. Technology in this context is more than machines and equipments and a mere means of establishing the relationship between capital and labour. The ramification extends beyond the immediate factory setting.

21.2 TECHNOLOGICAL CHANGE AND ECONOMIC DEVELOPMENT

Technology, as an instrument of development affects all aspects of economic and social life directly or indirectly. In the narrow sense, technology refers to fixed capital, mechanization and automation. In the wider sense technology is the society's pool of knowledge used by industry regarding the principles of physical and social phenomena, knowledge regarding the application of these principles to production and knowledge regarding day to day operation of production. The socio-cultural factor that is essential for the development of such knowledge is also included in the concept of technology in the wider sense.

The technology existing at a given point of time sets limits on how much output can be produced with a given amount of inputs. A change in the existing technology can only push up the upper limits on obtainable output. Such a change in technology often takes the form of new methods of producing existing products, new techniques of organization, marketing and management. Therefore, a study on the crucial role of technology in the process of economic development has to deal with the measurement of technological change over the period.

There are considerable difficulties in taking proper account of the change in techniques of organization, marketing and management, change in labour-skills, change in project mix etc. Therefore, some indirect measures of technological change have been suggested. One such measure is the change in output per man

hours, i.e. the rate of growth of labour productivity. Though frequently used, this is a very inadequate measure because the rate of technological change is not the only determinant of the rate of growth of labour productivity. A better measure is the total productivity index, which relates changes in output to change in both labour and capital inputs. However, it has the disadvantages of assuming that the marginal products of the inputs are altered only by technological changes and that their ratios remain constant and independent of the ratios of the quantities of the inputs. Some economists have also tried to devise more sophisticated measures on the basis of various simplifying assumptions regarding the nature of production function and the way it shifts over time, some assume that technological a change is disembodied others that it is capital embodied. Disembodied technological change consists of better methods and organization that improve the efficiency of both old capital and new. The assumption of the disembodied technological change ignores the fact that many changes in techniques must be embodied in new equipment if they are to be utilized. On the other hand, it is often impossible to distinguish capital embodied from disembodied technological changes on the basis of available data. There are some other problems associated with the customary measures of technological change. These measures often assume that there are economics of scale and the technological change is neutral. There are also difficulties in measuring inputs and outputs. In addition, it is difficult to adjust for quality changes inputs and outputs.

Although the difficulties associated with the measurement of technological changes are hard to overcome, it is necessary to have some idea about the state of technology used and the extent of technological changes in the Indian manufacturing industries. According to Dr. Suhlas Chattopadhyay, at a given point of time the first hand knowledge about the state of technology used in Indian menu fracturing industry can be had from capital intensity defined as fixed capital per worker or degree of mechanization defined as plant, machinery and tools per worker. Both capital intensity and degree of mechanization refer to capital embodied technology and do not give us any idea almost to state of disembodied technology. In spite of this limitation capital intensity and degree of mechanization are useful guides.

21.3 TECHNOLOGY AND PRODUCTIVITY

Productivity is often the most closely watched indicator of long-term economic prospects. Rising productivity is the key to making possible permanent increases in the standard of living. In productivity growth in 1990s.

Changes in technology are only the source of permanent increase in productivity, but a number of transient factors can affect both true and “measured” productivity for example workers may work harder during periods of high demand and firms may use their capital assets more intensively by running factories for extra shifts, both factors can lead measured productivity to be too

high relative to actual technological progress. Similarly, during periods of high demand, productivity can rise because firms take advantages of increasing returns to scale, whose effects are not permanent and should be discounted when measuring long-run technological change.

21.4 TECHNICAL CHANGE IN INDIAN ECONOMY

Although India is a labour rich country, labour intensive industries related the sectors like agriculture, mining and quarrying, food products, wood products, pulp and paper etc. have shown lesser growth in total factor productivity than that in some industries applying capital intensive technology like electronics industry.

It has been observed that better technology needs lesser quantum of inputs to produce the quantum of output which was used to be produced with greater amounts of inputs earlier, but, a significantly high price of inputs leads to an increase in the output cost even when the input use declines. Improvement in productivity is usually caused by innovation and in India's case, input cost on agriculture and allied activities in food products and beverages has progressively fallen over the years. Modernization has helped in reducing energy costs. However, the recent trend shows that due to constant rise in the fuel prices, the benefits of energy saving is over powered by the increase in the prices of fuel. In India, the sectors like transport, wholesale and retail trade have been the major sufferers in this regard.

21.5 THE RACE OF TECHNOLOGY AT THE GLOBAL LEVEL

Advances in technology are expected to lead to promotion of material wellbeing of the society. Historically, changing technology has had a great impact on the distribution of income and employment across the globe, though recent revolution in information technology has resulted in the creation of insufficient job opportunities on the face of the constantly rising number of job sectors. The gap between the need and availability of employment opportunities has been widening constantly, and this gap can be reduced only if production is augmented continuously in the long run. Besides, advances in information technology tend to augment productivity of capital and efficiency in the use of raw materials resulting in the expansion in the capacity and size of plants thereby creating new jobs. But, these job opportunities are meant only for skilled and technically qualified people who form a very thin minority out of the whole.

The process of technological change was typically associated with great trauma, the break-up of traditional communities, the displacement of labour, massive migration to all parts of the world, and a revolution in social as well as economic environment of the developing countries. In some respects, little appears to have been learned from earlier experiences with industrialization. While developing countries often benefited from the technological advances of the industrial countries, the application and the benefits have been uneven. Furthermore, developing countries generally have not had the safety valve of

exporting their surplus or displaced labour to overseas colonies, or obliging others to accept their surplus production.

The new technological revolution will also shift the international distribution of income. More than any other, the industrial 'revolution' of the modern age is based on the cumulative advances in scientific knowledge. And, because most research and development is carried out in the already industrialized countries, developing countries will be increasingly disadvantaged by the technological gap between them and the advanced industrial economies. It is usually argued that for the foreseeable future only the most advanced industrial countries with their highly developed infrastructure will be able to realize the full potential of the new technologies. There are divergent views as to how, where and indeed by whom the new technology will be implemented. It is also hoped that an increasing international division of labour motivated by the search for ever decreasing labour cost will continue to push industrialization towards the poorest regions of the world.

21.6 TECHNOLOGICAL CHANGE-A GLOBAL APPROACH

Globally, the situation is that the world economy is furiously competing for jobs while attempting to increase labour productivity. On the face of it, this appears a somewhat frightening scenario even though economic theory teaches that this could lead to an all-around improvement in global welfare. While history shows this optimism to be broadly justified in the long term, the distributional and transitional consequences can be complex and uneven depending both on the detailed way in which particular innovations are introduced and the highly interrelated world economic system.

