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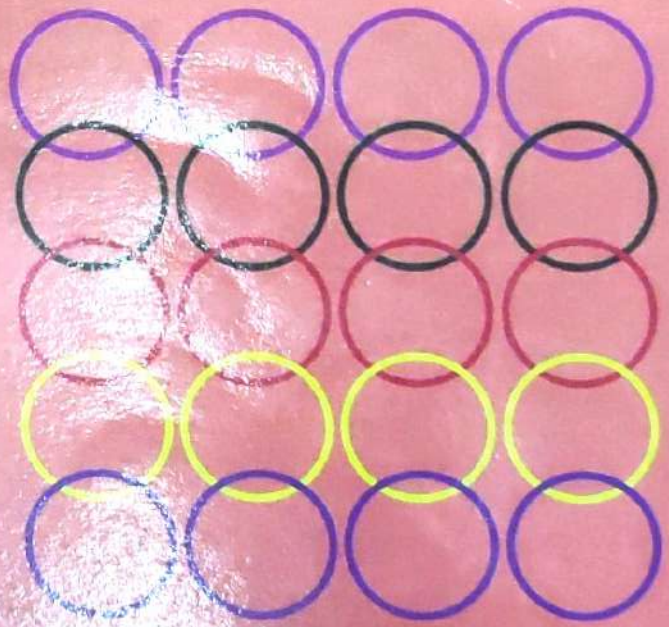
Business Economics - I

SARASWATHY SWAMINATHAN



VIPUL PRAKASHAN™

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Vipul's™

BUSINESS ECONOMICS - I

(BMS / BAF / BBI / BFM / BIM / BFinM / BTM Courses)
(First Year : First Semester)

SARASWATHY SWAMINATHAN
M.A. (Eco), D.H.E.
Former Vice-Principal and Former Head of the Department of Economics,
S. I. E. S. College of Commerce and Economics,
Sion (E), Mumbai - 400 022.

SEVENTH REVISED EDITION

™ VIPUL PRAKASHAN
161, Jagannath Shankar Seth Road,
Girgaum, Mumbai - 400 004.
Tele/Fax: 2387 1127 / 2387 9395
E-mail: info@vipulprakashan.com

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INTRODUCTION:

Economics, a social science deals with the economic behaviour of mankind. It studies the utilisation of scarce resources of the society and how the various goods and services produced are distributed among the different sections of the society. It has been defined by different economists in various ways proving the statement "when there are six economists there will be seven

opinions". Adam Smith, Father of Economics defined Economics as the Study of Wealth in his magnum opus "Wealth of Nations". Alfred Marshall, the famous neo-classical economist considered Economics as the "Science of Welfare". The most comprehensive definition was given by the modern economist Lionel Robbins who stressed upon scarcity of resources. According to him, "Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses". This definition indicates the constant tug of war between multiplicity of human wants and scarcity of resources which have alternative uses.

The above definition indicates the economic problem faced by all countries. Economic problem is the problem of unlimited wants and limited means. Moreover the means have alternative uses. Thus scarcity, choice and efficiency form the core of an economic problem. It can be explained in detail as follows:

(1) **Multiplicity of wants:** Human beings have unlimited wants. When one want is satisfied, another one emerges. There is a long list of wants to be satisfied one after the other.

(2) **Arrangement of wants:** While all wants can't be satisfied at the same time, particular want can be satisfied. For any individual, all wants are not equally important. Some wants are more important and urgent than others. Hence it is possible to arrange the wants according to their importance.

(3) **Scarcity of means:** The various means to satisfy the wants of people are limited. The means or resources are in terms of money, time, manpower, natural resources, etc. They are scarce in relation to their demand. A rich country may have substantial resources. However if the demand is more than the supply then the resources are said to be scarce in nature.

(4) **Alternative uses of means:** The various means are not only limited but they also have alternative uses. For e.g. money at the disposal of a person can be used to buy a car or he can use it for foreign travel. The limited amount cannot be used for both at the same time. Similarly a student can use his time either for studies or entertainment at a particular time. Hence a choice has to be made regarding the use of the resources.

All these four basic factors give rise to an economic problem which is nothing but the problem of unlimited wants and limited means.

Every society and every economy faces this problem of unlimited wants and limited means. This problem is termed as economic problem and it is universal in nature as it exists in both rich and poor countries. Scarcity of resources is the fundamental cause for an economic problem. To solve this a choice has to be made in the utilisation of resources and satisfaction of wants. While scarcity of resources is a technical problem, making a choice is economic in nature. The above definition also implies the need to use the scarce resources efficiently by making a proper choice. Thus scarcity, choice and efficiency constitute the subject matter of economics.

SCARCITY:

Every economy has a limited stock of resources viz. land, labour, capital, technology, etc. These have to be used for the production of various goods and services in the best possible manner. Goods and services are scarce in relation to wants. If the resources are abundant then all economic goods will become free goods like air, water, etc. In such an economy, markets do not have a role to play as there is no scope for price mechanism. Economics, as a subject will have no relevance. However, the problem of scarcity exists even in the richest of the rich countries. Today's world is a world of scarcity filled with economic goods.

CHOICE:

Due to the problem of scarcity, choice has to be exercised by every economy in the utilisation of resources and satisfaction of wants. The choice has to be made in such a way that optimum resource allocation can be ensured. What to produce, how to produce and for whom to produce are the three main issues faced while making a choice. This implies that every economy must make the right choice about factor inputs and output.

EFFICIENCY:

It implies the effective use of scarce resources in such a manner that maximum wants can be satisfied. If there is no efficiency then

people may be worse off than before. Ensuring efficiency in resource utilisation is the essence of economics.

MEANING, SCOPE AND IMPORTANCE OF BUSINESS ECONOMICS:

MEANING & IMPORTANCE OF BUSINESS ECONOMICS:

Business Economics is the application of economic principles in business decision making. Every business firm is confronted with a number of problems while producing goods and services. The firm has to decide about the type of good to be produced, the technology to be used and the mode of distribution. In order to maximise its profit and achieve other goals, decisions regarding pricing, the volume of output to be produced, the cost to be incurred etc. have to be carefully analysed by the firm. Business Economics helps the business firms to take rational decisions. Business Economics provides a tool-box of analysis and a technique of thinking to business firms to deal with their problems effectively. Through this it enables the firms to allocate their scarce resources rationally. Business Economics derives its tools of analysis from Micro Economics. Various micro economic concepts like elasticity of demand, economies of scale, opportunity cost, etc. are extensively used in business economics. Economic theories, models and quantitative techniques are used to analyse different types of problems in business decision making. Thus it is both theoretical and mathematical. It provides a link between abstract theory and business practices.

Business economics is said to be both positive and normative. It not only describes but it also prescribes. It explains the various factors which affect the working of a business and also the effects of its decisions. Further, it provides valuable suggestions to the business firms to enhance their efficiency and enable them to achieve their goals. The techniques and principles of business economics are employed by all types of firms – private, public and non profit organisations like schools, colleges etc. as the basic problem of scarcity of means and unlimited wants is common to all types of business firms. In the recent times business economics has acquired immense significance due to its utility to business firms.

Economics is broadly divided into two parts namely micro economics and macro economics. While micro economics studies the behaviour of individual economic units, macro economics studies the behaviour of the entire economy. Product pricing, factor pricing and welfare economics constitute the subject matter of micro economics. Macro economics on the other hand deals with national income, international trade, money and banking, general employment etc. Though micro and macro-economics are two different branches of economics, they are also interdependent.

Business Economics also known as Managerial Economics primarily depends upon Micro Economics. However, concepts and principles of macro economics are not totally irrelevant for business economics. Business environment is very much influenced by macro economic conditions like growth rate of the economy, level of employment, trade cycles, fiscal and monetary policy of the government etc. The survival and expansion of business firms depend upon the overall economic environment. Thus both micro and macro economics are important for business economics.

Business Economics uses a combination of economic theory and decision sciences. Economic theory provides the theoretical framework for analysing business problem. Decision sciences provide the necessary tools and techniques for decision making. Some of the tools and techniques are optimisation technique, linear programming, game theory etc. Techniques of demand forecasting are extensively depended upon by business firms for decision making related to expansion and diversification of the firm. All these help the firms in rational decision making and realisation of their goals. While economic theory and decision sciences are important for managerial economics, its dependence on decision sciences is considered as vital and significant. The importance of economics and decision sciences for managerial economics is depicted as follows:

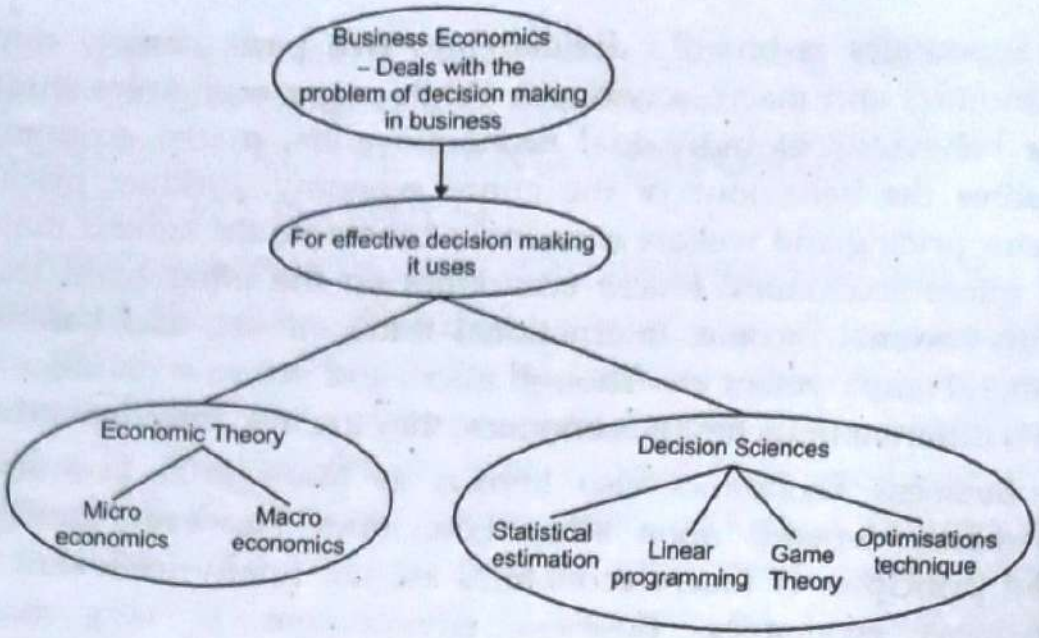


Fig. 1.1

NATURE AND SCOPE OF BUSINESS ECONOMICS:

Business economics has become very popular in the recent times due to its practical application. It has derived its subject matter from economics. Both micro and macro concepts and principles are used in business economics. Economics tools and techniques are extensively employed to formulate business policies. The subject matter of business economics broadly consists of the following:

(1) Demand analysis.
(2) Demand forecasting.
(3) Cost and production analysis.
(4) Price-output decisions under different market structures.
(5) Profit analysis.
(6) Capital budgeting.

The main focus of business economics is to analyse the problems of business firms and find solutions for the same. It is a positive and normative science i.e. it is both descriptive and prescriptive. It not only analyses the various problems involved in business decision making but also suggests ways and means to improve decision making. It provides a set of tools and techniques for rational decision making. Business firms always face conditions of risk and uncertainty. In such a business

environment, business economics helps in arriving at the right decisions quickly and easily. It helps in forward planning, maximisation of profits and attainment of other objectives. Thus business economics is concerned with the application of theories and techniques of modern economics in business decision making. Its subject matter consists of those concepts, principles and techniques of economics which are useful in solving the problems of business firms. Modern business firms thus depend upon economics for effective allocation and utilisation of resources. It has become an integral part of business management at present.

DISTINCTION BETWEEN ECONOMICS AND BUSINESS ECONOMICS:

Economics is concerned with the economic behaviour of mankind. It analyses the problem of scarce resources and unlimited wants. It studies the functioning of the economic system. Business economics is the application of economic principles in decision making. While economics cannot provide readymade solutions to the problems faced by a business firm, it can guide the firm in taking rational decisions. The various economic concepts and theories are useful to the firm in formulating a proper business policy. Though business economics depends upon economics, it also differs from economics in a number of ways. While economics is theoretical in nature, business economics is said to be a pragmatic science. The basic differences between the two can be enlisted as follows:

Economics	Business Economics
(1) It is concerned with various concepts, theories and principles.	(1) It is the application of economics in business decision making.
(2) It is considered as both positive and normative.	(2) It is concerned with what ought to be done. Hence, it is said to be normative and prescriptive.
(3) It's scope is wider as it deals with individuals, firm, industry etc.	(3) It's scope is narrow as it deals only with the problems of business firms.

(4) Economic theories are based on assumptions. Risk and uncertainty are not considered here. In other words, conditions are assumed to be normal.	(4) Business firms operate under conditions of uncertainty. Risk is inherent in every business. According to the conditions, economic theories and models are modified and then applied to business decision making.
(5) Economic theories are made simpler by making assumptions and by avoiding complexities.	(5) It is relatively complex as it deals with realistic aspects of business. It uses mathematics, statistics, operational research etc. in decision making. It is a pragmatic science.

BASIC TOOLS:

(1) Opportunity Cost:

It is an important cost concept. It arises due to the universal economic problem i.e. wants are unlimited, means are limited and they have alternative uses. Hence the use of resources has to be selected. At a particular time, they can be used for a particular purpose. The other uses have to be sacrificed. When a factor of production is employed in one use, the production of other good where it can be used is sacrificed. Therefore opportunity cost of a factor of production is the next best alternative that is sacrificed. It is also called as alternative cost or social cost of production. For e.g. a particular plot of land can be used for multiple purposes like construction of a house or a school or a hospital or cultivation of a crop. Once the purpose is decided, others have to be sacrificed. The next best alternative that is sacrificed is opportunity cost.

It is useful to a businessman for a number of purposes:

(1) It is useful to determine the relative prices of different goods. For e.g. the same factors can be used to construct 1 bungalow or 10 flats. While determining the price, the firm will see to it that the price of the bungalow is at least equal to the price of the ten flats.

(2) It helps in determining the normal earnings of a factor. If the factor has to be retained in the present job, it should be paid at least the amount it can get in the next best job. For example, if a person is employed by a college, his salary may be Rs. 10,000 per month. He can be employed by a financial institution and if the salary offered is Rs. 12,000, then the college should pay him at least Rs. 12,000 if it wants to retain him in the present job.

(3) It helps in decision-making and optimum allocation. For example, a builder has a choice to build a bungalow or ten flats using the same plot of land. In order to arrive at a decision, he has to compute the opportunity cost of building either of these two. Suppose he decides to construct 1 bungalow, then his opportunity cost will be the ten flats he has to sacrifice. Let us suppose the price of each flat is Rs. 20 lakhs then the total income he will get will be Rs. 2 crores. Suppose the price of bungalow is quoted as Rs. 3 crores, it is worthwhile for him to construct one bungalow rather than ten flats, as he can make more profits. Rational decision making is possible with the help of opportunity cost. Once a proper decision is taken, it ensures efficient use of resources.

PRODUCTION POSSIBILITIES FRONTIER/PRODUCTION POSSIBILITIES CURVE (PPC):

The concept of production possibilities curve (PPC) is given by the famous economist Prof. Samuelson. It explains the basic subject matter of economics namely scarcity of resources and the problem of economising. The resources like land, labour capital, technology, etc. available to any economy is limited. Hence they have to be utilised in the best possible manner to produce the maximum output. The question of efficiency arises when there is scarcity. An economy is said to be efficient when the maximum output is produced at minimum cost of production. This output is also termed as the least cost output.

The production possibilities curve is also known as the transformation curve. To explain this concept, Prof. Samuelson has assumed the following three conditions:

(a) There is full employment and full production of goods and services.

(b) The supply of factors of production is fixed. However they can be shifted among different uses within limits.

(c) The state of technology remains the same.

The production possibilities frontier can be illustrated by an example. Let us suppose an economy has certain amount of resources which can be used for producing two goods namely rifles and bread. While the former is a defence good, the latter is a civilian good. If all the resources are used for producing rifles then production of bread is impossible and vice versa. The economy is supposed to produce a combination of both the goods. The various production possibilities of both the goods can be depicted through a table and a diagram.

Production Possibilities

Possibilities	Bread (Thousands)	Rifles
A	0	20
B	1	19
C	2	17
D	3	14
E	4	10
F	5	0

In the above possibilities, if all the resources are used for the production of rifles, then production of bread will be zero. On the other hand if the resources are entirely used for the production of bread then production of rifles will be nil. In between these two extremes, there are a number of other possibilities.

The economy has to make a choice as to what quantities of bread and rifles have to be produced. The resources are limited. Hence only a limited output can be produced. If the production of bread has to be increased, the production of rifles has to be reduced and the vice-versa. To increase the production of bread, resources have to be transferred from the production of rifles. Thus a choice has to be made and this is the core of the economizing problem. The production possibilities curve can be vividly explained with the following diagram:

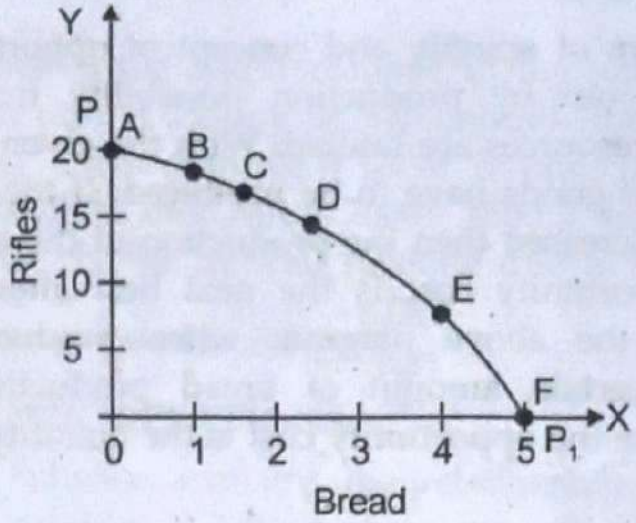


Fig. 1.2

In the above diagram PP_1 is the production possibilities curve. It shows the schedule along which the two goods can be substituted for each other. If all the resources are used for the production of bread, production of rifles will be nil and vice versa. Points B, C, D, E represent the combination of both the goods. If combination B is selected more of rifles and less of bread will be produced. On the other hand, combination E signifies production of more bread and less of rifles. PPF shows the maximum amount of the two goods that can be produced given the inputs and technology. In other words, PPC is nothing but the menu available to the society regarding goods and services.