Most efforts to evaluate the impact of new technologies have been at the sectoral or national level. For example, we take into account, the effects of new technology on the relocation of a particular activity (such as textile production) or the overall effects on employment in a particular locality. Such detailed studies are extremely valuable but cannot account for many of the secondary and indirect effects of technical change. Because of the interconnectedness of the modern world economy, wherever, or in whatever sector, new technologies are introduced, the rest of the world economy will be effected, innovations in motor vehicle production in Japan, for example, affect the motor industry in rich North America and poor Asia. There are also interactions across sectors within countries and internationally there is competition for labour and, more especially finance. This means that innovations in one sector can, in principle, affect production, employment and incomes in every other sector worldwide. The effects of technological change on growth need to be carefully considered. Economic theory suggests that only through constant technological change can the long run economic growth exceed the rate of growth of population. This desire for 'modernization' is part of the rationale behind the present rush to embrace new technologies. But the theory also shows that the imperative for

labour displacing technical change only arises when all existing labour is fully employed with the existing technology. Clearly this is not the case in the world at large, since there is massive unemployment and under employment in most developing countries and in the past years unemployment has risen to unprecedented level in many industrial countries also. In the world at large then, the rationale is questionable. The spread of existing or even more labour intensive technique might provide a greater push to global welfare seeking mainly short term and local gains. Such observations are generally not appealing to the sectors caught in the global race to new technology. But questions are certainly asked with respect to some developing countries; especially whether new technology could be used in better way to solve global unemployment problem.

The new wave of technological innovation has transformed the world into a global market place and especially with the growth of international firms an international production system has been evolved through which finance and knowhow can move with increasing rapidity.

Today, the Governments of the nations of the world are falling over each other to give away their resources, revoking welfare measures, shifting the burden of taxes and providing incentives to innovating or exporting industries to tariffs against imports. Some measures are designed to make the economies more competitive, others are the efforts to bolster failing industries against external competition. Socialists as well as market economies increasingly emphasize the importance of innovation and competition and with this the role of international and domestic markets.

Historically, the breakthrough which led to new waves of technological change have generally been the result of 'serendipity'. Even today there are few unambiguous links between research and development and economic success and between scientific endeavour and the commercial exploitation of technologies. Nevertheless, scientific discovery and innovation is a far more directed process today than in the past and is becoming better understood. Thus, it would be desirable to anticipate the unwanted consequences of serendipitous technical change and achieve the economic goals by easing their application.

21.7 SUMMARY

Technology is a problem-solving process. It is concerned with helping people, cope with their environment and safe guarding the quality of their life. Technological change brings about change in products, services, life style and living standards. Some new products in the fields of electronics, telecommunications and information technology, have significantly affected the management of a business enterprise. Technological change plays a crucial role in the productivity of an economy.

21.8 GLOSSARY

Technology: Technology is an inevitable instrument of development. As a vehicle of change, it is a major focus of attention of the world over. Technological changes affect all aspects of economic and social life directly and indirectly, immediately or ultimately. The industrial sector, however, is the primary and immediate point of impact.

Technological changes: Technological change amounts to “setting up of a new production function” which stresses the crucial role of the state of technology in input output relationship. With a given state of technology, the obtainable outputs from available inputs have an upper limit. Therefore, technological change is a means to raise the output. All such changes in physical conditions, managerial know-how, labour skill etc. which help in multiplying the outcome of efforts that are collectively expressed as technological change. Technology in this context is more than machines and equipments and a mere means of establishing the relationship between capital and labour. The ramification extends beyond the immediate factory setting.

Productivity: Productivity is one of the most closely watched indicators of long-term economic prospects. Rising productivity is the key to making possible permanent increases in the standard of living.

21.9 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- (i) Technological change implies setting up of a new ----- .
- (ii) Advances in information technology needs ----- labour.
- (iii) Industrial revolution of the modern era is based on the ----- in scientific knowledge.

(B) Point out whether the following statements are true or false:

- (i) Better technology needs of inputs to produce the output which was produced with the help of larger quantities of inputs.
 - (ii) The application and benefits of new technologies are evenly distributed among all the nations of the world.
 - (iii) Innovation in one region of the world affects other regions also.
-

21.10 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Production function (ii) skilled (iii) cumulative advances
 (B) (i) True (ii) False (iii) True
-

21.11 TERMINAL QUESTIONS

- (1) What do you mean by technological change?
- (2) Explain the role of technological change in increasing productivity.
- (3) Write a note on technological change in Indian economy.
- (4) Discuss the global approach of technology.

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UNIT 22-INNOVATION AND TECHNOLOGY

Structure

- 22.1 Introduction**
- 22.2 Meaning of Innovation**
- 22.3 Elements of Innovation**
- 22.4 Categories of Innovation**
- 22.5 Principles of Innovation**
- 22.6 Technology**
- 22.7 Technological Innovation System**
- 22.8 Let us Sum up**
- 22.9 Summary**
- 22.10 Glossary**
- 22.11 Check Your Progress**
- 22.12 Answers to Check Your Progress**
- 22.13 Terminal Questions**
- 22.14 Suggested Readings**

OBJECTIVES

After studying this unit, you should be able to :

- Learn the concept of Innovation
- Know the principles of Innovation
- Understand the meaning and scope of technology
- Understand the System Approach to Technological Innovation

22.1 INTRODUCTION

Innovation is the intrinsic characteristic of every developed economy as it serves as one of the chief agents of economic growth enabling a country to augment its potential to reach the pinnacle of prosperity. Innovation and technology both are interconnected areas which provide possibilities for mutual beneficial synergies through the flow of ideas and wealth causing a new class of people – the entrepreneurs. While technology involves quality vocational training and skill development, innovation concerns itself with generating commercial value through new and improved ideas and entrepreneurship. Technology is fundamental to entrepreneurship and innovation. Hence, innovation and technology both are

essential for competitive growth of an economy. This unit would provide the fundamentals of innovation and technology.

22.2 MEANING OF INNOVATION

Innovation is the process of generating and converting a new idea into a good or service that generates value for which the customers are prompted to pay. Innovation, thus, creates purchasing power through value addition to the material or immaterial thing that emerges as the end result of the innovative process. The capacity to create purchasing power associated with innovation is, in fact, generation of a resource. In the words of Peter F. Drucker, “there is no greater resource in an economy than “purchasing power”. But purchasing power is the creation of the innovating entrepreneur.”

Thus, innovation involves deliberate and planned application of information, imagination and initiative in deriving greater values from existing resources through the processes of generating and translating new ideas into useful products.

Innovation is, however, not synonymous with invention. The former refers to the use of a better and, as a result, novel idea or method, whereas the latter refers to the creation of the idea or method itself. Innovation also differs from improvement in the sense that it refers to the notion of doing something different whereas improvement implies doing the same thing in a better way.

22.3 ELEMENTS OF INNOVATION

The process of innovation involves the following three elements :

(i) Identification of needs for change : It is the change that always provides the opportunity for capturing something original and new that “breaks into” the market or society. Peter F. Drucker rightly observes, “systematic innovation therefore, consists in the purposeful and organized search for changes, and in the systematic analysis of the opportunities such changes might offer for economic or social innovation”. He further holds that the discipline of innovation is a diagnostic discipline : a systematic examination of the areas of change that typically offer entrepreneurial opportunities.

(ii) Developing Competent people : The next step involved in the process of innovation is related to the translation of the novel ideas into fruitful results in the form of a new good or services endowed with added value for which the customers will pay. The conversion of new ideas with fruitful results requires the services of competent personnel having the knowledge and skill of applying the required technology.

The required technological competence varies according to the type of innovations. Evolutionary innovations are brought about by many incremental advances in technology or processes whereas in case of revolutionary innovations technological developments are highly complex corresponding to the level of state of the art.

(iii) Commitment of Financial Support : Innovation requires the investment of adequate funds for bringing about the changes that offer innovative opportunities. The size of financial support needed for initiating innovative process is relatively small for pursuing evolutionary innovation but in case of revolutionary innovations financial support is quite huge.

Types of Entrepreneurial Roles involved in Innovative Process

The innovative process generally involves individuals at different organizational levels who perform following three different entrepreneurial roles :

(i) As a Product Champion : A product champion is a person who generates new idea and supports it through many organizational bottlenecks.

(ii) As a Sponsor : A sponsor is actually a department manager who recognizes the values of the idea, helps obtain funding to develop the innovation and facilitates its implementation.

(iii) As an Orchestrator : An orchestrator is someone in top management who articulates the need for innovation, provides funding for innovative activities, creates incentives for middle managers to sponsor new ideas, and protects product champions from unsupportive executives. Unless all these roles co-exist in an organization, major innovations are unlikely to take-off.

22.4 CATEGORIES OF INNOVATION

Innovation may range from evolutionary to revolutionary, that is, from incremental to radical. A company's capabilities in conjunction with its strategic scope can lead to form following four categories of innovation :

1. Improving Core Businesses : This type of innovation focuses on incremental innovations that can be developed rapidly and inexpensively. It includes line extensions and more convenient packaging and is often a part of a horizontal growth strategy. Its potential weakness is market myopia – its emphasis on current products and customers.

2. Exploiting Strategic Advantages: This type of innovation focuses on taking existing brands and product lines to new customers and markets without requiring major change in current capabilities. It means moving beyond the company's current strategic scope by leveraging capabilities by spreading them across a broader range of markets and customers via concentric diversification. Its potential weakness is the relative ease with which competitors with similar capabilities can imitate the innovation.

3. Developing New Capabilities: This type of innovation focuses on deepening customer satisfaction and loyalty to the brand or product line by adding new organizational capabilities without introducing major changes in strategic scope. The company may develop or purchase new technologies, talents, or businesses to better serve the firm's current scope of customers and markets. It may involve a

vertical growth strategy. Its potential weakness is the investment cost and implementation time.

4. **Creating Revolutionary Change** : This type of innovation focuses on radical innovations that transcend current product lines or brands to make fundamental changes in both its strategic scope and its capabilities. This can mean a new business model and a revolutionary new future for the company. Its potential weakness is a high risk of failure.

22.5 PRINCIPLES OF INNOVATION

Peter F. Drucker, the noted management expert, has prescribed certain “do’s” and certain “don’t’s” which he terms as principles of effective innovation. The “do’s” – things that have to be done and the “don’t’s” – things that have not to be done are as follows :

The Do’s of Innovation

According to Peter F. Drucker following points must be kept in mind while embarking upon the realm of innovation.

1. **Purposeful and systematic** innovation starts with the analysis of opportunities that are the genesis of innovative ventures. Analysis of opportunities for innovation refers to the identification and examination of the relevant source of innovative shot. The sources of innovative opportunities vary in importance according to the areas in which innovation is to be undertaken. For example, demographic changes may prove to be good opportunities for innovation in social spheres, but may be of little use for innovators in the field of industrial design. Therefore, the search for appropriate source of innovation has to be organized and conducted on a systematic basis.

2. **Innovation is both conceptual and perceptual.** Successful innovators look at figures while conceptualizing an innovative opportunities and at the same time they are fully charged in perceiving the degree of receptivity on the part of users of innovation keeping in mind their needs and expectations. The innovator must visualize initially whether the new approach will be a proper fit to the expectations of the persons who would use it.

3. **An effective innovation has to be simple.** It must focus on only one thing, otherwise, it would create confusion and not work well. It should be tied to a specific purpose leading to the emergence of a specific end result.

4. **“Think big but start small” is the most important principle of innovation.** The plan might be very ambitious, but the start has to be on a small scale requiring limited resources targeted at a small market. There may not be ample time and adequate resources to cope with adjustments and changes that might be required in the case of innovations embarked on a large scale.

5. Innovation should aim at playing a leading role within a given environment. Right from the beginning it should strive for assuming leadership otherwise it would not be able to establish and sustain itself in the market.

The Don't's of Innovation :

The innovators, in order to be successful, should guard themselves against doing the following :

(i) An innovator should not try to be clever and crafty. Transparency should never be allowed to be overshadowed by cleverness. Incompetence, if covered by clever design, is sure to come on the surface in the long run tending to cause the ultimate failure of the innovative venture.

(ii) Avoid diversified approach to innovations. Innovator should concentrate on only one thing. This is obviously a corollary to the “do” of being specific and focused in relation to its objectives.

(iii) Last but not the least, innovators should not try to look at the future. Innovation should be oriented towards the present rather than the future. Although an innovation may have long-range impact and long duration of its full maturity, it must have an immediate application in the present. It must focus the present need to be served, albeit on a moderate scale. It should not be prompted by distant future needs coated with ‘brilliant ideas’ which will fructify or not, is subjected to a question mark.