In the above diagram point 'R' is not possible as it is outside the PPF. If point 'S' is selected it indicates inefficiency as all the resources are not used. Thus, the economy should select a point on the curve for optimum use of resources.

The production possibilities curve is also known as the transformation curve. This is because when the output of bread is increased, resources are shifted from the production of the rifles. This in effect is nothing but transforming rifles to breads by transferring the resources. Thus in a full employment economy, production of one good can be increased only by sacrificing the production of the other good. It is not possible to increase the production of both as the resources are scarce. According to Prof. Samuelson "Substitution is the law of life in a full employment economy. The production possibilities curve or frontier depicts society's menu of choices."

The problem of scarcity and concept of opportunity cost are well brought out by production possibility frontier. In any economy the resources are limited. With the given resources, the combination of goods have to be produced. If the production of one good is increased then the production of the other has to be reduced. Opportunity cost is the next best alternative that is foregone. In the above diagram when production of rifles increases, a certain amount of bread production has to be sacrificed. Here the opportunity cost is the quantity of bread that is sacrificed.

Incremental and Marginal Concepts:

Incremental and marginal concepts are often used in business decision making. While marginal concept is concerned with 'unit change' incremental concept is concerned with 'bulk change'. For instance the change in total revenue due to the sale of one more unit of output is marginal revenue. If a firm gets additional revenue due to a new decision like use of robots instead of human labour, it is termed as incremental revenue.

Incremental Concept: Incremental concept analyses the impact of a decision on investment, production, prices, etc and ultimately on total cost and total revenue. Thus this concept can be viewed in terms of incremental cost and incremental revenue. Due to change in the decision of an organisation, total cost and total revenue will change. This change in total cost is called incremental cost and the change in revenue is called incremental revenue. The change in decision may be related to procurement of raw materials, recruitment of labour, marketing strategy, advertising, use of technology etc. Thus the incremental concept refers to a decision taken by a firm which influences total cost and total revenue. Such decisions are taken by a firm to increase total revenue and reduce total cost thereby profits are enhanced.

Marginal Concept: Marginal concept indicates the change in total revenue and total cost due to 'unit change'. Marginal cost is the cost incurred in producing an additional unit of the output. For instance if the total cost of producing 10 units is Rs. 100 and by producing the 11th unit, if the cost increases to Rs. 120, then the difference between the two total cost i.e. Rs. 20 is termed as marginal cost. It is expressed as $MC = TC_n - TC_{n-1}$. Similarly

marginal revenue is the addition made to the total revenue by selling one more unit of the output. Symbolically it is expressed as $MR = TR_n - TR_{n-1}$. For example if TR of 'n' units is Rs. 2000 and n – 1 units is Rs. 1800, then MR is 2000 – 1800 = Rs. 200. It is also expressed as the change in total revenue due to the change in output sold and expressed as $MR = \frac{\Delta TR}{\Delta Q}$.

BASIC ECONOMIC RELATIONS:

(1) **Function:** Function explains the relationship between two economic variables. It explains how one variable depends on the other. E.g. Demand for a good depends upon its price. It is expressed as D = f (p) where D = demand, p = Price and f = functional relationship. The relationship between consumption and income is expressed as C = f (Y) where C = consumption and Y = income. Functions are classified into two types namely explicit function and implicit function. Explicit function is one in which the value of one variable depends on the other in a definite form. E.g. Relationship between demand and price. Implicit function is one in which the variables are interdependent.

E.g. NI = f {savings, investment, ...}

(2) **Equations and Identities:** An equation explains the relationship between two economic variables namely the dependent and the independent variable. An equation is true only for a specific value. For e.g. the equation x – 5 = 2 is true only when x = 7. The symbol = is used in equations.

- Equations can be linear or quadratic.
- Identities are those in which the relationship is always true. Identities are denoted by the sign ≡. E.g. of an identity is $x^2 - 9 = (x + 3)(x - 3)$. This identity is always true.

(3) **Graphical Techniques:** Graphs are considered as very important in economic analysis. A graph is a diagram which shows the relationship between two variables. It is easy to represent a two dimensional figure through a graph. A graph has a vertical axis termed as Y axis and a horizontal axis termed as the X axis. When the relationship between the two

variables has to be expressed, one has to be shown on the X axis and the other on the Y axis. When all the points are plotted, a graph can be obtained. For e.g. the relationship between demand and price can be expressed in the form of a curve. It can be a linear or a non-linear curve.

(4) **Slope:** Slope is an important concept in Economics. It refers to the change in one variable due to a change in the other variable. In other words it is the change in the variable Y which is represented in the Y axis due to per unit change in the variable X on the X axis. Slope measures numerically the relationship between change in Y and the change in X. Slope is also popularly termed as "the rise over the run". Here rise is the vertical distance while run is the horizontal distance.

(5) **Variables:** Variables play an important role in economic theories. It is a magnitude of interest which can be defined and quantified. It is a symbol whose value keeps on changing. It assumes different values at different times or places. E.g. of variables are prices, profit, income, etc. Variables can be endogenous or exogenous. Endogenous are those which lie within the theory while exogenous lie outside the theory.

(6) **Constant:** Constant is a symbol whose value remain the same throughout a particular problem. E.g. $\pi = {}^{22}/_{7}$. Constants are of two types namely **(a)** absolute and **(b)** arbitrary or parametric. In the case of absolute constant, the value will remain the same. In the case of arbitrary or parametric constant, the value will remain the same in the particular problem but it will change its value in other problems.

(7) **Ceteris Paribus:** It implies "other things being equal". Economic theories often use ceteris paribus assumptions. When the relationship between two variables are explained, other factors which affect the variables are assumed to be constant. This is termed as Ceteris Paribus and such assumptions help to simplify the theories.

(8) **Time Series:** The relationship between time and a set of data is called time series. It traces the movement in the variable over a period of time. For e.g. if the changes in the GDP of

India from 1995-2000 is analysed, it can be represented in the form of time series. Time-series graphs have the variable like GDP on the Y axis and time on the X axis. The relationship between the variable and time can be traced in the graph. This tool is very useful to businessmen for demand forecasting, to the planners for predicting the future conditions of the economy and also to the government to analyse economic fluctuations and the steps to be taken to control them.

TOTAL, AVERAGE AND MARGINAL RELATIONS:

Revenue:

Revenue function is an important factor on the supply side like cost function. It refers to the sales receipts. The revenue of a firm depends upon the quantity of output sold and the price per unit of the commodity. There are three concepts of revenue namely.

(a) **Total revenue:** It is the total receipts earned by the firm by selling the output. It is calculated as TR = P × Q where TR is total revenue, p is price of the commodity per unit and Q is the total quantity of output sold. For e.g. if a seller sells 100 units of a commodity at Rs. 10 per unit, then TR = 100 × 10 = Rs. 1,000.

(b) **Average revenue:** It is the revenue obtained per unit of the output. Symbolically, it is expressed as:

$$AR = \frac{TR}{Q}.$$

In the above example:

$$TR = 1000,$$
$$Q = 100$$

Therefore,

$$AR = \frac{1000}{100}$$
$$= \text{Rs. } 10.$$

AR is nothing but the price of the commodity per unit i.e.

$$AR = \frac{TR}{Q}$$

$$= \frac{P \times Q}{Q} = P$$

$\therefore$ AR = Price

Applying the above example, it can be shown that AR = Price.

$$AR = \frac{P \times Q}{Q}$$

$$= \frac{10 \times 100}{100} = 10.$$

Generally, business firms sell the various units of their goods at the same price. Hence by and large average revenue is equal to price. However, if the seller practices price discrimination, then average revenue and price will differ. Price discrimination refers to the practice of selling different units of the commodity at different prices. For instance, in the above example if all the units are sold at the same price then average revenue will be equal to price. Let us consider four units of the commodity sold at the rate of Rs. 10 per unit. Then total revenue will be Rs. 40, average revenue and price will be equal to Rs. 10. Suppose the first four units are sold at the rate of Rs. 12, Rs. 13, Rs. 15, Rs. 20 then the average revenue and price will be different. Here the total revenue from the four units will be Rs. 12 + 13 + 15 + 20 = Rs. 60. Average revenue will be 60/4 = Rs. 15. Thus AR and price will differ if the same price is not charged. Generally a monopolist adopts the practice of price discrimination.

Another aspect to be noted here is that the demand curve of the consumer is the same as the average revenue curve of the producer. The demand curve shows the relationship between price and quantity demanded. When the buyer spends on the commodity, it becomes the income of the seller. Thus the demand curve of the consumer is also the average revenue curve of the producer.

(c) **Marginal Revenue:** It is the addition made to the total revenue by selling one more unit of the output. Symbolically,

$$MR = TR_n - TR_{n-1}$$

For e.g. $MR = 1000 - 980$

$= 20.$

$\therefore \quad MR = 20.$

It is also expressed as the change in total revenue due to the change in the output sold:

$$MR = \frac{\Delta TR}{\Delta Q}$$

Cost:

Cost of production is an influential factor on the supply side. It refers to the expenditure incurred on the various factors of production like land, labour, capital and organisation which are used in the production of a commodity. It denotes the remuneration paid to the factors of production for their services.

While analysing the cost data of a firm, the following types of costs are considered:

(1) **Total Cost (TC):** It is the total expenditure incurred by the firm in producing a given level of output. It is obtained by multiplying factor prices with their quantities. Symbolically it is expressed as TC = f (Q) which implies that total cost varies with output. Total cost includes explicit, implicit and money costs. In the short run TC is also equal to Total variable cost + Total fixed cost i.e. TC = TVC + TFC.

(2) **Total Fixed Cost (TFC):** It is the total cost incurred on the fixed factors of production. TFC remains the same at all levels of output in the short run.

(3) **Total Variable Cost:** In the short run some factors are variable. The cost incurred on these variable factors is called total variable cost. It varies with the level of output.

(4) **Average Fixed Cost (AFC):** AFC is the total fixed cost divided by total units of the output.

i.e. $AFC = \frac{TFC}{Q}$. AFC is the fixed cost per unit of the output.

(5) **Average Variable Cost:** It is the total variable cost divided by the total units of output.

$AVC = \frac{TVC}{Q}$. It is the variable cost per unit of output.

(6) **Average Total Cost (ATC):** It is total cost divided by the units of output. ATC = $\frac{TC}{Q}$. It is the average cost per unit of the output. It can also be calculated as the sum of average fixed and average variable cost.

(7) **Marginal Cost:** It is the cost of producing an extra unit of the output. It is calculated as $MC = TC_n - TC_{n-1}$ i.e. Total cost of producing n units of the output – total cost of producing (n – 1) units of the output. It indicates the change in the total cost due to the production of an additional unit.

Product:

(a) **Total product:** It is the total quantity of the commodity, produced by using fixed and variable factors of production.

(b) **Average product:** It is the total output divided by the total units of input.

(c) **Marginal product:** It is the addition made to the total output by employing one more unit of the input. It is expressed as $MP = TP_n - TP_{n-1}$, where TP is total product and MP is marginal product. Suppose there are four labourers and produce 100 units of a commodity and if the fifth labourer joins and the total output increases to 115 units, then marginal product is equal to (115 – 100) 15 units.

USE OF MARGINAL ANALYSIS IN DECISION MAKING:

The concepts of marginal revenue, marginal product and marginal cost help the business firms in decision making. They have to take decisions regarding investments, production use of more inputs etc. To identify the equilibrium output, marginal revenue and marginal cost are required. The marginal concepts help the firms to make rational decisions and maximise profits.

QUESTIONS FOR REVIEW

(1) **Define the following concepts:**

(a) Scarcity.
(b) Choice.
(c) Efficiency.
(d) Economic Problem.
(e) Production Possibility Frontier.
(f) Opportunity Cost.
(g) Marginal Revenue.
(h) Marginal Cost.
(i) Function.
(j) Equation.
(k) Slope.
(l) Total Revenue.
(m) Free Goods.
(n) Economic Goods.
(o) Total Product.
(p) Average Product.

(q) Marginal Product.
(r) Total Cost.
(s) Average Cost.
(t) Economics.
(u) Business Economics.

Fill in the blanks:

(a) Adam Smith is referred as the _____.
(b) Scarcity of resources is a _____ problem.
(c) Economics is concerned with the ways in which _____ are allocated among alternative uses to satisfy _____.
(d) Production possibility curve is _____ to the origin.
(e) Economics is a _____ science.
(f) The concept of production possibility curve was developed by _____.
(g) The term 'the rise over the run' is related to _____.
(h) Functions can be both _____ and _____.
(i) Production Possibility Curve is also known as _____.
(j) _____ explains the dependence of one variable on the other variable.
(k) Opportunity cost is the _____. (Price of goods and services, all out of pocket costs, Value of the best alternative sacrificed, Price that exceeds market price)

*[**Ans.:** (a) Father of Economics; (b) Universal; (c) resources, human wants; (d) concave; (e) social; (f) Prof. Samuelson; (g) slope; (h) explicit and implicit; (i) Transformation curve; (j) Functional Relation; (k) Value of the best alternative sacrificed]*

State whether the following statements are true or false:

(a) Economics is concerned with scarcity, choice and efficiency.
(b) Economic problem is a universal problem.
(c) Scarcity is the root cause of an economic problem.
(d) The problem of scarcity and opportunity cost are implied in the production possibilities curve.
(e) Substitution is the law of life in a full employment economy. The production possibility frontier depicts society's menu of choices.
(f) Economic inefficiency is indicated if a firm operates inside the production possibility curve.
(g) Scarcity of resources is a universal problem.
(h) Opportunity costs arise because resources are unlimited. ***(March 17)***
(i) An exogenous variable is within an economic model. ***(March 17)***
(j) Microeconomics deals with the analysis of national income. ***(BIM, Oct. 17)***
(k) Macro economics deals with the analysis of NI. ***(March 18)***
(l) Opportunity cost arises because resources are limited. ***(March 18)***
(m) An equation is true only for a specific value. ***(Oct. 18)***
(n) A variable is an identity whose quantity can change over a specified time period. ***(Oct. 18)***
(o) Function explains/express the relationship between two economic variables. ***(BIM, Oct. 18)***
(p) An equation specifies the relationship between the dependent and independent variables. ***(March 19)***
(q) Economics deals with the problem of scarcity of resources. ***(BIM, March 19)***
(r) The economic problem arises only because wants are unlimited.
(s) The primary focus of business economics is economic welfare.

*[**Ans.:** (a) True; (b) True; (c) True; (d) True; (e) True; (f) True; (g) True; (h) False; (i) False; (j) False; (k) True; (l) True; (m) True; (n) True; (o) True; (p) True; (q) True; (r) True; (s) True]*

Match the following:

(A)		(B)	
(1)	Graphs ***(BIM, Oct. 17)***	(a)	Mathematically express functions
(2)	Business Economics ***(BIM, Oct. 17)***	(b)	Geometrical tool to study functions/ Diagrammatic representation of function

(3)	Equations *(Oct. 17)*	(c)	Application of economic theory and quantitative techniques/Mathematical expression.
(4)	Slope *(Oct. 18)*	(d)	Show the pictorial presentation and the relationship between two variable
(5)	Graphs *(Oct. 18)*	(e)	Refers to change in one variable due to change in other variable
(6)	Incremental cost *(BIM, Oct. 18)*	(f)	Measures larger change
(7)	Business economics *(March 19)*	(g)	Analyses the impact of a decision on investment and production
(8)	Incrementalism *(March 19)*	(h)	Application of economic theory to business management
(9)	Opportunity Cost	(i)	Value of next best alternative sacrificed
(10)	Means	(j)	Limited
(11)	Replace	(k)	Alternative uses

[Ans.: (1 – b); (2 – c); (3 – a); (4 – e); (5 – d); (6 – g); (7 – h); (8 – f); (9 – i); (10 - j); (11 – k)]

(2) Define / What is business economics? Discuss its scope. ***(BIM, Oct. 17)***

(3) Explain scope and importance of Business Economics.

(4) Explain / Discuss the scope of business economics.

(5) Analyse the problems of scarcity, choice and efficiency.

(6) Explain in detail with the help of an example the concept of production possibility curve.

(7) Explain opportunity cost in detail.

(8) Explain the concept of opportunity cost with the help of diagram.

(9) Differentiate between incremental and marginal concepts.

(10) Generally students studying in the commerce stream have a tendency to pursue professional courses like CA, ICWA, etc. They have to use their time for both. Consider these two as goods and construct a production possibility curve.

(11) The Government of India has to allocate resources to the various sectors under the planning process. Let us suppose it has to allocate capital amounting to Rs. 500 lakh crores for road development and for providing subsidies to farmers in the drought prone districts. Consider these two priorities and construct a production possibilities curve.

(12) India is a developing country. It requires capital goods for development. At the same time, population of India is ever increasing. India needs consumer goods to satisfy the needs of its huge population. Construct a production possibility curve and explain resource allocation. Show the shift in the curve when India becomes a developed economy.

(13) Explain the various concepts related to marginal analysis.

(14) Explain with an example the concept of production possibility curve.