Essential conditions of Innovation – Following are the three essential conditions of innovation :

1. Innovation is a work that requires knowledge and ingenuity of high level. Given the required knowledge and ingenuity, innovation makes heavy demand on diligence, persistence and commitment. If they are missing, no amount of knowledge or talent will serve the purpose.

2. For being successful, innovators must build up their strengths. Given the wide range of innovative opportunities, the innovator should opt for the opportunity that fits best with the knowledge, talent and temperament of the innovators.

3. Innovation is an effect in economy and society reflecting a change in the behavior of customers in particular and of people in general. It has, therefore, to be focused on the market.

22.6 TECHNOLOGY

Its Meaning and Scope :

According to the Merriam Webster Dictionary the term technology refers to “the practical application of knowledge especially in a particular area”, and “a

capability given by the practical application of knowledge”. Technology might be broadly defined as the entities, both material and immaterial, created by the application of mental and physical efforts in order to achieve some value. In this sense, it refers the use of tools and machines for solving real-world problems. Tools and machines need not be material; virtual technology, such as computer software and modifications in business processes and methods fall under the immaterial domain of technology.

The word “technology” can also be used to refer to a collection of techniques. In this context, it is the current state of humanity’s knowledge of how to combine resources to produce desired products, to solve problems, fulfill needs, or satisfy wants; it includes technical methods, skills, processes, techniques, tools and raw materials. When combined with another term, such as “medical technology” or “space technology”, it refers to the state of the respective field’s knowledge and tools. “State-of-the-art technology” refers to the high technology available to humanity in any field.

In a broader sense technology is the purposeful application of scientific knowledge in the design, production and utilization of goods and services, and in the organization of human activities having their impacts on society and its surroundings.

In the light of the above explained meaning of the term technology, its scope may be divided into following five categories :

1. **Tangible** : blueprints, models, operating manuals, prototypes.
2. **Intangible** : consultancy, problem-solving, and training methods.
3. **High**: entirely or almost entirely automated and intelligent technology that manipulates ever finer matter and ever powerful forces.
4. **Intermediate** : semiautomated partially intelligent technology that manipulates refined matter and medium level forces.
5. **Low** : labor-intensive technology that manipulates only coarse or gross matter and weaker forces.

Science, engineering and technology

The distinction between science, engineering and technology is not always clear. Science is the reasoned investigation or study of phenomena, aimed at discovering enduring principles among elements of the phenomenal world by employing formal techniques such as the scientific method. Technologies are usually exclusive products of science, because they have to satisfy requirements such as utility, usability and safety.

Engineering is the goal-oriented process of designing and making tools and systems to exploit natural phenomena for practical human means, often (but not always) using results and techniques from science. The development of technology

may draw upon many fields of knowledge, including scientific, engineering, mathematical, linguistic, and historical knowledge, to achieve some practical result.

Technology is often a consequence of science and engineering – although technology as a human activity precedes the two fields. For example, science might study the flow of electrons in electrical conductors, by using already-existing tools and knowledge. This new-found knowledge may then be used by engineers to create new tools and machines, such as semiconductors, computers, and other forms of advanced technology. In this sense, scientists and engineers may both be considered technologies; the three fields are often considered as one for the purposes of research and reference.

22.7 TECHNOLOGICAL INNOVATION SYSTEM

The concept of a technological innovation system was introduced as part of a wider theoretical school, called the innovation system approach. The central idea behind this approach is that determinants of technological change are not (only) to be found in individual firms or in research institutes, but (also) in a broad societal structure in which firms as well as knowledge institutes, are embedded. Since the 1980s, innovation system studies have pointed out the influence of societal structures on technological change, and indirectly on long-term economic growth, within nations, sectors or technological fields.

Technological Innovation Systems are defined in terms of knowledge/ competence flows rather than flows of ordinary goods and services. They consist of dynamic knowledge and competence network.

This means that a Technological Innovation System may be analyzed in terms of its system components and/ or in terms of its system functions.

The system components of a Technological Innovation System are called structures. These represent the static aspect of the system, as they are relatively stable over time. Three basic structures of the system components are as under :

1. Actors : Actors involve organizations contributing to a technology, as a developer or adopter, or indirectly as a regulator, financier, etc. It is the actors of a Technological Innovation System that, through choices and actions, actually generate, diffuse and utilize technologies. The potential variety of relevant actors is enormous, ranging from private actors to public actors, and from technology developers to technology adopters. The development of a Technological Innovation System will depend on the interrelations between all these actors. For example, entrepreneurs are unlikely to start investing in their businesses if governments are unwilling to support them financially. Similarly, governments have no clue where financial support is necessary if entrepreneurs do not provide them with the information and the arguments they need to legitimate policy support.

2. Institutions : Institutional structures are at the core of the innovation system concept. They serve as the rules of the game in a society, or vice-versa. A distinction can be made between formal institutions and informal institutions, with former being the rules that are codified and enforced by some authority, and the latter being more tacit and organically shaped by the collective interaction of actors. Informal institutions can be normative or cognitive. The normative rules are social norms and values with moral significance, whereas cognitive rules can be regarded as collective mind frames, or social paradigms. Examples of formal institutions are government laws and policy decisions; firm directives or contracts also belong to this category. An example of a normative rule is the responsibility felt by a company to prevent or clean up waste.

3. Technological factors : Technological structures consist of artifacts and the technological infrastructures in which they are integrated. They also involve the techno- economic workings of such artifacts, including costs, safety, reliability. These features are crucial for understanding the feedback mechanisms between technological change and institutional change. For example, if R & D subsidy schemes supporting technology development should result in improvements with regard to the safety and reliability of applications, this would pave the way for more elaborate support schemes, including practical demonstrations. These may, in turn, benefit technological improvements even more. The structural factors are merely the elements that make up the system. In an actual system, these factors are all linked to each other. If they form dense configurations they are called networks. An example would be a coalition of firms jointly working on the application guided by a set of problem-solving routines and supported by a subsidy program. Likewise, industry associations research communities, policy networks, user-supplier relations etc. are all examples of networks.

System Dynamics Approach to Technological Innovation System

An analysis of structures typically yields insight into systemic features that constitute drivers and barriers for technology diffusion at a certain moment or within a given period in time. Structures involve elements that are relatively stable over time. However, for many technologies, especially, newly emerging ones, these structures are not yet fully established. For this reason, a new approach is adopted to analyse and evaluate the Technological Innovation System. This approach puts focus on the build-up of structures over time rather than on their stability. The central idea of this approach is to consider all activities that contribute to the development, diffusion and use of innovations as system functions. These system functions are to be understood as types of activities that influence the build-up of a Technological Innovation System. Following are the important system functions that impact the development of technological innovation system.