(15) **Write short notes on:**

- (a) Opportunity cost. ***(Oct. 16)***
- (b) Scope of Business Economics. ***(March 17, 19)***
- (c) Distinguish between Economics and Business Economics.
- (d) Production Possibility Curve. ***(Oct. 17)***
- (e) Importance of business economics. ***(March 18)***
- (f) Use of marginal analysis in decision making. ***(Oct. 18)***
- (g) Scope of business economies. ***(March 19)***
- (h) Nature of business economics. ***(BIM, Oct. 18)***
- (i) Marginalism and Incrementalism.
- (j) Economic Tools.

2

Demand and Supply Analysis

DEMAND AND SUPPLY ANALYSIS
EQUILIBRIUM PRICE DETERMINATION

DEMAND ANALYSIS:

This economic variable 'Demand' is important in business decision making and policy formulations. It determines the magnitude of economic activities, the size and pattern of production. If there is no demand, output is unwarranted. Business firms use this concept widely for a number of purposes like production planning, inventory management, market research, cost budgeting, etc. The term demand refers to desire backed by willingness to pay and ability to pay. It is defined as 'the various quantities of a given commodity or service which consumers would buy at various prices during a given period of time'. Demand is always related to price and a particular time period.

∴ DD = Desire + Ability to pay + Willingness to pay

Demand Schedule: When the relationship between quantities demanded of a commodity and prices are tabulated, it is called as a demand schedule. It is a table or chart which shows the quantities of a commodity demanded at different prices during a given period of time. It can be shown as follows:

Price per litre of milk (Rs.)	Quantity demanded (in litres)
30	1
25	2
20	3
15	4
10	5

This schedule refers to the quantity demanded by an individual. When the quantity demanded by all the consumers is summed up, market demand schedule can be obtained. It can be represented as follows:

Price per litre (Rs.)	DD of Consumer A	DD of Consumer B	DD of Consumer C	Total DD (A + B + C)
30	1	2	3	6
25	2	3	4	9
20	3	4	5	12
15	4	5	6	15
10	5	6	7	18

The demand schedule can be used to draw the demand curve. When the relationship between price and quantity is plotted on a graph, a downward sloping demand curve can be obtained. This is known as the demand curve. It has a negative slope. It indicates the inverse relationship between price and quantity demanded. This can be explained with the help of the following diagram:

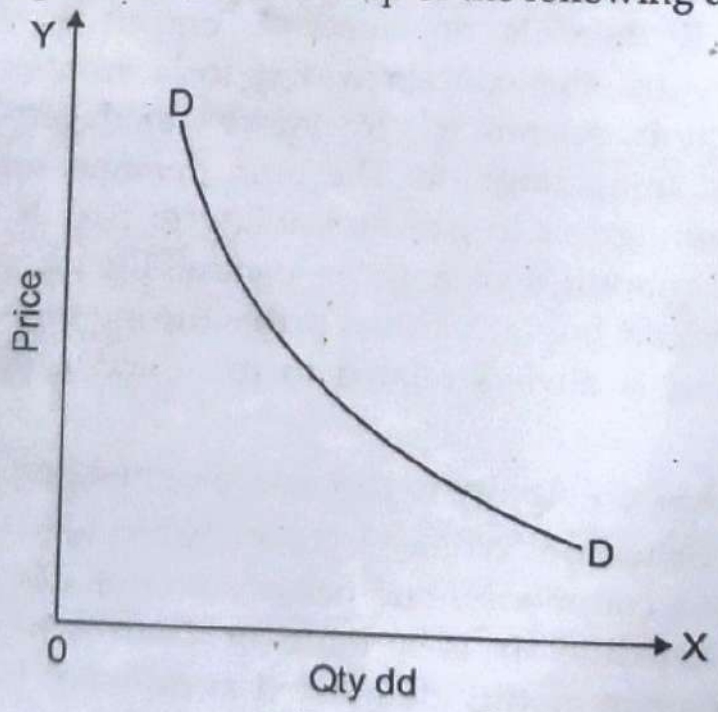


Fig. 2.1

In the above diagram X axis represents quantity demanded while Y axis represents price. The downward sloping demand curve indicates that higher the price, lower the demand and vice versa.

THE LAW OF DEMAND:

The functional relationship between price and quantity demanded of a commodity is explained by the law of demand. This law is also known as the 'First Law of Purchase'. The law propounded by the famous economist Alfred Marshall states that **"other things being equal if the price of a commodity falls, the quantity demand of it will raise and if the price of the commodity rises, its quantity demanded will decline."** The law indicates the inverse relationship between price and quantity demanded. In the above statement "other things being equal" refers to the constancy of other factors which determine demand. Demand is also influenced by income of the consumer, tastes and preferences, prices of related goods, advertisement effect etc. All these factors are assumed to be constant and the change in demand due to change in price is analysed by the law of demand.

The demand schedule and the demand curve are used to explain the law of demand. The above demand curve which is sloping downwards from left to right shows the inverse relationship between the two. The law is based on certain assumptions like the consumer is rational, factors determining demand except price are constant etc. The negative slope of the demand curve is explained as follows:

WHY DOES THE DEMAND CURVE SLOPE DOWNWARDS FROM LEFT TO RIGHT?

The demand curve slopes downwards due to income effect and substitution effect. When the price of a commodity falls, a unit of money goes farther and one can buy more. With a fall in price, the real income of the consumer increases. He feels better off and tends to buy more. Secondly when the price falls, it becomes relatively cheaper and consumers tend to substitute it for dearer goods. While the former refers to income effect the latter refers to substitution effect. Due to the combined operation of these two effects, the demand curve slopes downwards from left to right.

Moreover, when a commodity becomes cheaper it is put to more uses. While the existing customers buy more, new customers also enter the market. The law of diminishing marginal utility also states that when the price of a commodity falls, more has to be purchased to bring out the equilibrium between price and marginal utility.

Generally the demand curve slopes downwards from left to right. However there are certain cases in which the demand curve will slope upwards. They are called as exceptions to the demand curve.

EXCEPTIONS TO THE DEMAND CURVE:

(1) If people expect a shortage in future, they tend to buy more when the price rises.

(2) Certain precious items like diamond are purchased more when their prices are high.

Such goods are called status symbol commodity. This exception was given by the Social Critic Thorstein Veblen. According to him certain commodities like diamond has no intrinsic value. However when people own it, a certain social status is conferred on them. When the prices of such goods are high, they are demanded by the rich people and when their prices fall, demand will also fall. This exception for the law of demand came to be known as the Veblen effect.

(3) Due to ignorance also people may buy more when the prices are high.

(4) Sometimes people think that higher the price, better the quality. Hence they buy more.

(5) In the case of necessary items, even if the price goes up, people may buy more of them by readjusting their expenditure.

(6) The demand for inferior goods will fall with a fall in price and will rise with a rise in price. This behaviour was observed by Sir Robert Giffen and hence named after him. He found that in Britain, when the price of bread increased, poor families reduced their demand for meat in order to spend on bread. These goods are known as Giffen

Goods and this exception to demand is known as the Giffen Paradox.

In the above cases the demand curve will be sloping upwards from left to right. The exceptional demand curve can be shown as follows:

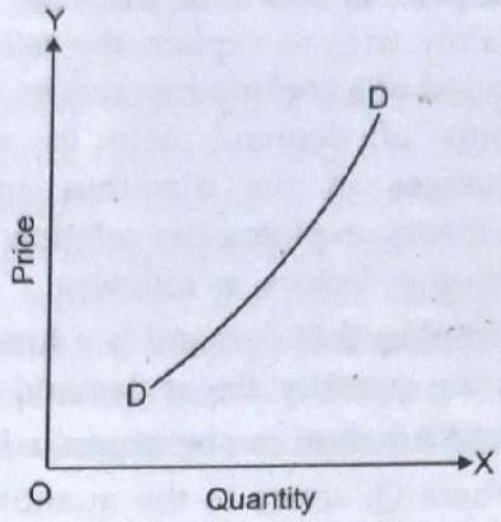


Fig. 2.2

DEMAND FUNCTION:

Demand function explains the relationship between the demand for a commodity and its determinants. In precise terms it refers to the relationship between the various units of a commodity that might be purchased and the various factors which determine the demand during a given period of time. Demand as mentioned earlier, always refers to effective demand i.e. desire backed by ability to pay and willingness to pay. While demand for a commodity mainly depends upon its price, other factors which influence demand are prices of related goods which may be complimentary or substitutes, income of the consumer, future expectations about the price of the commodity and tastes and preferences of the consumer. The relationship between demand and its determinants can be expressed in the form of a function as:

$$Q_x = f(P_x, P_r, Y, E, T, O)$$

Here, Q_x refers to the Quantity demanded of commodity X,

f refers to Functional Relationship,

P_x refers to Price of X,

P_r refers to Prices of Related Goods,

Y refers to the Income of the Consumer,
E refers to Expectations about Future Prices,
T refers to Tastes and Preferences, and
O refers to Other Factors.

Of all the factors, price is said to be the most predominant one. Demand theory mainly tries to explain the relationship between the quantity demanded of a commodity and its determinants. The various determinants of demand help to analyse consumer behaviour and changes in the direction and proportion of demand. Demand theory explains the relation between demand and price, given the other factors, as follows:

$Q_x = f(P_x)$. This implies that demand is a function of price of x. To estimate exactly the quantity, linear demand function is used.

The linear demand function can be expressed as follows:

$Q_x = a + bP_x$ where Q_x refers to the quantity demand of X, a refers to intercept which implies the demand for x due to factors other than price. The other factors are assumed to be given. Hence 'a' remains constant.

b is the coefficient which indicates the extent of change in demand due to change in price. The positive and negative sign of this coefficient indicates the direct or indirect relationship between demand and price. P_x refers to the price of the commodity x. Demand function can be explained with the help of the following examples. Let us assume the demand function for commodity x is given as follows:

$Q_x = 100 - 1$ P. The demand for x can be calculated as follows by assuming the price of x to be Rs. 10, Rs. 20, Rs. 30, Rs. 40 and Rs. 50.

Solution:

$Q_x = 100 - 1$ P

(1) P = 10 $\quad \therefore Q_x = 100 - 1 \times 10 = 90.$

(2) P = 20 $\quad \therefore Q_x = 100 - 1 \times 20 = 80.$

(3) P = 30 $\quad \therefore Q_x = 100 - 1 \times 30 = 70.$

(4) P = 40 $\quad \therefore Q_x = 100 - 1 \times 40 = 60.$

(5) P = 50 $\quad \therefore Q_x = 100 - 1 \times 50 = 50.$

By plotting the above relationship between quantity demanded and price, the demand curve can be derived.

The above example considers only two variables namely demand and price. Other determinants of demand can also be considered and the relationship between demand and its determinants can be estimated. Let us consider the following example.

$Q_x = 500 - .2p + .5y$ where Q_x is the demand for x, 500 is the intercept, .2 is the price coefficient and .5 is the income coefficient. Here 500 is the quantity demand of x due to other factors which remain constant. Price coefficient .2 implies that demand will change by .2 unit whenever the price changes by 1 unit. The negative sign indicates the inverse relationship between price and demand. The income coefficient is positive and it is given as .5. It implies that when income increases by one unit, demand for x will increase by .5 unit.

Assuming income = 0 and price = Rs. 100, then

$Q_x = 500 - .2p + .5y$

$\therefore Q_x = 500 - .2(100) + 0 = 480$

If price is zero and if income is Rs. 200 then

$Q_x = 500 - .2p + .5y$

$\therefore Q_x = 500 - 0 + .5(200) = 500 + 100 = 600.$

Thus more determinants of demand can be included in the equation and demand can be estimated.

FACTORS DETERMINING DEMAND:

Individual demand and market demand are influenced by a variety of factors. They are as follows:

Individual Demand:

(1) **Income of the consumer:** Demand for a good is directly related to the income of the consumer. Higher the income, greater the demand for a product and vice versa.

(2) **Price of the commodity:** It is one of the main determinants of demand. Demand will be more if the price is low and it will be less when the price is high. There is an inverse relationship between price and quantity demanded.

(3) **Tastes and preferences:** Demand for many goods depend on the taste and preferences of the people. This factor is a subjective factor. Tastes and preferences are also influenced by cultural and historical factors. If people are habituated to a particular good like coffee, tobacco, fancy cars, etc. demand for such goods is generally high.

(4) **Prices of related goods:** The demand for certain goods depend on the prices and availability of related goods. Some goods are substitutes for each other, while some others are complementary goods. For e.g. tea and coffee are substitutes. If the price of coffee increases, the demand for tea will increase. Car and petrol are complementary goods. If the price of petrol increases, the demand for car will decrease and vice versa.

(5) **Future expectations:** If the consumers expect a rise in the price of a good in future, demand for it will increase now. On the other hand, if prices are expected to fall in future, present consumption will be postponed.

(6) **Effect of advertisement:** Advertisement has a significant impact on the consumption of the people in the modern days. Demand for certain goods like soaps, shampoo and durable goods like television, refrigerator, etc. are influenced by advertisement campaign.

Market Demand:

(1) **Changes in weather:** According to changes in weather, the demand for certain goods will change. For e.g. During the summer season demand for cold drinks, air conditioners, etc. will be more and during winter season the demand for woolen clothes will be more.

(2) **Changes in fashion:** The demand for a good will be more if it is in fashion and vice versa.

(3) **Changes in money circulation:** If supply of money is more, the demand for goods will be more and vice versa.

(4) **Changes in the size of population:** When the size of population increases the demand for various goods and services will go up and vice versa.

(5) **Technological changes:** Better technology and new inventions will lead to the production of new goods and services. They will replace old goods for e.g. TV sets replacing radios, computers replacing typewriters, etc. Hence demand for new goods will increase.

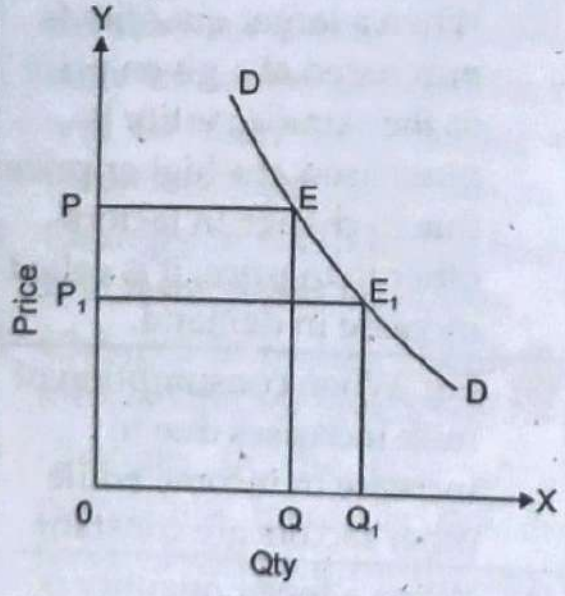
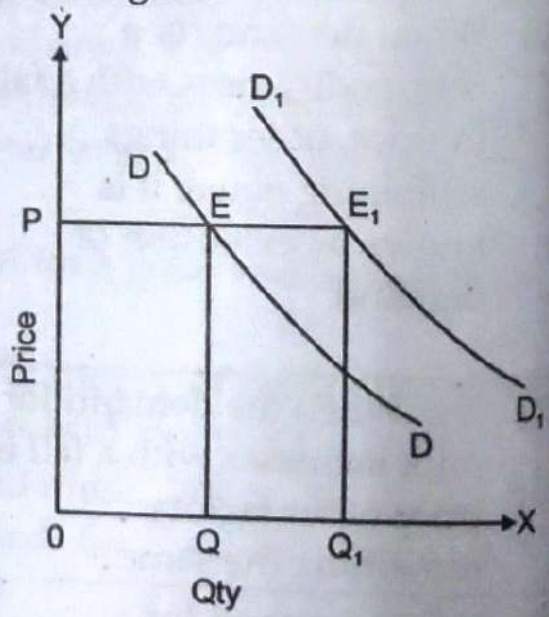
(6) **Discovery of cheap substitutes:** Availability of new substitutes will affect the demand for certain goods. For e.g. Supply of polythene bags affect the demand for jute bags.

(7) **Advertisement effect:** The demand for various goods is significantly influenced by advertisement at present. A persistent campaign will influence the customers and increase the demand for such goods.

All the above factors will bring about a change in demand for goods and services.

DISTINCTION BETWEEN EXTENSION & CONTRACTION OF DEMAND AND INCREASE & DECREASE IN DEMAND:

Extension and Contraction of Demand	Increase and Decrease in Demand
(1) When the demand for a commodity changes due to a change in price other factors remaining constant, it is called extension or contraction in demand.	(1) When demand for a commodity changes due to changes in other factors other than price, it is called increase or decrease in demand.
(2) When demand for a commodity rises with a fall in price, other things remaining equal, it is known as extension of demand.	(2) When a larger quantity is purchased at a given price or the same quantity is purchased at a higher price due to change in factors other than price, it is called increase in demand.
(3) E.g. When the demand for milk increases with a fall in price other factors remaining the same.	(3) E.g. When consumption of milk increases due to increase in income while other factors are constant.
(4) When demand for a commodity falls with a rise	(4) When a lesser quantity is demanded at the same

in price, other things being equal is known as contraction in demand.	price or the same quantity is demanded at a lower price due to change in factors other than price, then it is said to be decrease in demand.
(5) E.g. when the demand for milk falls due to rise in price, other things remaining constant.	(5) E.g. Let us assume original price is Rs. 20 and quantity demanded is 2 litres of milk, when the price of milk falls from Rs. 20 to Rs. 10 per litre, demand per day remaining at 2 litres or when one litre is demanded at the same price of Rs. 20 per litre, it implies decrease in demand.
(6) Extension and contraction can be shown on the same demand curve.	(6) Here a new demand curve has to be drawn.
(7) It is also known as the movement along the demand curve.	(7) It is known as shift in the demand curve.
(8) Diagram  Fig. 2.3	(8) Diagram  Fig. 2.4

In this diagram when the price falls from OP to OP_1, demand extends from OQ to OQ_1. This is known as extension in demand.	Here price remains the same. DD increases from OQ to OQ_1. This is known as increase in demand. Thus it implies that at the same price more is demanded.

CLASSIFICATION OF DEMAND:

In any economy variety of goods and services are produced. They are demanded by different sections of the society, while some goods are demanded by the consumers depending upon their income, taste and preferences etc. certain other goods are demanded by the producers depending upon the type of product they produce, the nature of market, the degree of competition, etc. Traditional theories focused mainly on consumer demand, modern theories try to analyse the demand for goods and services from other sections of the economy.

For effective managerial decision-making the following classification of demand is considered:

(1) **Direct demand and derived demand:** The demand for **final** goods and services is said to be direct demand or autonomous demand. Consumer goods and services which can be readily used belong to direct demand. This demand depends on the income of the consumer, price of the product, prices of related goods, etc. Derived demand on the other hand refers to the demand for factors of production or anything that is required to produce other goods and services. It is also known as induced demand. Derived demand depends upon the demand for final goods and services, degree of substitutability, complementarity of inputs etc. The distinction between the two is a matter of degree rather than kind i.e. it is very difficult to distinguish demand as direct and indirect as final goods and inputs cannot be clearly demarcated. For example, when a producer sells raw material, it is final good for him whereas for the buyer it is not the final good.

(2) **Company demand and industry demand:** The demand for a commodity produced by an individual firm is termed as

company demand. Industry demand refers to the total demand faced by all the firms constituting the industry. For example, the demand for steel products produced by Tatas refers to company demand while the demand faced by all units producing steel products is the industry demand. Thus firm's or company's demand is a percentage of industry's demand which is also termed as the market share of the company. To improve their market share, companies resort to innovation, aggressive marketing strategies, advertisement etc. In the case of company demand, there may be substitutes for the product while it may not be so in the case of industry's products. The distinction between the two also depends upon the market structure. In the case of monopoly both company demand and industry demand are one and the same. In other market structures like perfect competition and monopolistic competition the distinction between the two exists very much.

(3) **Demand for durable goods and demand for non-durable goods:** Durable goods are those which can be used over a long period of time. They are used to meet the current demand and future demand. Examples of durable consumer goods are furniture, automobiles, washing machines etc. and examples of durable producer goods are machines, equipments, etc. Demand for durable goods may be replacement demand or new demand. If the demand for the good is for maintaining the capital asset it is called replacement demand. When a good is demanded as an addition to the stock taken it is known as new demand. Non-durable goods are single use goods. They are perishable in nature and are therefore single use goods. Examples are milk, fruit, vegetables, etc. They are mainly used to meet the current demand.

(4) **Short run demand and long run demand:** Based on the time period, demand is classified as short run demand and long run demand. While short run demand refers to the existing demand, long run demand refers to the size and pattern of demand which will exist in the long run. Short run demand is mainly influenced by price and changes in income. Long run demand is affected by factors like growth in population,

technological changes, new substitutes, etc. For production planning, inventory control, expansion, diversification, etc. firms depend upon long term demand trend projection.

(5) **Total market demand and market segment demand:** The total demand for a commodity from all sectors or sources is called total market demand. When this market is subdivided it is termed as market segment. For example, when the total demand is divided into domestic and international market it is known as market segment. Market demand can also be segmented on the basis of income, age, literacy rate, etc. Market segmentation helps the business firms in formulating their price, sales and profit policies.

(6) **Individual demand and market demand:** The demand for a good from an individual consumer is known as individual demand. Market demand refers to the summation of demand of all the consumers for a product.

(7) **Joint demand and composite demand:** When two or more goods are demanded at the same time to satisfy a particular want, it is called as joint demand. e.g. car and petrol, bread and butter etc. Composite demand refers to the demand for those goods or services which can be used for more than one purpose. For instance, water can be used for cooking, washing, drinking, etc. Similarly electricity can be used for multiple uses. If there is a change in the demand for one use, then the demand for other uses will be affected.

SUPPLY:

INTRODUCTION:

The term supply refers to the quantities that a seller is willing and able to sell at different prices during a given period of time. Supply is related to price and time. Generally supply will be more when the price goes up and vice versa. Supply and stock are two different concepts. Stock refers to the total quantity of a commodity that can be supplied while supply refers to the actual quantity that is offered for sale. Stock is the basis of supply.

Like a demand schedule, a supply schedule shows the various quantities of a commodity offered for sale at different prices. It shows the direct relationship between quantity and price. On the

basis of the supply schedule, the supply curve can be drawn. Both are explained as follows:

Price per litre	Quantity supplied
1	2
2	4
3	6
4	8
5	10

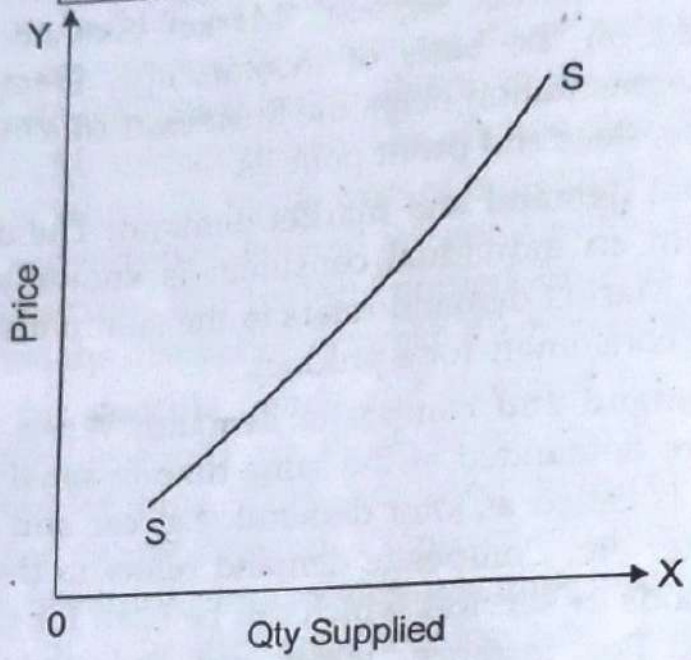


Fig. 2.5

The supply curve slopes upwards indicating the direct relationship between price and quantity supplied.

Supply function: Like demand function, supply function indicates the direct relationship between quantity supplied and the price of a commodity. The relation between the two is expressed as:

$Q_{sx} = f(P_x)$ where 'Q_{sx}' refers to quantity of commodity 'x' supplied, 'f' refers to functional relationship and 'P_x' price of commodity x. A linear supply function can be represented as:

$Q_{sx} = -c + dP_x$ where

c refers to quantity supplied when price is zero. (When price is zero, quantity supplied will always be zero. Hence, c will be zero always.)

d = co-relation co-efficient between quantity supplied and price.

P_x = price of commodity x.

Suppose the price of commodity x is Rs. 100, the supply function is given as $Q_{sx} = -1000 + 60P_x$ then quantity supplied at this price can be calculated as follows:

$Q_{sx} = -1000 + (60 \times 100)$

$= -1000 + 6000 = 5000$. Hence the quantity supplied is 5000 units. For different prices, a supply schedule and a supply curve can be derived based on the supply function.

THE LAW OF SUPPLY:

"Other things being equal as the price of a commodity rises, its supply is extended and as the price falls its supply is contracted." When prices go up, profits earned by the producers increase and hence they are willing to supply more. The above supply schedule and the supply curve indicate the positive relationship between price and supply.

EXCEPTIONS TO THE LAW OF SUPPLY:

There are some exceptional cases where, when price rises, supply tends to decrease and vice versa. These exceptional cases are given below:

(a) Labour Supply: In the case of labour, as the wage rate in an industry rises, the supply of labour (number of hours of work) would rise up to a point. Hence the supply curve will slope upward up to that point. But beyond that point, with a further rise in the wage rate, the supply curve of labour may slope backward as shown in figure 2.6. This is because the workers may prefer more leisure to work after receiving a certain fixed amount of income in the form of wages.

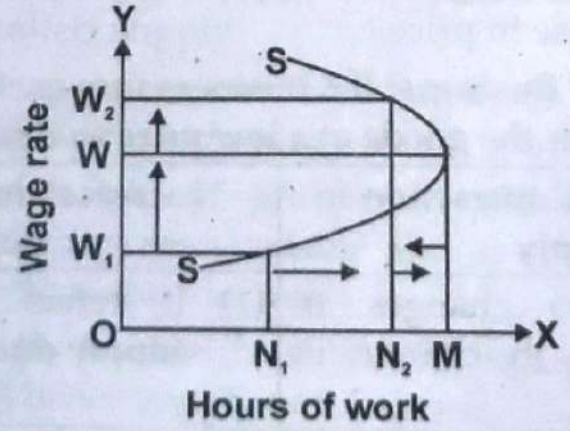


Fig. 2.6

It can be seen in figure 2.6 that the supply of labour (i.e., S_L curve) rises with every rise in the wage rate up to OW. But thereafter, as the wage rate rises from OW to OW_2, the supply of labour falls from OM hours to ON_2 hours.

Thus we get a backward-sloping supply curve of labour. It is called as an exceptional supply curve.

(b) Savings: Supply of Capital: Normally, when the rate of interest rises, the amount of savings would rise. But the savings of some people may fall with a rise in the rate of interest and rise with a fall in the rate of interest. This is usually the case with those persons who are interested in a fixed income in the form of interest.

In this case also, the supply curve of capital will slope backward like a backward-sloping supply curve of labour as shown in figure 2.6.

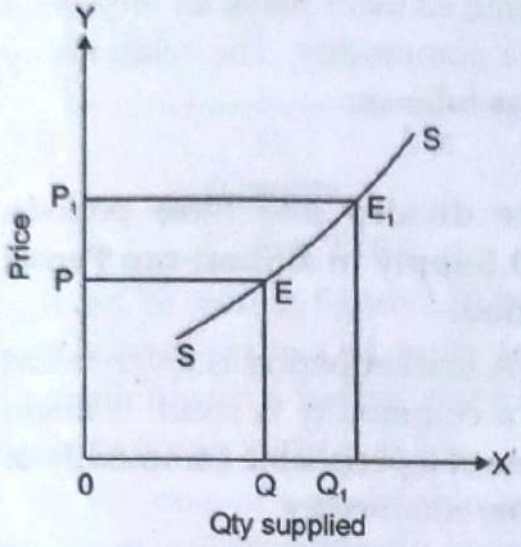
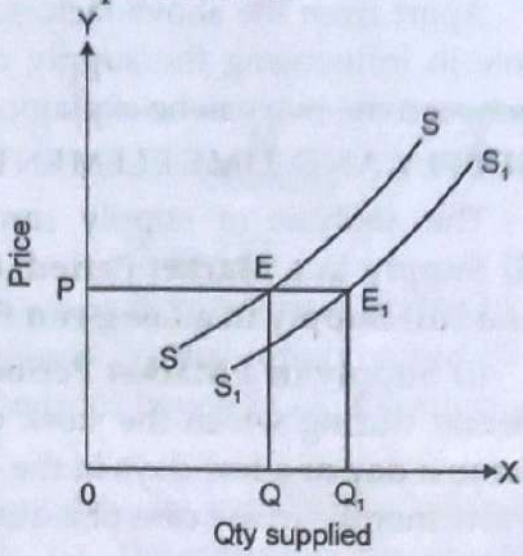
(c) Expectation of a Change in Price in the Immediate Future: If, with a slight rise in the price of a commodity, some of its sellers expect a further rise in its price in the immediate future, its total supply may decline in the current period. Opposite would be the case, if the price of a commodity falls.

(d) Immediate Need for Cash: If a seller is hard-pressed for money and if he requires immediately a particular amount of money, he would supply a larger amount of a commodity at a lower price and a smaller amount of that commodity at a higher price.

(e) Rare Collections: In the case of rare collections like old coins, stamps, paintings, etc. supply cannot be increased even if there is an increase in price.

(f) Closure of Business: If a business firm is closing down then the firm may offer the goods at a low price to clear the stock.

Extension and Contraction in Supply	Increase and Decrease in Supply
(1) It refers to changes in supply due to change in price.	(1) It refers to changes in supply due to other factors.

(2) It can be shown on the same supply curve.	(2) A new curve has to be drawn.
(3) It is also called as movement along the curve.	(3) It is called as shift in the curve.
(4) Diagrammatic representation  Fig. 2.7	(4) Diagrammatic representation  Fig. 2.8
When price increases from OP to OP_1, supply increases from OQ to OQ_1. This is extension in SS.	At the same price OP more quantity OQ_1 is supplied. This is known as increase in supply.

FACTORS INFLUENCING SUPPLY:

Apart from price, other factors which influence supply are:

(1) **Natural conditions:** Supply will be good if rainfall is timely and adequate. Droughts, floods and other natural calamities will adversely affect supply.

(2) **Technological advancement:** New methods of production due to advancement in technology leads to more supply.

(3) **Availability of factors of production and their prices:** If factors of production are available and at cheaper rate then supply will be more and vice versa.

(4) **Improvement in transport:** This will reduce the cost of production and hence supply will increase.

(5) **Market structure:** If monopoly exists then there may be increase or decrease in supply.

(6) **Government's policy:** Through fiscal policy, government can influence the supply of a commodity. For e.g. by imposing a high import duty supply may be restricted or by giving tax concessions the supply of a commodity may be increased.

Apart from the above factors, time element plays an important role in influencing the supply of a commodity. The relationship between the two can be explained as follows:

SUPPLY AND TIME ELEMENT:

The analysis of supply can be divided into three periods: **(i) Supply in a Market Period, (ii) Supply in a Short-run Period and (iii) Supply in a Long-run Period.**

(i) Supply in a Market Period: A market period is a very short period during which the stock of a commodity is fixed. It might mean a day or a few days in the case of a perishable commodity or a few months in the case of a durable commodity.

In a market period, there is market supply as given below and a market supply curve as given in Fig. 2.9. It indicates that, when price rises, supply rises and vice versa.

Market Supply	
Price per Orange (in Paise)	*Total Quantity Supplied (Market Supply)*
5	60
10	85
15	115
20	145
25	190

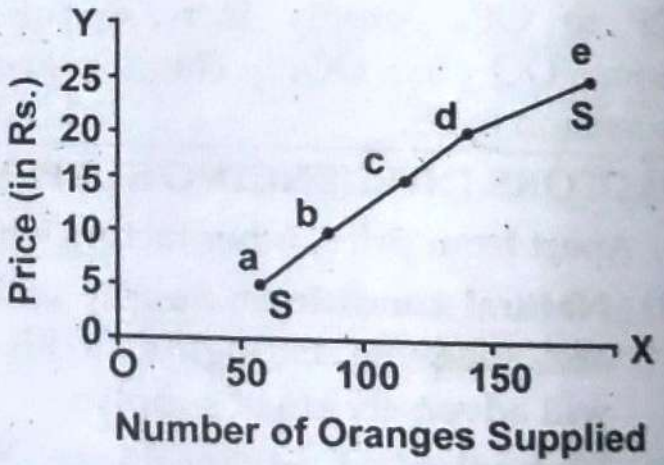


Fig. 2.9

When the price rises to a very high level, the entire stock is offered for sale. If there is a further rise in the price, the supply curve will become *vertical* to the X-axis from that price onwards, as shown in Fig. 2.10.

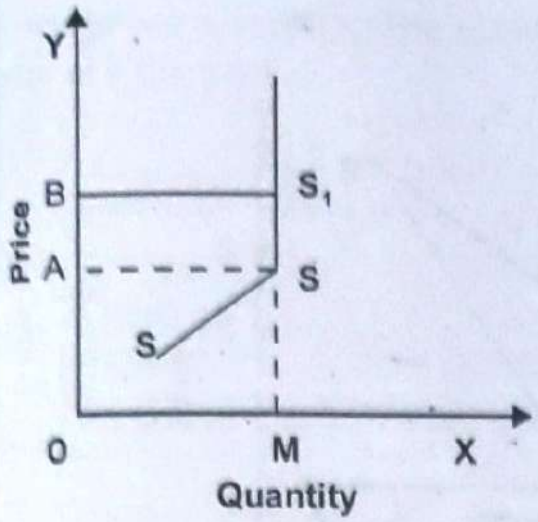


Fig. 2.10

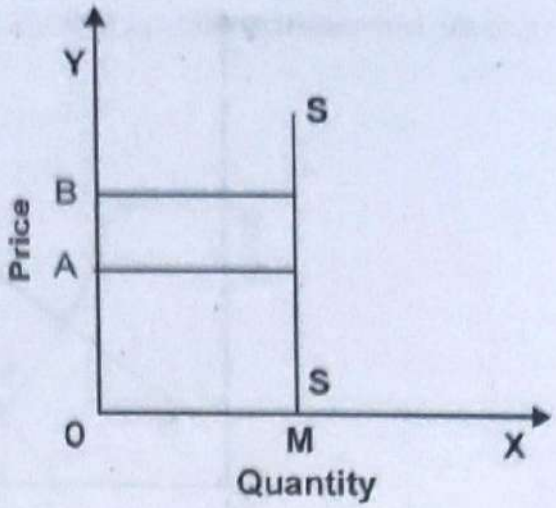


Fig. 2.11

It can be seen in figure 2.10 that, when the price rises up to OA, supply rises up to OM units as shown by the supply curve SS. Thereafter, with a further rise in the price beyond OA, the supply curve becomes vertical as SS_1.

In the case of a perishable commodity, its supply in a market period would be perfectly inelastic, i.e., the supply curve would be vertical to the X-axis as shown in figure 2.11. Whether the price is OA or OB per unit, the total amount offered for sale remains constant at OM units.

(ii) Short-run Period Supply: In a short-run period, the plants of firms remain constant, i.e., fixed factors like factory building, machinery etc., cannot be changed. However, the output of a commodity can be increased or decreased by increasing or reducing the amounts of variable factors like raw material, labour etc., employed with the given plants.

Hence the supply in a short-run period is influenced by variable costs only, i.e., costs on variable factors only, for the fixed costs on plants are independent of output.