Entrepreneurial activities : Crucial role of the entrepreneur is to translate knowledge into business opportunities, and eventually innovations. The

Entrepreneurial Activities involve projects aimed to prove the usefulness of the emerging technology in a practical and/or commercial environment. Such projects typically take the form of experiments and demonstrations.

Knowledge development : The Knowledge Development function involves learning activities, mostly on the emerging technology, but also on markets, networks, users etc. There are various types of learning activities, the most important categories being learning-by-searching and learning-by-doing. The former concerns R & D activities in basic science, whereas the latter involves learning activities in a practical context, in the form of laboratory experiments or adoption trials.

Knowledge diffusion / knowledge exchange : The characteristic organization structure of a Technological Innovation System is that of the network. The primary function of networks is to facilitate the exchange of knowledge between all the actors involved in it. Knowledge Diffusion activities involve partnerships between actors for example technology developers and holding workshops and conferences. The innovation system approach stresses that innovation happens only where actors of different backgrounds interact. A special form of interactive learning is learning-by-using, which involves learning activities based on the experience of users of technological innovations, for example through user-producer interactions.

Guidance of the search : The Guidance of the Search function refers to activities that shape the needs, requirements and expectations of actors with respect to their (further) support of the emerging technology. Guidance of the Search refers to individual choices related to the technology but it may also take the form of hard institutions, for example, policy targets. It also refers to promises and expectations as expressed by various actors in the community. Guidance of the Search can be positive or negative. A positive Guidance of the Search means a convergence of positive signals – expectations, promises, policy directives – in a particular direction of technology development. If negative, there will be a digression, or, even worse, a rejection of development altogether. Since resources are usually limited, it is important that specific focus is laid on development of innovation.

Market formation : Emerging technologies cannot be expected to compete with incumbent technologies. In order to stimulate innovation, it is usually necessary to create artificial (niche) markets. The Market Formation function involves activities that contribute to the creation of a demand for the emerging technology, for example by financially supporting the use of the emerging technology, or by taxing the use of competing technologies.

Resource mobilization: Resource Mobilization refers to the allocation of financial, material and human capital. Typical activities involved in this system function are investments and subsidies. The Resource Mobilization function represents a basic economic variable. Its importance is obvious : an emerging

technology cannot be supported in any way if there are no financial or natural means, or if there are no actors present with the right skills and competences.

Support from advocacy coalitions: The rise of an emerging technology often leads to resistance from actors with interests in the incumbent energy system. In order for a Technological Innovation System to develop, other actors must counteract this inertia. This can be done by urging authorities to reorganize the institutional configuration of the system. The Support from Advocacy Coalitions function involves political lobbies and advice activities on behalf of interest groups. This system function may be regarded as a special form of Guidance of the Search. After all, lobbies and advices are pleas in favor of particular technologies. The essential feature which sets this category apart is that advocacy coalitions do not have the power, like for example governments, to change formal institutions directly. Instead, they employ the power of persuasion. The concept stresses the idea that structural change within a system is the outcome of competing interest groups, each representing a separate system of values and ideas. The outcome is determined by political power.

22.8 LET US SUM UP

Innovation creates purchasing power through value addition to a material or immaterial thing. It is a planned application of information, imagination and initiative in deriving greater values from existing resources. Innovation is a task which requires knowledge and ingenuity of high level and for being successful, innovators to must build up their strengths to have special focus on customers and market.

Technology is purposeful application of scientific knowledge in the design, production and utilization of goods and services. It is an outcome of science and engineering which is the goal oriented process of designing and making tools and systems to exploit natural resources for practical human means. Both innovation and technology are of great significance to human life for present and the future.

22.9 SUMMARY

In this unit of game theory, we studied competitive situations where the characteristics of competitive games and their strategies were discussed. Discussion has been made on the maximin-minimax principle along with the analysis of control of dominance and effort. Furthermore, from a graphical perspective, the analysis has been done for $2 \times n$ \times $n \times n$ and $m \times 2$ \times $2m \times 2$ games. The models given here are very useful for decision-making theory and decision analysis.

In this unit, we also studied the type of game in which n players participate — such games are called n -person games. A game in which two players participate is called a two-person game. If a game is such that the gain of one player equals the loss of the other player, then the total gain and loss of the players is zero; such a game is called a zero-sum game. A zero-sum game in which two players participate is called a two-person zero-sum game. Such a game is also known as an adversarial game. A two-person game may also be non-

zero-sum when the gain of one player is not equal to the loss of the other. When both players cooperate according to pre-established rules, it is called a cooperative game. Two-player strategies may be pure strategies or mixed strategies. A pure strategy game is one in which each player follows a definite and fixed strategy. In contrast, in a mixed strategy game, players use probabilistic combinations of different strategies.

22.10 GLOSSARY

- **Innovation:** Innovation is the process of generating and converting a new idea into a good or service.
- **Technology:** Technology might be broadly defined as the entities, both material and immaterial, created by the application of mental and physical efforts in order to achieve some value.

22.11 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- (i) Innovation creates purchasing power through ----- .
- (ii) Revolutionary technological developments are highly complex, corresponding to the level of -----.
- (iii) An individual as an orchestrator in top management protects product champions from ----- .
- (iv) High technology available to humanity in any field is also known as ----- .
- (v) Technology is often an outcome of -----.
- (vi) Technological Innovation Systems consist of ----- .

(B) State whether the following statements are true or false :

- (i) Innovation is different from invention.
- (ii) The discipline of innovation is not a diagnostic discipline.
- (iii) Innovation may range from incremental to radical phases.
- (iv) Computer software is an example of material technology.
- (v) Information institutions may be normative or cognitive.
- (vi) Guidance of the search refers to group choices related to technology.

22.12 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) value addition (ii) state of the art (iii) supportive executives science and engineering (iv) state of the art (v) science and engineering (vi) Dynamic knowledge and competence network
- (B) (i) True (ii) False (iii) True (iv) False (v) True (vi) False

22.13 TERMINAL QUESTIONS

(C) Short Answer Questions:

- (1) Explain the various elements of innovation.
- (2) What are the categories of innovation?
- (3) Explain the meaning of technology and discuss its scope.