As compared to the supply in a market period, the supply in a short-run period can be slightly adjusted to demand.

(iii) Long-run Period Supply: In the long run, all factors of production become variable. The size of plants can be fully increased or decreased. In other words, supply can be fully adjusted to demand in the long run. In the long run, the supply is influenced by variable costs.

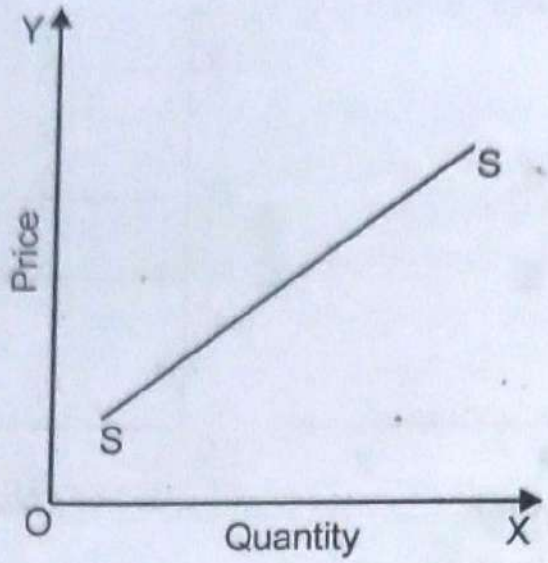


Fig. 2.12

In the long run supply can be easily adjusted to match the change in demand. Hence the changes in price in the long run will be less than the changes in price in the short run.

EQUILIBRIUM PRICE DETERMINATION:

The equilibrium price in a market economy is determined at the point where demand and supply are in balance. At this price the quantity demanded by the consumers is equal to the quantity supplied by the producers. The determination of equilibrium price can be explained with the help of the following table and diagram:

Price per litre of milk (in Rs.)	Quantity demanded (in litres)	Quantity supplied (in litres)	Market status	Price changes
5	8	16	Surplus	Decline
4	10	14	Surplus	Decline
3	12	12	Equilibrium	Balance
2	14	6	Deficit	Increase
1	18	2	Deficit	Increase

In the above table initially when price is higher supply is more than demand. This leads to a decline in price. When price is Rs. 3 per litre, demand is equal to supply. If price is Rs. 2 per litre, demand will increase and demand will be more than supply. This excess demand will lead to a rise in price and the equilibrium price will be restored. At the equilibrium point, there is neither a

shortage nor a surplus. The same table can be represented in the form of a diagram.

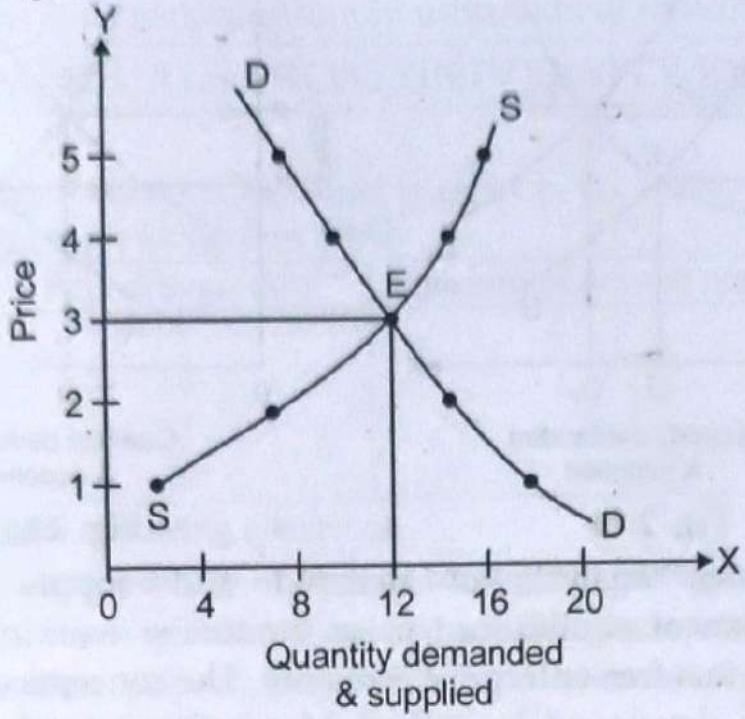


Fig. 2.13

In the above diagram the demand curve slopes downwards from left to right indicating the inverse relationship between price and quantity demand. The supply curve slopes upwards implying more will be supplied at a higher price and less will be supplied at a lower price. The two curves intersect at point E where quantity demanded is in balance with quantity supplied. The equilibrium price is Rs. 3 per litre and the equilibrium quantity demanded and supplied is 12 litres of milk.

The equilibrium price will change wherever there is a change in demand or supply or both. For example, supply remaining the same if demand increases, the curve will shift to the right and there will be a rise in the equilibrium price. On the other hand if there is an increase in supply, demand remaining the same, price will fall. The following figures explain the above conditions.

In Fig. 2.14, demand increases while supply remaining the same. Since demand exceeds supply, the price rises from OP to OP_1. In Fig. 2.15 the increase in supply, demand remaining the same causes the price to fall.

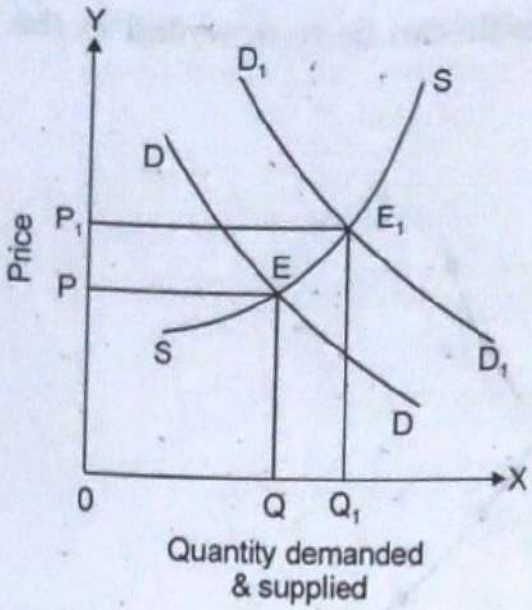


Fig. 2.14

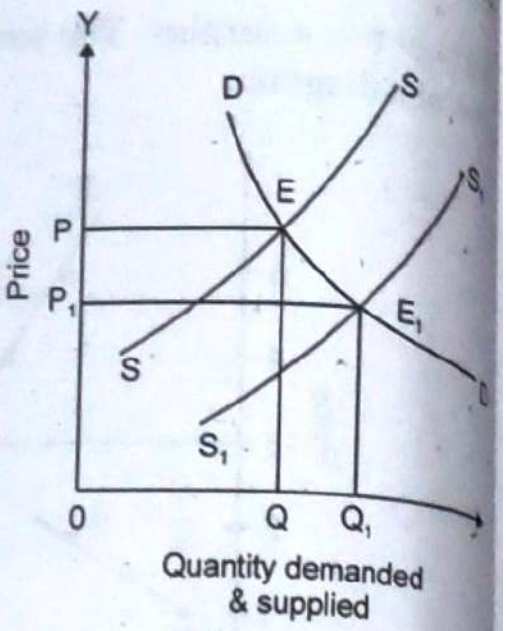


Fig. 2.15

The above analysis of demand and supply and the determination of equilibrium price shows the working of price mechanism in a free enterprise economy. The concepts of demand and supply developed by Alfred Marshall are fundamental to economics. Together they help to solve the problems of what to produce, how to produce and whom to distribute.

Market mechanism, in a free enterprise economy influences all economic activities. Like an invisible hand, it enables the working of a free enterprise economy through demand and supply forces. If demand is more than supply, then prices will increase inducing the producers to invest and produce more. On the contrary, the supply is more than demand prices will decline leading to a reduction in supply.

Market mechanism influences not only the production of goods and services but also the distribution of the same amongst the consumers. The distribution of output by price mechanism is also known as rationing function. This function is performed by price mechanism efficiently without any additional expenditure. Who should get the output, how much should be distributed etc. are determined by price mechanism. The output will be made available to people who have the ability to pay and willingness to pay. While ability to pay depends upon the income or purchasing power of the people, willingness to pay depends upon the utility of the commodity.

Thus in a free enterprise economy, price mechanism, the invisible hand influences production, consumption and distribution and ensures optimum utilisation of resources.

NUMERICALS FROM UNIVERSITY EXAMS

Ex. 1: *(March 17)*

The demand equation for Sugar is given as $Q_{ds} = 200 - 5P_s$ and the price of sugar is given in below table:

Price of Sugar (Rs.)	Quantity of demand (Kg)
5	
10	
15	
20	

Answer the following questions:

(1) Calculate quantity of demand for sugar at given prices.

(2) With the help of above demand schedule draw a demand curve.

(3) Calculate price elasticity of demand when price changes from Rs. 10 to Rs. 15.

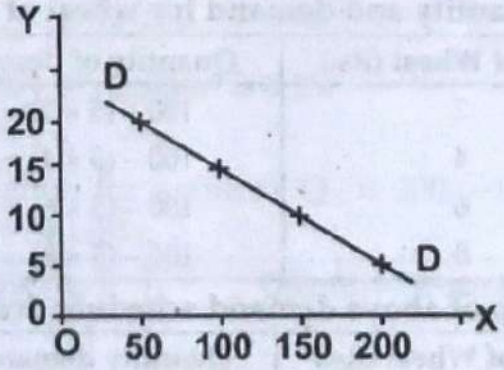
Solution:

(1) Calculate quantity of demand for sugar at given prices:

The demand equation for Sugar is given is $Q_{ds} = 200 - 5P_s$. The quantity demanded of sugar at given prices is as follows:

Price of Sugar (Rs.)	Quantity of demand (Kg)
5	$200 - (5 \times 5) = 175$
10	$200 - (5 \times 10) = 150$
15	$200 - (5 \times 15) = 125$
20	$200 - (5 \times 20) = 100$

(2) With the help of above demand schedule draw a demand curve:



(3) Calculate price elasticity of demand when price changes from Rs. 10 to Rs. 15:

Price (Rs.)	Quantity (Kgs.)
10	150
15	125

$$\text{Elasticity of demand} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$\Delta Q = 150 - 125 = 25$$

$$\Delta P = 15 - 10 = 5$$

$$\therefore E_d = \frac{25}{5} \times \frac{10}{150}$$

$$= \frac{250}{750} = \frac{1}{3} = 0.33$$

So the price elasticity of demand is 0.33.

Ex 2: *(Oct. 17)*

The demand function for commodity wheat is given by $Q_{dw} = 100 - 5_{pw}$. The price of wheat is given in below table:

Price of Wheat (Rs.)	Quantity of demanded (Kg)
2	
4	
6	
8	

Answer the following questions:

(i) Calculate quantity of demand for wheat at given prices.

(ii) With the help of above demand Schedule draw the demand curve.

(iii) Calculate price elasticity of demand when price changes form Rs. 4 to Rs. 8.

Solution:

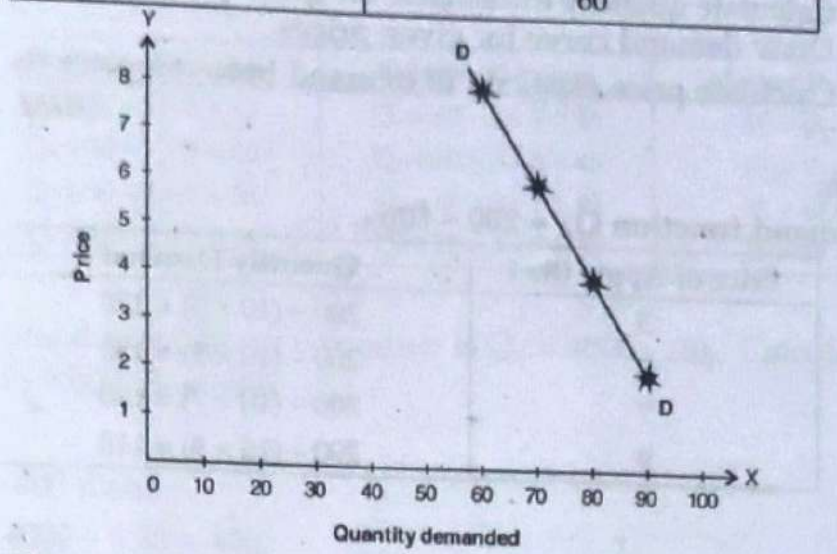
(1) Calculate quantity and demand for wheat at given prices:

Price of Wheat (Rs.)	Quantity of demanded (Kg)
2	$100 - (5 \times 2) = 90$
4	$100 - (5 \times 4) = 80$
6	$100 - (5 \times 6) = 70$
8	$100 - (5 \times 8) = 60$

(2) With the help of above demand schedule draw the demand curve:

Price of Wheat (Rs.)	Quantity demanded (Kgs.)
2	90
4	80

6	70
8	60



(3) Calculate price elasticity of demand when price changes from Rs. 4 to Rs. 8:

When price is Rs. 4, quantity demanded is 80 kgs. When price changes to Rs. 8 quantity demanded is 60 kgs.

∴ price elasticity of demand is calculated as follows:

$$\text{Elasticity of demand} = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P}$$

$$\Delta Q = 80 - 60 = 20$$

$$\Delta P = 8 - 4 = 4$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$\Delta Q = \frac{20}{4} \times \frac{4}{80} = \frac{1}{4}$$

$$\therefore E_d = \frac{1}{4}$$

So the price elasticity of demand is 0.25.

Ex 3:

Given demand equation for apple as $Q_A = 200 - 10p_A$ and price of apple is given in the below table:

Price of Apple (Rs.)	Quantity Demand
3	
5	
7	
9	

Questions:

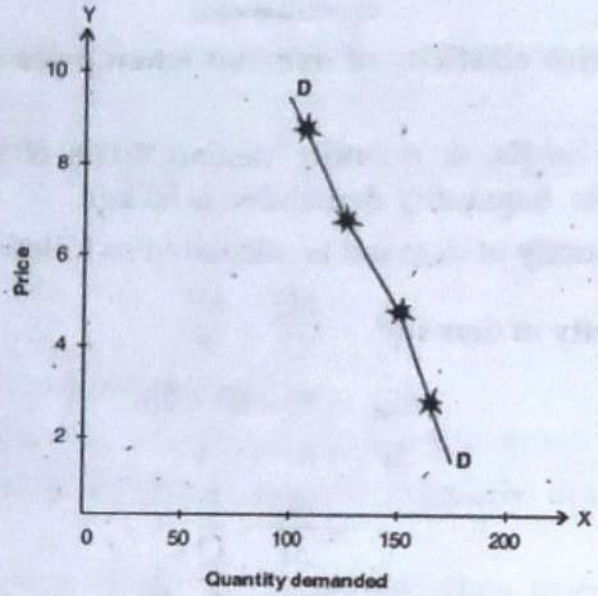
(i) Calculate quantity of demand for given price.
(ii) Draw demand curve for given prices.
(iii) Calculate price elasticity of demand between price Rs. 5 and P 7. *(BIM, Oct. 20*

Solution:

(i) Demand function $Q_A = 200 - 10p_A$.

Price of Apple (Rs.)	Quantity Demand
3	200 – (10 × 3) = 170
5	200 – (10 × 5) = 150
7	200 – (10 × 7) = 130
9	200 – (10 × 9) = 110

(ii)



(iii) When price is Rs. 5, Quantity demanded is 150.
When price rises to Rs. 7, quantity demanded falls to 130.

$$\therefore \Delta Q = 150 - 130 = 20 \qquad \Delta P = 7 - 5 = 2$$

$$P = 5, Q = 150.$$

$$\therefore Ed = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \frac{20}{2} \times \frac{5}{150} = \frac{1}{3}$$

Ex 4: *(BIM, March 19*

Ramesh and Suresh are assumed to be the buyer of commodity x. Given below is demand equation for Ramesh $Q_x = 50 - 2p$ and for Suresh $Q_x = 60 - 3p$, complete the following table.

Price	Ramesh's Demand	Suresh's Demand	Market Demand
4			
5			

6			
7			

Solution:

Price	Ramesh's Demand	Suresh's Demand	Market Demand
4	$Q_x = 50 - 2 \times 4 = 42$	$Q_x = 60 - 3 \times 4 = 48$	$42 + 48 = 90$
5	$Q_x = 50 - 2 \times 5 = 40$	$Q_x = 60 - 3 \times 5 = 45$	$40 + 45 = 85$
6	$Q_x = 50 - 2 \times 6 = 38$	$Q_x = 60 - 3 \times 6 = 42$	$38 + 42 = 80$
7	$Q_x = 50 - 2 \times 7 = 36$	$Q_x = 60 - 3 \times 7 = 39$	$36 + 39 = 75$

Ex 5:

The demand function for a product is $Q_d = 4000 - .20_p$. Calculate Q_d if ($P_1 = 400$, $P_2 = 500$, $P_3 = 600$)

Solution:

(a) If $P_1 = 400$ then

$Q_d = 4000 - 0.20 \times 400$

$= 3920$

(b) If $P_2 = 500$ then

$Q_d = 4000 - 0.20 \times 500$

$= 3900$

(c) If $P_3 = 600$ then

$Q_d = 4000 - 0.20 \times 600$

$= 3880$

QUESTIONS FOR REVIEW

(1) Define the following concepts:

(a) Demand.
(b) Demand Schedule.
(c) Supply.
(d) Supply Schedule.
(e) Equilibrium Price.
(f) Market.
(g) Demand Function.
(h) Joint demand.
(i) Composite demand.
(j) Giffen goods.
(k) Veblen effect.
(l) Stock.

Select the best answer from the given options:

(a) When price of a commodity increases, the _____ also increases. (stock, supply, agricultural economics)

(b) PPF was propounded by _____. (Philip Kotler, Paul Samuelson, Joel Dean)

(c) If Dominos lowers the price of its pizzas _____. (Demand for pizza hu pizza increases, Demand for Dominos pizza increases, Demand for pizza hu pizza decreases, Both (a) and (b))

(d) The supply curve shows how _____. (Quantity supplied increases a price decreases, Quantity supplied increases as price increases, Quanti supplied increases as technology improves, Quantity supplied increases a resource price decreases)

[Ans.: (a) Supply; (b) Paul Samuelson; (c) Demand for Dominos pizza increases; (d Quantity supplied increases as price increases]

Match the following:

(A)		(B)	
(1)	Demand function	(a)	Market segment demand
(2)	Joint demand	(b)	Electricity
(3)	Giffen goods	(c)	Q = f (p)
(4)	Composite demand	(d)	Exception to law of demand / no luxury goods
(5)	Subdivision of *market* demand	(e)	Car and petrol
(6)	Demand function ***(Oct. 18)***	(f)	$Qd_x = f(P_x)$
(7)	Upward sloping ***(BIM, March 19)***	(g)	Q = f (p)
(8)	Demand function ***(March 19)***	(h)	Supply
(9)	Complementary Demand	(i)	Car and petrol
(10)	Normal goods	(j)	Positive Income Effect

[Ans.: (1 – c); (2 – e); (3 – d), (4 – b); (5 – a); (6 – g); (7 – h); (8 – f); (9 – i); (10 – j)]

State whether the following statements are true or false:

(a) Demand is inversely related to price.

(b) Extension in demand and increase is demand mean the same. ***(Oct. 16)***

(c) Demand for factors of production is a derived demand.

(d) Demand curve always slopes upwards.

(e) Extension and contraction can be shown on the same demand curve.

(f) Veblen effect explains exception to the law of demand.

(g) The demand curve for griffin goods is a downward sloping one.

(h) Stock and supply of a good are different concepts.

(i) Supply varies directly with price.

(j) The normal supply curve bends backwards.

(k) Supply is fully adjustable in the short run.

(l) Extension and contraction can be shown on the same demand curve. ***(Oct. 17)***

(m) Change in a non-price determinant of demand is shown by movements along the demand curve. ***(BIM, Oct. 17)***

(n) Demand curve always slopes upward. ***(Oct. 18)***

(o) Price always has a tendency to move away from equilibrium. ***(March 19)***

(p) The demand curve has negative slope. ***(BIM, March 19)***

(q) In case of an increase in demand, supply remaining same, price will fall.

(r) Inferior goods have negative income effect but positive substitution effect.

(s) Giffen goods are exception to law of demand.

(t) Supply and price are inversely related.

(u) When with a fall in price, a consumer's real income rises, it is known as substitution effect.

[Ans.: (a) True; (b) False; (c) True; (d) False; (e) True; (f) True; (g) False; (h) True; (i) True; (j) False; (k) False; (l) True; (m) False; (n) False; (o) True; (p) True; (q) False; (r) True; (s) True; (t) False; (u) False]

Fill in the Blanks:

(a) The market supply schedule shows _____ relationship between price and quantity supplied.

[Ans.: (a) Direct]

(2) **Distinguish between:**
- (a) Individual demand and market demand.
- (b) Extension and contraction in demand and increase and decrease in demand.
- (c) Extension and contraction in supply and increase and decrease in supply.
- (d) Short run demand and long run demand.
- (e) Total market demand and market segment demand.
- (f) Direct demand and derived demand.
- (g) Demand and supply.
- (h) Extension of demand and increase in demand with suitable diagram.

(3) **Comment on the following statements:**
- (a) Demand and supply determine the equilibrium price in the market economy.
- (b) The demand curve is a downward sloping one.
- (c) Price mechanism like an invisible hand influences production, consumption and distribution in a capitalist economy.
- (d) Longer the time period more elastic is the supply of a commodity.
- (e) There are no exceptions to the law of demand.
- (f) There are no exceptions to the law of supply.

(4) Explain the determination of equilibrium price in a market economy.

(5) Construct an imaginary demand and supply schedule and show the determination of equilibrium price through diagrams.

(6) Explain movement and shift in the demand curve with suitable examples and diagrams.

(7) Distinguish between extension of demand and increase in demand with suitable diagram.

(8) Consider the various courses offered by your institution. For which course demand is high and why? What are the causes for disequilibrium between demand for and supply of the various courses?

(9) The demand for medical education in India is very high. Analyse the causes for the same. What are the supply side constraints?

(10) Explain the various factors which influence demand and supply.

(11) Discuss the different types of demand.

(12) Explain how time element influences the supply of a commodity.

(13) Why does the demand curve slope downwards from left to right?

(14) Define Demand and explain its determinants. ***(BIM, March 19)***

(15) What is demand function? Explain with the help of determinants of demand.

(16) **Write short notes on:**
- (a) Law of Demand. ***(Oct. 16)***
- (b) Factors affecting demand. ***(Oct. 17)***
- (c) Determinants of demand. ***(BIM, Oct. 17)***
- (d) Exceptions to law of Demand.
- (e) Classification of Demand.

(17) Construct a demand schedule and demand curve from the following:
The demand function for pen is $Q_A = 10{,}000 - .4p$. Assume the prices to be Rs. 100, Rs. 200, Rs. 300, Rs. 400 and Rs. 500.

(18) The demand function for mobile per day is estimated to be $D_m = 1000 - .2p$. If the price is Rs. 1000, how many mobiles will be demanded per day? If the price rises to Rs. 2000, Rs. 3000 and Rs. 4000, construct the demand schedule and the demand curve.

(19) Three consumers A, B and C demand commodity x as per the following demand function. Assume the price of commodity x is Rs. 50 per unit.
A's demand function $Q_x = 200 - .4p$
B's demand function $Q_x = 400 - .2p$
C's demand function $Q_x = 500 - .1p$
Estimate the market demand.

(20) Consider the following demand function $Q_x = 300 - .2p_x$. Calculate Q_x if P = Rs. 60, Rs. 100 and calculate the price at which Q_x will be zero.

(21) The demand function is given as $Q_A = 500 - .5p + .3y$. Calculate Q_A for the following values of p and y.
p = Rs. 40, Rs. 80, Rs. 120, Rs. 200.
y = Rs. 1000, Rs. 2000, Rs. 3000, Rs. 4000.

(22) Explain Giffen paradox and Veblen effect.

(23) If $Q_x = 500 - 3P$ and P = Rs. 100, Rs. 150 Calculate Q_x.

(24) If $Q_x = 1000 - 2P$ and P = 200, P = Rs. 400 what is Q_x? What should be the price if Q_x has to be zero?

(25) What are the exceptions to the law of Demand?

(26) Explain demand with a schedule and a diagram.

(27) Discuss/Explain the various determinants of demand.

(28) What is supply? What are the factors influencing supply.

(29) What are the assumptions of the law of demand?

(30) What is demand? Explain market demand with the help of market demand schedule and market demand curve.

(31) Define supply and Individual Supply curve with the help of individual supply scheduled diagram.

(32) Given the demand and supply equations,
$Q_{dx} = 100 - 20P_x$ and $Q_{sx} = -40 + 50P_x$
Questions:
(i) What is the equilibrium price?
(ii) If market price is Rs. 3, what will be amount of surplus units?
(iii) How much is the quantity demanded at equilibrium price?

MODULE – II: DEMAND ANALYSIS

3

Nature of Demand Curve under Different Markets

TYPES OF MARKETS
NATURE OF DEMAND CURVES UNDER DIFFERENT MARKETS

The term market refers to the link between the buyer and the seller. The link can be established through a number of ways like through telephones, fax, e-mail, etc. It is not necessary for the buyer and the seller to meet directly in many cases. Markets are classified as product markets and factor markets. The product market is a market where goods and services are bought and sold. The product market is classified on the basis of the commodity sold i.e. whether they are homogeneous or heterogeneous or on the basis of the number of buyers and sellers. Market is also classified on the basis of time and place. The broad classification of market is as follows:

(1) On the basis of place it is classified as local, national and international.

(2) On the basis of time it is classified as very short period, short period, long period and very long period.

(3) On the basis of the nature of the product, number of sellers and degree of competition markets are classified into perfect competition and imperfect competition.

The various types of markets based on number of firms, degree of competition can be tabulated as follows:

Type of market structure	No. of buyers and sellers	Degree of competition
(1) Monopoly	Single seller and many buyers	Nil
(2) Oligopoly	Few sellers and many buyers	Severe
(3) Monopolistic competition	Many sellers and many buyers	Intense
(4) Perfect competition	Larger number of buyers and sellers	Intense

DEMAND CURVE UNDER DIFFERENT MARKET STRUCTURES:

(a) **Perfect Competition:** Perfect competition is a market structure where there are large number of sellers and buyers. The products sold by them are homogenous and they have a single price. The products are perfect substitutes for each other. Both the sellers and the buyers have perfect knowledge about the market. In this market structure an individual seller is a price taker not a price maker i.e. at a given price he can sell any amount of the commodity. He cannot influence the price by adjusting his supply.

Under perfect competition an individual firm faces a perfectly elastic demand curve. The price per unit or average revenue remains the same. Hence the average revenue curve or the demand curve is a horizontal straight line. All additional units are sold at the same price. Hence the total revenue will increase in a constant proportion. Therefore the TR curve will be an upward sloping straight line and it is also a 45° line originating from the origin. This implies that the total revenue will change with the change in the units of output sold. Since a single price prevails in the market and all additional units are sold at the same price marginal revenue

will remain constant and it will be equivalent to average revenue. Hence the AR and MR curves coincide with each other under perfect competition.

The nature of AR and MR under perfect competition can be explained with the help of the following table and diagram:

Units of Output Sold	Price Per Unit (AF)	Total Revenue	Marginal Revenue ($TR_n - TR_{n-1}$)
1	10	10	–
2	10	20	10
3	10	30	10
4	10	40	10
5	10	50	10

In the above table TR is increasing in a constant proportion. Price per unit remains the same at Rs. 10. All additional units are sold at the same price. Therefore marginal revenue = Rs. 10. Since AR = MR, the respective curves will coincide with each other. This can be depicted as follows:

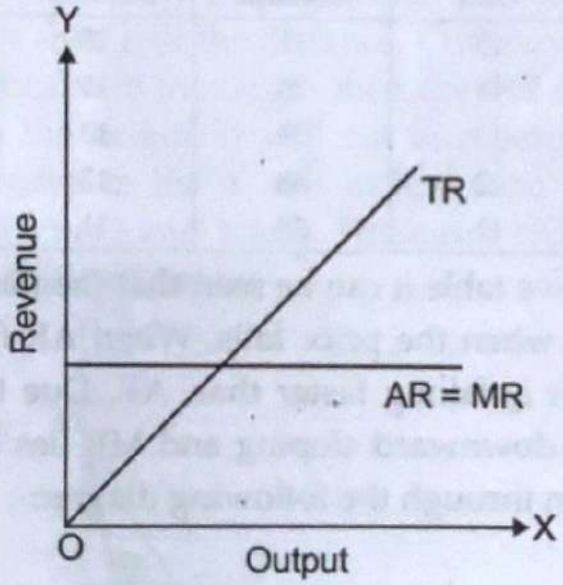


Fig. 3.1

The total revenue curve in the above diagram is a 45° line indicating that it will change in a constant proportion with the change in output. The AR and MR curves coincide with each other and they are represented by a horizontal straight line.

(b) Monopoly: Monopoly refers to a market situation where there is a single seller. There are no close substitutes and no free entry and exit. Though he is the single seller he cannot decide both output and price at the same time. He does not have exclusive control over all the aspects of the market. If he decides the price, then he has to leave it to the market the quantity to be sold and vice versa. Under monopoly the AR curve slopes downwards from left to right and the MR curve lies below the AR curve. The downward sloping AR curve implies that the monopolist can sell more at a lower price and he can sell less at a higher price. Since average revenue is falling, the total revenue will increase at a diminishing rate. The marginal revenue curve will lie between the AR curve and the Y axis and it will lie exactly at half the distance between the AR curve and Y axis. AR and MR curves can be explained with the help of the following table and diagram.

Quantity (Units)	Price Per Unit	Total Revenue	Average Revenue	Marginal Revenue
1	15	15	15	–
2	14	28	14	13
3	13	39	13	11
4	12	48	12	9
5	11	55	11	7

In the above table it can be seen that the monopolist is able to sell more when the price falls. When AR falls, MR is also falling and it is falling faster than AR. Due to this both AR and MR are downward sloping and MR lies below AR. This can be shown through the following diagram:

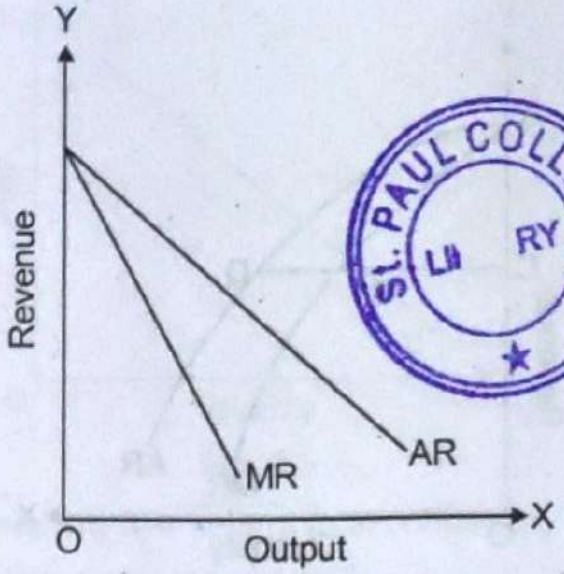


Fig. 3.2

Here the AR and MR curves are downward sloping. When AR and MR are straight lines, they are called linear curves.

In case the AR curve is a non-linear curve then MR curve will not lie at halfway between the AR curve and Y axis. If the AR curve is convex to the origin then MR curve will also be convex. It will cut any perpendicular drawn from AR to the Y axis at more than half the distance. Contrary to this, if the AR curve is concave to the origin then the MR curve will also be concave to the origin. It will cut any perpendicular drawn from AR curve to the Y axis at less than half the distance between AR curve and Y axis. These two types of AR and MR curves are depicted below:

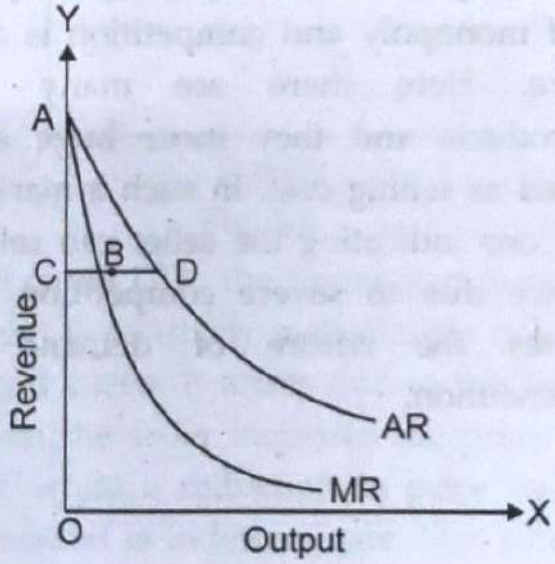


Fig. 3.3

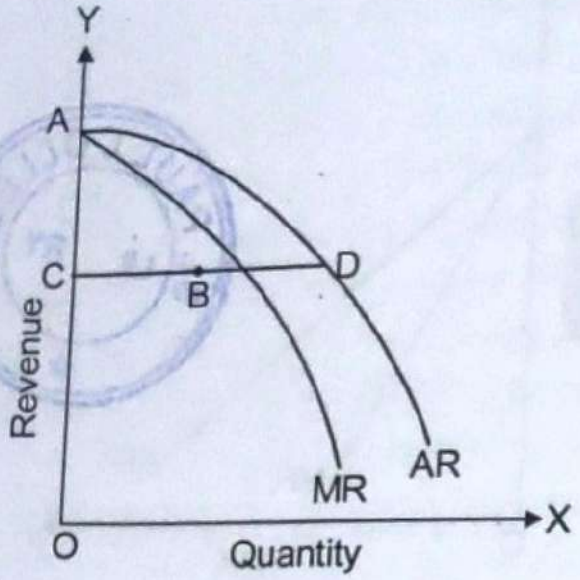


Fig. 3.4

Fig. 3.3 represents convexity of AR and MR curves. The perpendicular DC is drawn from the AR curve to the y axis. Here MR cuts the perpendicular DC at a point which is more than half the distance from the AR curve. In Fig. 3.4 the AR and MR curves are concave to the origin. Here MR cuts the perpendicular DC at a point which is less than half the distance between AR and Y axis, when measured from the AR curve.

Demand Curve under Monopolistic Competition and Oligopoly:

Monopolistic Competition: Monopolistic competition which is a combination of monopoly and competition is a more realistic market structure. Here there are many sellers selling differentiated products and they incur huge expenditure on advertising termed as selling cost. In such a market the demand curve is a flatter one indicating the seller can sell more only by reducing the price due to severe competition. The following diagram indicates the nature of demand curve under monopolistic competition.

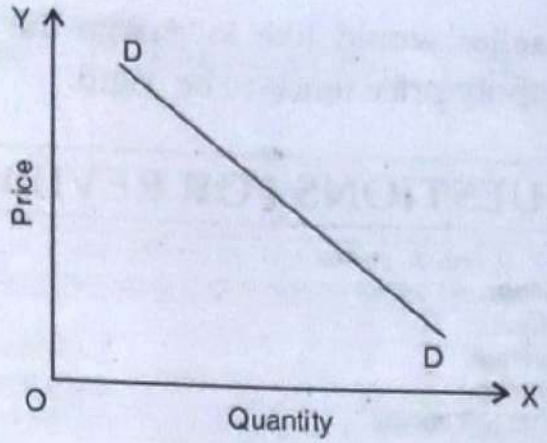


Fig. 3.5

Oligopoly: There are few sellers in an oligopoly market selling homogeneous or differentiated products. There is a high degree of interdependence among the sellers. If a seller increases the price, others will not increase. On the contrary, if he lowers the price, others will follow. Hence it is not possible to draw the demand curve of a firm under oligopoly accurately. Its demand is to be indeterminate due to uncertainty about the behaviour of the rivals. Hence the demand curve is a kinked one. The following figure depicts the nature of demand curve under oligopoly.