(D) Long Answer Questions:

- (1) Explain the various principles of innovation.
- (2) Explain the System Dynamics Approach to Technology Innovation System.

22.14 SUGGESTED READINGS

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UNIT-23 RISK, UNCERTAINTY AND DECISION MAKING

Structure

- 23.1 Introduction**
- 23.2 Elements of a Decision Problem**
- 23.3 Types of Decision-making situations**
- 23.4 Decision Making under Certainty**
- 23.5 Decision making under Uncertainty**
- 23.6 Decision making under risk**
- 23.7 Decision Tree**
- 23.8 Summary**
- 23.9 Glossary**
- 23.10 Check your Progress**
- 23.11 Answers to Check your Progress**
- 23.12 Terminal Questions**
- 23.13 Suggested Readings**

OBJECTIVES

After reading this unit you should be able to:

- Define Risk, Uncertainty and Decision Making
- List out the types of risks and decisions
- Know about risk, uncertainty in cost volume analysis
- Understand Decision Tree concept

23.1 INTRODUCTION

Decision making is a process of choosing a course of action of several alternative courses for the purpose of achieving a goal or goals. As a student, you make complex decisions about which questions are to appear in examination and how much study time or which study material (i.e., books, notes etc.) will be required to score certain grades in the examination.

Statistical decision theory consists of a large number of quantitative techniques which help in analyzing a decision situation and enable us to arrive at a conclusion which is the best under given circumstances of the case. Statisticians have a variety of names : Statistical decision theory, Bayesian decision theory or simply Decision theory. A manager who must select from among a number of available investments should consider the profit or loss that might result from each alternative. Applying decision theory involves selecting an alternative and having a reasonable idea of economic consequences of choosing that action.

23.2 ELEMENTS OF A DECISION PROBLEM

There are some elements which are common to all kinds of decision problems. These are.

1. **The Decision –maker.** The decision maker refers to an individual or a group of individuals responsible for making a choice of an appropriate course of action from the available courses of action.
2. **Courses of action.** Courses of action are also called actions, alternatives, acts or strategies. For a problem situation, all possible courses of action should be included.
3. **States of Nature.** States of nature are sometimes called outcomes or events. The decision-maker must develop an exhaustive list of possible future of events. However, decision maker has no control over the occurrence of specific event.
4. **Payoff.** It is the effectiveness associated with a particular combination of a course of action and state of nature.
5. **Payoff table.** For a given problem a payoff table lists the states of nature and a set of given courses of action. For each combination of states of nature and course of action, the payoff is calculated. Let different states of nature or outcomes be represented by O_1, O_2, \dots, O_m and different courses of actions or strategies by S_1, S_2, \dots, S_n . For a given combination of O_i , and S_j , the corresponding payoff is denoted by a_{ij} . Such a payoff table is shown on the next page :

		Courses of actions			
States of nature		S_1	$S_2 \dots \dots \dots S_j \dots \dots \dots S_n$		
O_1		a_{11}	$a_{12} \dots \dots \dots a_{1j} \dots \dots \dots a_{1n}$		
O_2	⋮	a_{21}	$a_{22} \dots \dots \dots a_{2j} \dots \dots \dots a_{2n}$		
O_i	⋮	a_{i1}	$a_{i2} \dots \dots \dots a_{ij} \dots \dots \dots a_{in}$		
O_m	⋮	a_{m1}	$a_{mj} \dots \dots \dots a_{mn}$		

Payoffs may be evaluated in terms of Profit, Cost, or Opportunity Loss. When such payoffs are evaluated in terms of profit they are called Payoffs. A payoff

table shows the relation between all possible outcomes (states of nature), all possible courses of action and the value associated with these.

In the payoff table, the column headings designate the various courses of action out of which the decision maker may choose while the row headings show the admissible states of nature under which the decision maker has to take decision. The cell value a_{ij} shows payoff resulting by taking course of action S_i when the state of nature is O_j for all $j=1, 2, 3, \dots, n$ and $i=1, 2, 3, \dots, m$. A payoff table represents the economics of a problem – a problem of revenue and costs. A payoff may be thought of as a conditional value or conditional profits (losses). It is conditional value in the sense that associated with each course of action there is a certain profit (or loss), given that a specific state of nature has occurred. A payoff table thus contains all conditional values of all possible combinations of courses of action and states of nature.

23.3 TYPES OF DECISION-MAKING SITUATIONS

Given the payoff matrix for a decision problem, the process of decision making depends upon the situation under which the decision is being made. These situations can be classified into three broad categories : (a) Decision making under certainty; (b) Decision making under uncertainty ; (c) Decision making under risk.

We can classify the following types of decision making :

- (A) Decision Making under certainty
- (B) Decision Making under risk
- (C) Decision Making under uncertainty.

Let us discuss these in detail.

23.4 DECISION MAKING UNDER CERTAINTY

The conditions of certainty are very rare particularly when significant decisions are involved. Under conditions of certainty, the decision maker knows which particular state of nature will occur or equivalently, he is aware of the consequences of each course of action with certainty. Under such a situation, the decision maker should focus on the corresponding column in the payoff table and choose a course of action with optimal payoff.

23.5 DECISION MAKING UNDER UNCERTAINTY

A situation of uncertainty arises when there can be more than one possible consequences of selecting any course of action. In terms of the payoff matrix, if the decision maker selects A_1 , his payoff can be X_{11}, X_{12}, X_{13} , etc., depending upon which state of nature S_1, S_2, S_3 , etc., is going to occur. A decision problem, where a decision maker is aware of various possible states of nature but has insufficient information to assign any probabilities of occurrence to them, is termed as decision making under uncertainty.

There are a variety of criteria that have been proposed for the selection of an optimal course of action under the environment of uncertainty. Each of these criteria make an assumption about the attitude of the decision maker.

1. Maximin Criterion:

This criterion, also known as the criterion of pessimism, is used when the decision maker is pessimistic about future. Maximin implies the maximization of minimum payoff. The pessimistic decision maker locates the minimum payoff for each possible course of action. The maximum of these minimum payoffs is identified and the corresponding course of action is selected. This is explained in the following example:

Let there be a situation in which a decision maker has three possible alternatives A_1 , A_2 and A_3 , where the outcome of each of them can be affected by the occurrence of any one of the four possible events S_1 , S_2 , S_3 and S_4 . The monetary payoffs of each combination A_i and S_i are given in the following table.

Payoff Matrix

Events \Rightarrow Actions \Downarrow	S_1	S_2	S_3	S_4	Min. Payoff	Max. Payoff
A_1	27	12	14	26	12	27
A_2	45	17	35	20	17	43
A_3	52	36	29	15	15	52

Solution.