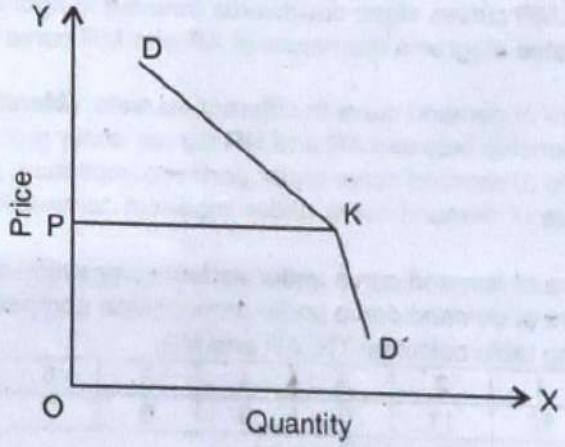


Fig. 3.6

In the demand curve DD', the upper part is relatively elastic, while the lower part is relatively inelastic. At point 'K' there is a kink in the demand curve. It arises due to the behaviour of the rivals namely when the seller increases the price, the rivals will not rise the price while a reduction in price will be promptly followed. Thus demand is indeterminate. Due to the uncertainty

of demand, the seller would like to charge the same price and hence under oligopoly price tends to be rigid.

QUESTIONS FOR REVIEW

(1) Define the following:

(a) Total revenue.
(b) Marginal revenue.
(c) Average revenue.
(d) Linear AR and MR curves.

Fill in the blanks:

(a) Revenue function is an important factor on the _____ side.
(b) Total revenue = _____ × _____.
(c) The revenue obtained per unit is _____.
(d) The addition made to the total revenue by selling one more unit of the output is _____.
(e) Under perfect competition AR is equal to _____.

[Ans.: (a) supply; (b) quantity, price; (c) average revenue; (d) marginal revenue; (e) MR]

Match the following:

(A)	(B)
(1) TR ***(Oct. 18)***	(a) TR/Q
(2) AR ***(BIM, Oct. 18)***	(b) P X Q

[Ans.: (1 – b); (2 – a)]

(2) Explain the various revenue concepts under the different market structures.
(3) Show that AR = MR under perfect competition.
(4) Why the AR and MR curves slope downwards from left to right under monopoly?
(5) Explain with suitable diagrams the nature of AR and MR curves when they are linear and non-linear.
(6) Explain the nature of demand curve in different markets. ***(March 17)***
(7) Explain the relationship between AR and MR curves under monopoly. ***(Oct. 17)***
(8) Explain the nature of demand curve under perfect competition. ***(Oct. 18)***
(9) Explain the nature of demand curve under imperfect competition market. ***(BIM, Oct. 18)***
(10) Explain the nature of demand curve under perfect competition and monopoly.
(11) Explain the nature of demand curve under monopolistic competition and oligopoly.
(12) From the following table calculate TR, AR and MR.

Quantity	1	2	3	4	5	6	7	8
Price	12	11	10	9	8	7	6	5

Show the nature of MR and AR curves.

(13) Calculate TR, AR and MR from the given data:

Quantity sold 1 2 3 4 5 6 7 8 9 10

Identify the market structure and draw the revenue curve.

(14) Complete the following table.

Output (units)	AR	TR	MR
1	40		
2	30		
3	20		
4	10		

(15) Complete the following table.

Output (units)	Price per unit (Rs.)	TR	MR	AR
1	50			
2	40			
3	32			
4	26			
5	20			

(16) Two goods x and y are offered by two sellers A and B. From the following table identify the market structure and give reason for the answer.

Output (units)	5	10	15	20
Price of x per unit (Rs.)	4	4	4	4
Price of y per unit (Rs.)	10	9	8	7

(17) Calculate TR and MR from the following table. Identify the market structure.

Units of output	1	2	3	4	5	6
Price per unit	10	9	8	7	6	5

(18) In a perfectly competitive market structure, two goods X and Y are produced. The price of X per unit is Rs. 50 and that of Y is Rs. 40 per unit. The firm produces 8 units of X and 6 units of Y. Calculate TR and MR of the firm for both the products.

(19) The demand schedule for an industry in a purely competitive market is given as follows: ***(Oct. 18)***

$$Q = 500 - 3P$$

The short-run supply schedule of the industry is as follows:

$$Q = -3 + 8P$$

Questions:

(1) What is the equilibrium price and quantity in the market?

(2) What is the total expenditure incurred by the consumers?

(3) Calculate the total revenue of the firms.

4

Elasticity of Demand

CONCEPT OF ELASTICITY OF DEMAND
TYPES OF ELASTICITY OF DEMAND
MEASUREMENT OF ELASTICITY OF DEMAND
FACTORS INFLUENCING ELASTICITY OF DEMAND
THEORETICAL AND PRACTICAL APPLICATIONS OF ELASTICITY OF DEMAND
RELATIONSHIP BETWEEN ELASTICITY OF DEMAND AND REVENUE CONCEPTS

CONCEPT OF ELASTICITY OF DEMAND:

Elasticity of demand is a concept given by the famous economist Prof. Alfred Marshall. It explains the degree of responsiveness of demand to a given change in price. The law of demand simply explains that demand will change whenever there is a change in price. It does not give the extent of change in demand. It is given by the concept of elasticity of demand.

Elasticity of demand is defined as the sensitiveness or responsiveness of demand to changes in price. According to Alfred Marshall "The elasticity of demand in a market is great or small according as the amount demanded increases much or little for a given fall in the price and diminishes much or little for a given rise in price."

Symbolically elasticity of demand is expressed as

$$Ed = \frac{\text{Proportionate change in quantity demanded}}{\text{Proportionate change in price}}$$

$$= \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Elasticity of demand can also be expressed in terms of percentage as follows:

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

If the percentage change in quantity and price are known elasticity of demand can be easily calculated. Suppose the percentage change in quantity is 4 and the percentage change in price is 1 and assume that the price falls. Here the change in price will be negative as it is assumed to be falling:

$$\therefore \quad Ed = \frac{4}{-1} = -4.$$

If the price rises by 1 and demand falls by 4 then

$$Ed = \frac{-4}{1} = -4.$$

Therefore E is always negative. Hence the minus sign is ignored. Ed is called the coefficient of elasticity of demand.

Generally elasticity of demand refers to change in quantity demanded due to a change in price. Sometimes demand changes due to change in the income of the consumer and change in the price of the other commodities.

Hence, elasticity of demand is broadly classified as

(1) Price elasticity.
(2) Income elasticity.
(3) Cross elasticity.
(4) Promotional elasticity.
(5) Arc elasticity.

TYPES OF ELASTICITY OF DEMAND:

(1) **Price Elasticity Demand:** A change in price brings about change in quantity demanded, other things remaining the same. The extent of change in demand due to the change in price is called price elasticity of demand. It is expressed as follows:

$$Ed = \frac{\text{Proportionate change in quantity demanded}}{\text{Proportionate change in price}}$$

$$= \frac{\Delta Q}{Q} \div \frac{\Delta P}{P}$$

$$= \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where Q refers to original quantity demanded.

P refers to original price.

ΔQ refers to change in quantity demanded.

ΔP refers to change in price.

If this coefficient of elasticity of demand i.e. Ed is greater than one, demand is said to be relatively elastic and if it is less than one demand is said to be relatively inelastic. A numerical example can clarify this easily.

	Price (Rs.)	Quantity demanded (units)
Original	10	100
New	8	125

By applying the above formula coefficient of elasticity of demand can be calculated. In this example

$$Q = 100$$

$$\Delta Q = (125 - 100) = 25$$

$$P = 10$$

$$\Delta P = (10 - 8) = 2$$

$$\therefore \quad Ed = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$Ed = \frac{25}{2} \times \frac{10}{100} = 1.25$$

Since the value is more than one, it indicates that demand is relatively elastic. The value of elasticity of demand can vary from zero to infinity. Hence, price elasticity is of various degrees. They are as follows:

Degrees of Price Elasticity of Demand:

(a) **Perfectly Elastic Demand:** At the given price any amount of the commodity can be demanded and a small change in price could bring about infinite change in the quantity demanded. Demand is said to be highly sensitive to changes in price. In this case the demand curve will be a horizontal straight line parallel to the X axis and symbolically it is represented as ED = ∝.

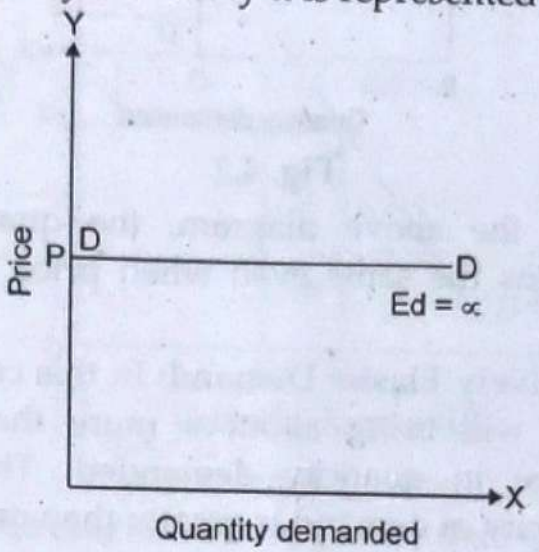


Fig. 4.1

Suppose the price increases by small percentage demand will be 0 and if the price falls increase in demand will be infinite.

(b) **Perfectly Inelastic Demand:** In this case the quantity demanded remains the same whatever be the change in price. The demand curve is a vertical line parallel to the Y axis and the coefficient of elasticity of demand is equal to zero.

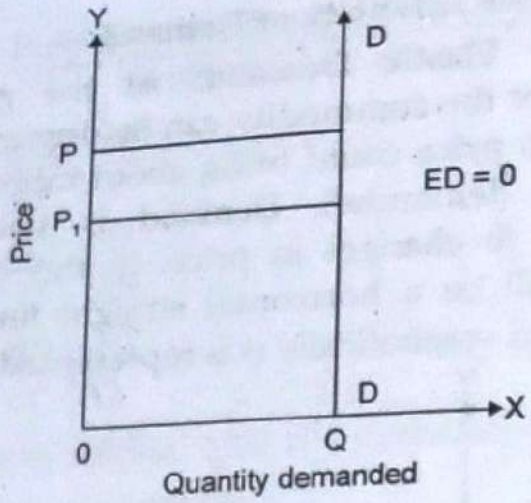


Fig. 4.2

In the above diagram, the quantity demande remains the same even when price falls from OP t OP1.

(c) **Relatively Elastic Demand:** In this case the change i price will bring about a more than proportionat change in quantity demanded. The coefficient o elasticity of demand is greater than one.

The demand curve is a flatter one as shown below:

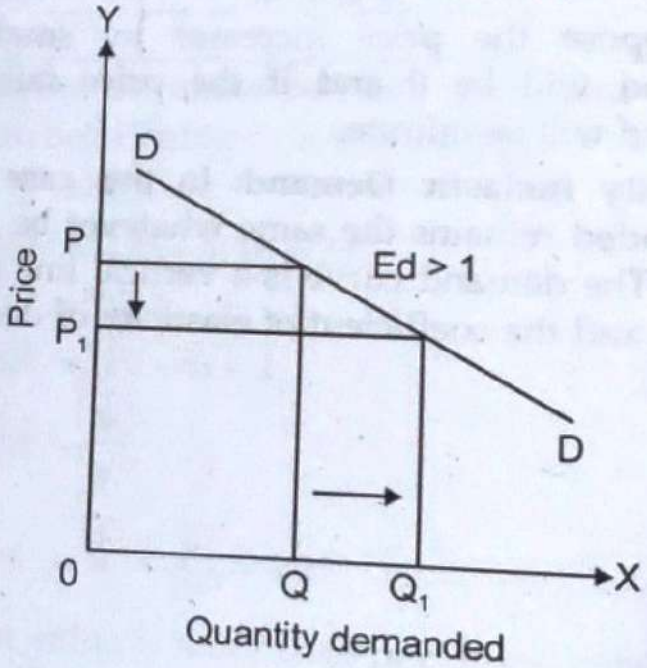


Fig. 4.3

In the above diagram change in price is only PP_1 an the change in quantity demanded is QQ_1. It is obviou from the figure that $QQ_1 > PP_1$.

(d) **Relatively Inelastic Demand:** The change in demand will be less than the change in price. Here the demand curve is a steeper one. The coefficient of elasticity of demand will be lesser than one.

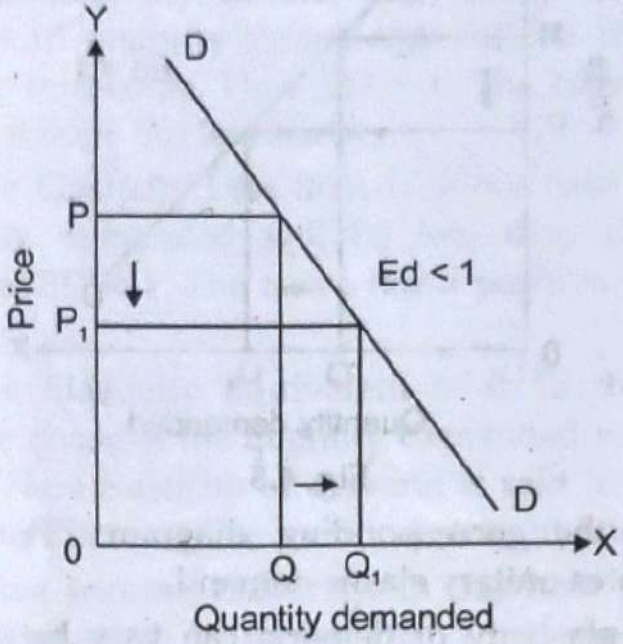


Fig. 4.4

In this diagram PP_1 is greater than QQ_1. The change in price is much more than the change in quantity demanded.

(e) **Unitary Elastic Demand:** In this case the change in price brings about a proportionate change in the quantity demanded. Elasticity of demand is equivalent to unity.

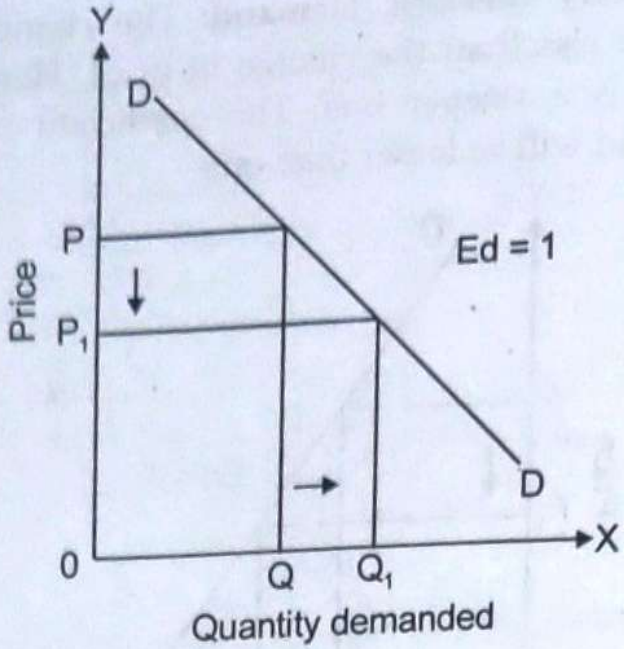


Fig. 4.5

In the corresponding diagram $PP_1 = QQ_1$. This indicates unitary elastic demand.

Thus price elasticity of demand can vary between zero and infinity. However in reality perfectly elastic demand and perfectly inelastic demand are very rare. Hence price elasticity of demand is generally relatively elastic or inelastic. While calculating price elasticity of demand either the price or the quantity demanded decreases. Hence elasticity of demand is always negative. Since it is always negative the minus sign is ignored.

(2) Income Elasticity of Demand: It is the responsiveness of quantity demanded of a commodity when there is a change in income. It is symbolically represented as

$$\left\{\begin{matrix}\text{Income} \\ \text{ED}\end{matrix}\right\} = \frac{\text{Proportionate change in quantity demanded}}{\text{Proportionate change in income}}$$

Further it can be represented as

$$Y_{Ed} = \frac{\Delta Q}{Q} \div \frac{\Delta Y}{Y}$$

$$= \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

Types of Income Elasticity:

(a) Unitary Income Elasticity: Here the change in quantity demanded is equal to the change in income. The

elasticity ratio is equivalent to 1. In this case the curve will have a positive slope and it is represented by a 45° line.

(b) **Income Elasticity Greater than Unity:** In this case the change in quantity demanded will be more than the change in income. Here ED > 1. The curve will have a positive slope but less steeper.

(c) **Income Elasticity Less than 1:** In this case the change in quantity demanded will be less than the change in income. ED < 1. The curve has a positive slope but it is steeper.

(d) **Income Elasticity Equivalent to 0:** In this case when income changes the quantity demanded will remain the same. Here elasticity of demand is said to be equivalent to 0. The curve will be a vertical straight line.

(e) **Negative Income Elasticity:** In this case the curve will bend backward. It implies that when income increases the quantity demanded will decline. It happens in the case of inferior goods.