Since 17 is maximum out of the minimum payoffs, the optimal action is A_2 .

2. Maximax Criterion:

This criterion, also known as the criterion of optimism, is used when the decision maker is optimistic about future. Maximax implies the maximization of maximum payoff. The optimistic decision maker locates the maximum payoff for each possible course of action. The maximum of these payoffs is identified and the corresponding course of action is selected. The optimal course of action in the above example, based on this criterion, is A_3 .

3. Regret Criterion:

This criterion focuses upon the regret that the decision maker might have from selecting a particular course of action. Regret is defined as the difference between the best payoff we could have realized, had we known which state of nature was going to occur and the realized payoff. This difference, which measures the magnitude of the loss incurred by not selecting the best alternative, is also known as opportunity loss or the opportunity cost.

From the payoff matrix (given in § 18.6), the payoff corresponding to the actions A_1 , A_2 , A_n under the state of nature S_j are X_{1j} , X_{2j} , X_{nj} respectively. Of these assume that X_{2j} maximum. Then the regret in selecting A_i to be denoted by R_{ij} is given by $X_{ij} - X_{2j}$ $i= 1$ to m . We note that the regret

in selecting A_2 is zero. The regrets for various actions under different states of nature can also be computed in a similar way.

The regret criterion is based upon the minimax principle, i.e., the decision maker tries to minimize the maximum regret. Thus, the decision maker selects the maximum regret for each of the actions and out of these the action which corresponds to the minimum regret is regarded as optimal.

The regret matrix of example 17 can be written as given below:

Regret Matrix

Events \rightarrow Actions \downarrow	S ₁	S ₂	S ₃	S ₄	Max. Regret
A ₁	25	24	21	0	25
A ₂	7	19	0	6	19
A ₃	0	0	6	11	11

From the maximum regret column, we find that the regret corresponding to the course of action is A_3 is minimum. Hence, A_3 is optimal.

5. Hurwicz Criterion

The maximax and the maximin criteria, discussed above, assumes that the decision maker is either optimistic or pessimistic. A more realistic approach would, however, be to take into account the degree or index of optimism or pessimism of the decision maker in the process of decision making. If α , a constant lying between 0 and 1, denotes the degree of optimism, then the degree of pessimism will be $1 - \alpha$. Then a weighted average of the maximum and minimum payoffs of an action, with α and $1 - \alpha$ as respective weights, is computed. If $\alpha = 0.5$, the decision maker is said to be neutralist.

We apply this criterion to the payoff matrix of example 17. Assume that the index of optimism $\alpha = 0.7$.

Action	Max. Payoff	Min. Payoff	Weighted Average
A ₁	27	12	$27 \times 0.7 + 12 \times 0.3 = 22.5$
A ₂	45	17	$45 \times 0.7 + 17 \times 0.3 = 36.6$
A ₃	52	15	$52 \times 0.7 + 15 \times 0.3 = 40.9$

Since the average for A_3 is maximum, it is optimal.

5. Laplace Criterion

In the absence of any knowledge about the probabilities of occurrence of various states of nature, one possible way out is to assume that all of them are equally likely to occur. Thus, if there are n states of nature, each can be assigned a probability of occurrence = $1/n$. Using these probabilities, we

compute the expected payoff for each course of action and the action with maximum expected value is regarded as optimal.

23.6 DECISION MAKING UNDER RISK

There are certain types of decision problems where there can be more than one outcome and it is possible to assign a probability value to each outcome. In other words, the decision maker knows the probability of occurrence of each state of nature.

- (i) **Expected monetary value.** The best strategy is selected on the basis of the highest expected monetary value (EMV). The EMV for a course of action is the sum of the products obtained by multiplying the payoff for a given outcome by its probability value.

If m_1, m_2, \dots, m_n are the payoffs corresponding to the states of nature. S_1, S_2, \dots, S_n respectively, and the corresponding probabilities of S_1, S_2, \dots, S_n are p_1, p_2, \dots, p_n , then EMV is defined as :

$$EMV = m_1p_1 + m_2p_2 + \dots + m_np_n = \sum mp.$$

- (ii) **Expected opportunity loss.** Another decision criterion of decision theory is called expected opportunity loss (EOL). Opportunity loss represents the amount of profit that is lost because the most profitable course of action is not taken. To calculate EOL, we must find the conditional opportunity loss (COL). The COL of the optimal act being zero, the COL of any other act is the difference between the payoff of the optimal act and the action taken, and obviously will always be positive. When payoffs are replaced by their corresponding opportunity losses, we get what is known as the Loss Table. If l_{ij} (the element of a loss table) is the opportunity loss resulted by taking an action S_j when the state of nature O_i then l_{ij} satisfies the following relation :

$$l_{ij} = \max_j p_{ij} l - p_{ij}$$

For all $i = 1, 2, \dots, n$
 $j = 1, 2, \dots, m$

- (iii) **Expected value of perfect information.** The expected value of perfect information (EVPI) is the difference between expected profit (EP) of the optimal decision without perfect information and that with the perfect information. This expected profit with perfect information (EPPI) is called the expected value of payoff under certainty. The perfect prediction reduces the opportunity losses due to uncertainty to zero. The highest payoff in the absence of perfect predictor is EP of the optimal action. The difference between $EPPI$ and EP is called the *expected value of perfect information* (abbreviated $EVPI$). $EVPI$ represents the maximum amount of money which a decision-maker could spend to obtain additional information regarding the states of nature. It may be noted that $EVPI$ is always equal to the EOL of selecting the optimum action under uncertainty. The identity $EP + EOL = EPPI$ follows from the result $EVPI = EOL$ and $EVPI = EPPI - EP$.

23.7 DECISION TREE

A decision tree is a graphical expression which displays various organs of decision process that include courses of action, risks involved and the possible outcomes. It enables a decision maker to consider alternative solution, assigned financial values to them, estimate the probability of a given outcome for each alternative, make comparisons and choose the best alternative.

The base of the decision tree is called the 'decision point' and is usually square-shaped. The branches of the tree begin at the first 'chance event'- the chance event is represented by a circle. Every chance event produces two or more than two possible effects and then leads to subsequent decision points. A manager calculates the different probability estimates by careful research that associated with different chance events with the help of which he takes a final decision.

In nut shell, decision tree analysis is a systematic portrayal of future 'Acts' (Decisions) and 'Events' (Consequences) in an organized form directly connected with the analysis of a problem having sequential outcomes over a period of time. Every 'act' depends on and is influenced by 'events' that are usually not fully known. Imagine a decision choice in betting. The decision is a simple yes/no, win/lose decision as shown in the following figure.

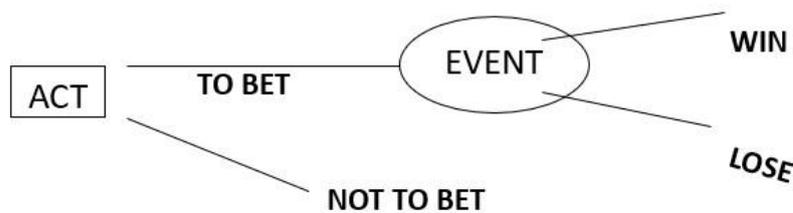


Figure 23.1

To make the analysis meaningful and useful as a tool of decision making, it is necessary to lay down criteria for a decision. In business decisions, the usually used criterion is to maximize monetary benefits. Others could be employment, use of capital, company image etc.

This method can best be understood with the help of the example given further.

Table Showing Investment Alternatives

Alternative		Outcomes (Rs.)		Expected Value (Rs.)
A	10000	20000	30000	17000
B	15000	30000	10000	18500
C	5000	15000	40000	15000

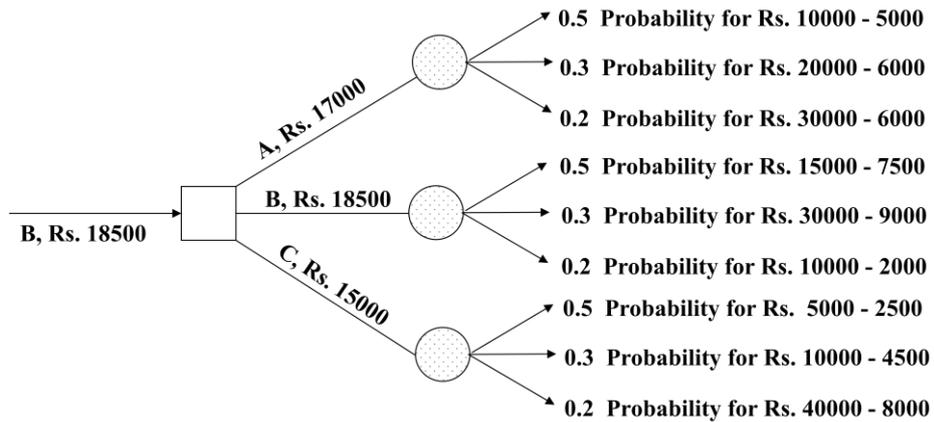


Figure 23.2 Decision Tree

Probabilities	0.5	0.3	0.2	
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The table shows that by investing in the alternative A, the chances of the investor of getting a return of Rs. 10000 are 0.5 (i.e. 5%), whereas the chance is 30% of getting two times return and 20% of getting the return three times. Likewise, the expected return and the expected probabilities for the rest of the alternative investment opportunities are also specified. The investor, then arithmetically calculates the expected value of the return from a probability with the outcome. Here, in order to get the expected value from the investment in A, the following process would be applied.

$$\text{Expected value} = 10000 \times 0.5 + 20000 \times 0.3 + 30000 \times 0.2 = 17000$$

We can analyse the same problem through Decision tree. Accordingly, the decision would be to invest in alternative to give it yields the highest return of Rs. 18500 in comparison to other alternatives. A decision tree on the basis of the referred information would be formed in the following shape :

Decision tree provides an advantage of clearly illustrating what really goes on in decision making process. It serves as a useful tool for representing combinational problems, whereas payoff and opportunity cost tables are useful and convenient when a single decision needs to be made in a single time period so that the decision is made at the beginning of a given period and the outcomes of the decisions are estimated only once. But most decision are time dependent and are sequential in nature so that each decision has an impact on the successive decisions. The decision trees satisfy the condition where a series of decisions are to be made simultaneously.

23.8 SUMMARY

A decision under faces risk when there are several outcomes associated with a decision and the probabilities of those outcomes are known. The greater the variation is in those outcomes, the greater the risk. The set of outcomes and their associated probabilities comprise a probability distribution. If the probabilities of the outcomes are known, the decision make faces uncertainty.

Behaviour is said to be risk averse if the certainty equivalent of a gamble is greater than the expected rupee value of the gamble. In contrast, behaviour is risk seeking if the certainty equivalent of a gamble is less than the expected rupee value of the gamble. A market for insurance exists because many people are risk averse, whereas a market for gambling exists because there are risk seeking individuals.

The most common method for compensating risk when making a decision is to add a risk premium to the rate used to discount future profits. The risk premium increases as the risk linked with the decision increases. An alternative method for adjusting for risk is to evaluate the certainty equivalent of a risky decision.

The decision tree analysis gives us an objective view of the various parts of 'act' and 'events' according to any laid-down criteria, but this should not mean that whatever fulfils the criterion, is the decision. Such decisions have to be weighed and personal preferences have to be matched with decision in order to bring in the realities of organizational ability, financial strength, capacity to bear risk, etc. Thus, the decision tree analysis is a technique and a tool to help in arriving at a decision and not an end-in-itself.

23.9 GLOSSARY

- **Decision Tree:** It enables a decision maker to consider alternative solutions, assign financial values to them, estimate the probability of a given outcome for each alternative, make comparisons and choose the best alternative.

23.10 CHECK YOUR PROGRESS

(A) Fill in the blanks :

- A ----- may be considered as a conditional profit or loss.
- is known as the criterion of pessimism.
- The expected profit with perfect information is called the ----- under certainty.
- A decision tree has a ----- structure.

(B) State whether the following statements are true or false :

- A decision maker must prepare a brief of possible future events.
- A payoff table shows the relation between all possible states of nature.
- Maximax implies the maximization of maximin payoff.
- The decision point of a decision tree is circular in form.

23.11 ANSWERS TO CHECK YOUR PROGRESS

- (A) (i) Payoff (ii) Maximin Criterion (iii) the expected value of payoff (iv) Horizontal
- (B) (i) False (ii) True (iii) True (iv) False

23.12 TERMINAL QUESTIONS

- Discuss the various elements of decision problems.
- Explain payoff.

- (iii) Explain the process of decision making under risk.
- (iv) Discuss the circumstances under which Decision tree method is more suitable in decision making process than others.

23.13 SUGGESTED READINGS

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