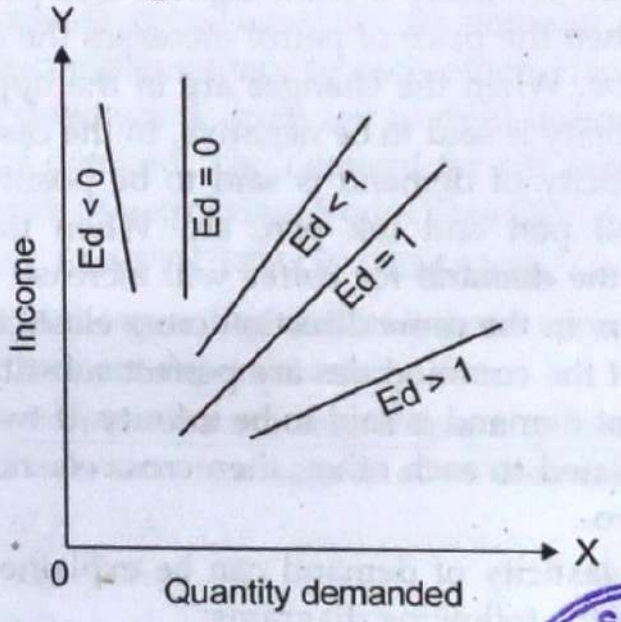


Fig. 4.6

Income elasticity of demand also depends upon the nature of goods. In the case of normal goods it is positive. In the case of inferior goods it will be negative. In the case of luxuries it is positive and greater than one. In the case of necessities it is

positive but the elasticity ratio is less then one. In the case of certain goods like salt, match box, etc. it is zero.

(3) **Cross Elasticity of Demand:** It is the change in the quantity demanded of a commodity due to the change in the price of other commodities. It can be defined as "the ratio of proportionate change in the quantity demanded of commodity x to a given proportionate change in the price of the related commodity." It is represented as

$$\text{Cross ED} = \frac{\text{Proportionate change in quantity demanded of X}}{\text{Proportionate change in price of Y (y)}}$$

$$= \frac{\Delta Q_X}{Q_X} \div \frac{\Delta P_Y}{P_Y}$$

$$= \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_Y}{Q_X}$$

Cross elasticity depends upon the type of goods consumed by the people. If two goods are complementary to each other, cross elasticity of demand is said to be 'negative'. Complementary goods refer to those goods which are used in combination to satisfy a want e.g. car and petrol, bread and butter. When the price of petrol increases the demand for car will decline. When the changes are in the opposite direction cross elasticity is said to be negative. In the case of substitutes cross elasticity of demand is said to be positive e.g. tea and coffee, ball pen and ink pen, etc. When the price of tea increases the demand for coffee will increase. Since both the changes are in the same direction cross elasticity is said to be positive. If the commodities are perfect substitutes then cross elasticity of demand is said to be infinity. If two commodities are not related to each other, then cross elasticity of demand will be zero.

Cross elasticity of demand can be explained further with the help of the following diagrams:

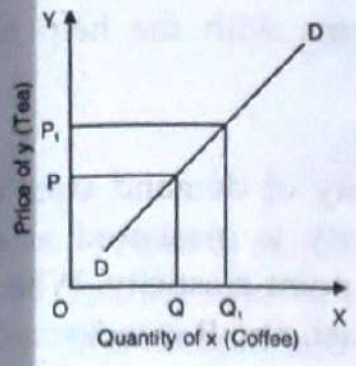


Fig. 4.7

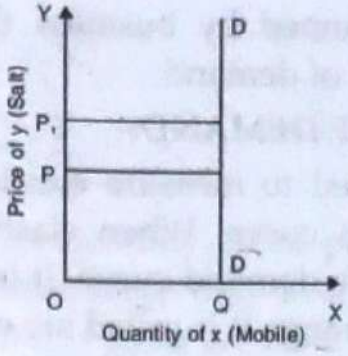


Fig. 4.8

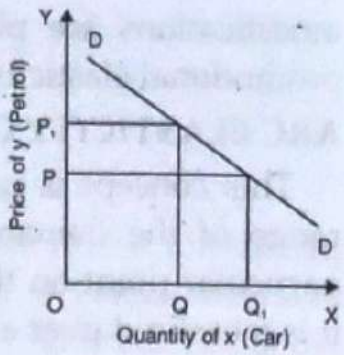


Fig. 4.9

Fig. 4.7 represents cross elasticity of demand between two goods x and y which are substitutes for each other. Here the demand curve slopes upwards indicating positive cross elasticity of demand. When the price of y increases, from OP to OP_1, the demand for x will increase from OQ to OQ_1 and the vice versa. If x and y are perfect substitutes cross elasticity of demand will be infinite.

In fig. 4.8, cross elasticity of demand between two unrelated goods is shown. The demand curve is a vertical straight line indicating zero cross elasticity of demand. There is no change in the quantity even when the price increases from OP to OP_1.

Fig. 4.9 represents cross elasticity of demand between two goods which are complementary to each other. Here the demand curve is sloping downwards from left to right indicating negative cross elasticity of demand. The demand for car falls from OQ to OQ_1 when the price of petrol rises from OP to OP_1.

PROMOTIONAL ELASTICITY OF DEMAND:

It is a change in the quantity demanded of a commodity due to change in advertisement expenditure.

$$\text{Promotional ED} = \frac{\text{Proportionate change in quantity demanded of X}}{\text{Proportionate change in advertisement expenditure}}$$

$$= \frac{\Delta Q_X}{Q_X} \div \frac{\Delta A}{A}$$

$$\text{Symbolically} = \frac{\Delta Q_X}{\Delta A} \times \frac{A}{Q_X}$$

This elasticity of demand is very useful to business firms to find out the impact of their advertisement expenditure on the demand for the commodity. Future expansions, innovations and

modifications are planned by business firms with the help of promotional elasticity of demand.

ARC ELASTICITY OF DEMAND:

This concept is used to measure elasticity of demand over a range of the demand curve. When elasticity is measured at a particular point on the demand curve, it is point elasticity. When it is measured over a range it is called arc elasticity. It is measured as

$$Ed = \frac{\Delta Q}{\Delta P} \times \frac{P_1 + P_2}{Q_1 + Q_2}$$

where Q_1 = Original quantity

Q_2 = New quantity demanded

P_1 = Original price

P_2 = New Price

$\Delta Q = Q_1 - Q_2$ and

$\Delta P = P_1 - P_2$

This type of elasticity is used when changes in price and quantity are substantial.

MEASUREMENT OF ELASTICITY OF DEMAND:

Elasticity of demand refers to the degree of responsiveness of demand to a given change in price, other things remaining the same. There are three methods to measure elasticity of demand. They are: (1) Percentage or ratio method (2) Total outlay method and (3) Geometric method or point method.

(1) **Percentage or Ratio Method:** In this method elasticity is measured by dividing the percentage change in quantity demanded by the percentage change in price. Symbolically, it can be represented as

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

$$= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100}$$

$$= \frac{\Delta Q}{Q} \div \frac{\Delta P}{P}$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Here Q stands for quantity, P for price and Δ for change. For the sake of convenience only absolute values are taken into account and minus signs are always ignored. The above method is used to measure elasticity at a particular point on the demand curve. In other words when price and quantity variations are small, percentage method can be used. When the variations are large, arc elasticity formula has to be used. The formula is

$$\text{Price elasticity} = \frac{\Delta q}{\frac{q_1 + q_2}{2}} \div \frac{\Delta p}{\frac{p_1 + p_2}{2}}$$

$$= \frac{\Delta q}{q_1 + q_2} \times \frac{p_1 + p_2}{\Delta p}$$

$$= \frac{\Delta q}{\Delta p} \times \frac{p_1 + p_2}{q_1 + q_2}$$

(2) **Total Outlay or Total Expenditure Method:** Under this method the changes in the expenditure of the consumer with the change in price are considered to measure elasticity of demand. When the consumer spends, it becomes the income of the seller as one man's expenditure is another man's revenue. Hence this method is also called as total revenue method. The following changes in price and expenditure indicate elasticity of demand.

(a) When the total outlay remains the same with the change in price, then elasticity of demand is said to be unitary elastic. Here the coefficient of elasticity of demand is equal to one.

(b) When the total outlay falls with a rise in price and increases with a fall in price, then demand is said to be relatively elastic. Here the coefficient of elasticity of demand will be greater than one.

(c) When the total outlay decreases with a fall in price and increases with a rise in price then elasticity of demand is said to be relatively inelastic. The coefficient of elasticity of demand in this case will be less than one.

Thus when the change in total outlay and change in price are in the opposite direction, demand is relatively elastic. When the changes are in the same direction then it indicates relatively inelastic demand. With the change in price, if total outlay remains the same, then demand is said to be unitary elastic. This method can be explained with the help of a numerical example.

	Price (Rs.)	Quantity (units)	Total Outlay (Rs.)	Elasticity of demand
Original	5	30	150	–
Change	6	20	120	Ed > 1
	4	75	300	
Change	6	45	270	Ed < 1
	4	35	140	
Change	6	25	150	Ed = 1
	3	50	150	

While the percentage method gives the exact numerical value of elasticity of demand, the total outlay method indicates whether elasticity of demand is greater or lesser or equal to one.

(3) **Geometric Method or Point Method:** To measure elasticity of demand at a point on the demand curve, this method is used. To explain this method, let us consider a linear demand curve. At a point on this curve, elasticity is measured by using the formula

$$Ed = \frac{\text{Lower segment}}{\text{Upper segment}}.$$

This can be explained with the help of the following diagram:

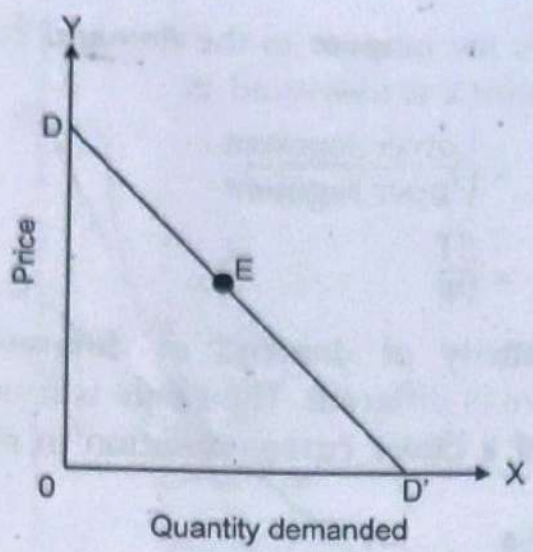


Fig. 4.10

In the above diagram, at point E elasticity of demand

$$= \frac{\text{Lower segment}}{\text{Upper segment}}$$

$$= \frac{D'E}{DE}$$

If this coefficient is greater than 1, then demand is said to be relatively elastic and vice versa.

In the case of a non-linear demand curve, if elasticity has to be measured at a particular point on the curve, then a tangent has to be drawn at that point and then the same formula has to be used. This is depicted as follows:

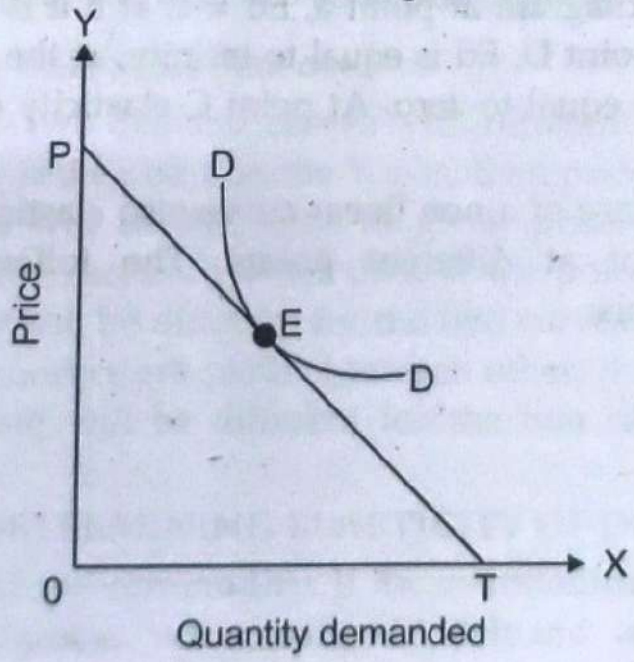


Fig. 4.11

Here PT is the tangent to the demand curve. Elasticity of demand at point E is measured as

$$Ed = \frac{\text{Lower segment}}{\text{Upper segment}}$$

$$= \frac{ET}{PE}$$

Price elasticity of demand at different points on the demand curve is different. The range is from zero to infinity. In the case of a linear curve, variation in elasticity is shown below:

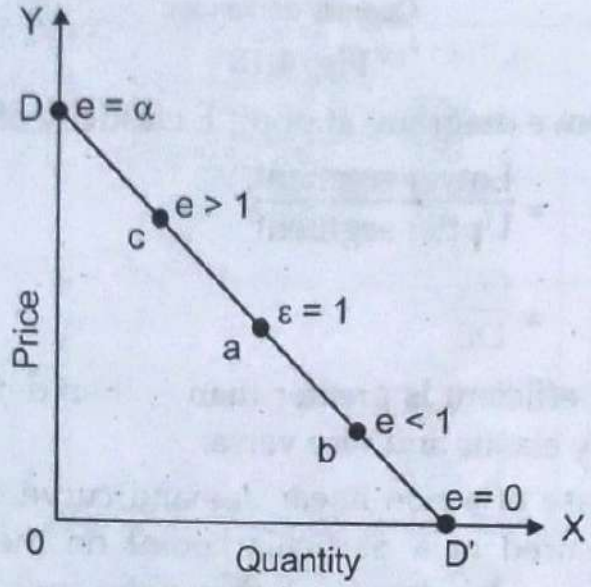


Fig. 4.12

In this diagram at point a, Ed = 1, at b it is less than one. While at point D, Ed is equal to infinity, at the other extreme i.e. D′ it is equal to zero. At point C elasticity is greater than one.

In the case of a non linear curve also elasticity of demand is different at different points. The following diagram explains this:

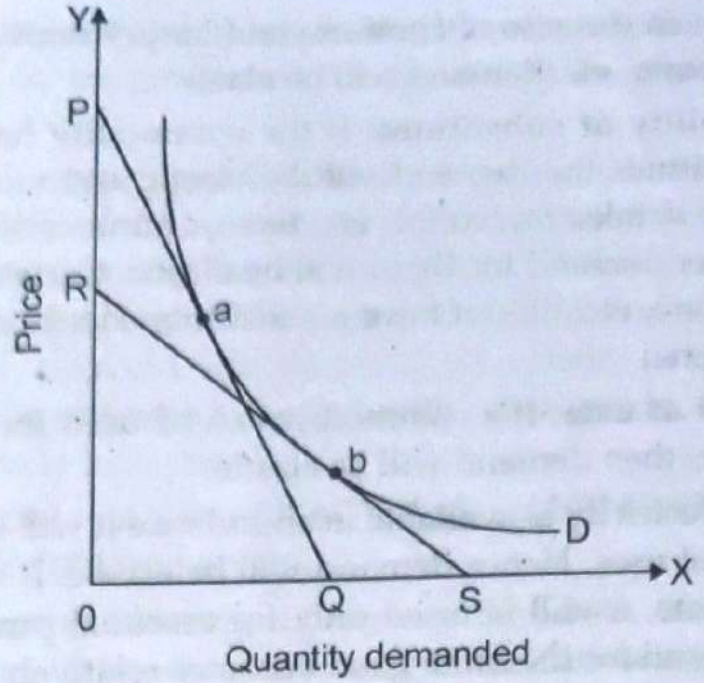


Fig. 4.13

In the above figure there are two points a and b on the demand curve DD. To find out elasticity at these points two tangents PQ and RS are drawn. Elasticity of demand at point

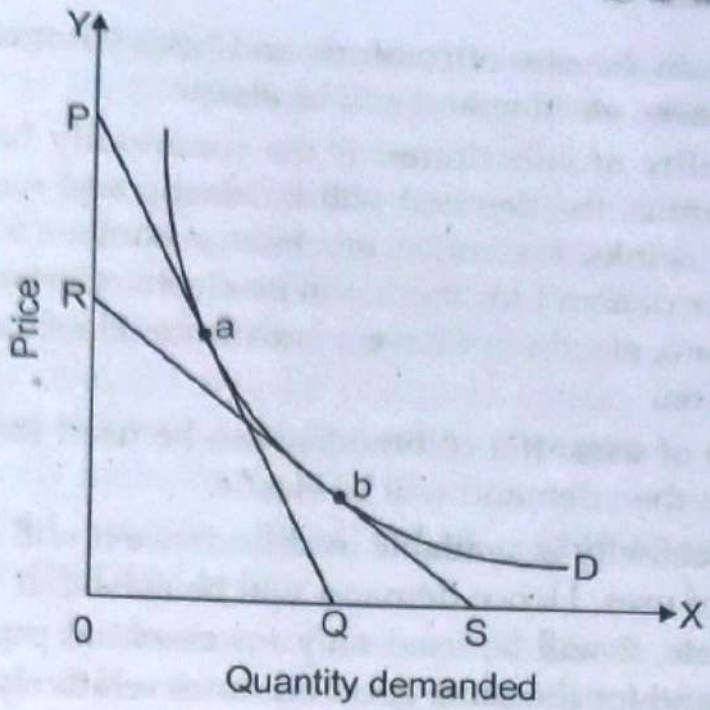
$$a = \frac{\text{Lower segment}}{\text{Upper segment}} = \frac{aQ}{aP}$$

Since the distance aQ is greater than aP, elasticity of demand will be more than one. At point b, elasticity is equal to $\frac{bS}{bR}$. Since the distance bS is less than bR, here elasticity of demand will be less than one.

When two demand curves with different slopes originate from the same point on the Y axis, then price elasticity of the 2 curves will be the same at given price. If two demand curves intersect each other then at the point of intersection, elasticity will be different for the two curves. Similarly if two demand curves are parallel to each other, then also elasticity of demand will be different for the two curves at a given price.

FACTORS DETERMINING ELASTICITY OF DEMAND:

(1) **Nature of the commodity:** If the commodities are necessities like foodgrains, water, salt, etc. demand will be relatively



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FACTORS DETERMINING ELASTICITY OF DEMAND:

(1) **Nature of the commodity:** If the commodities are necessities like foodgrains, water, salt, etc. demand will be relatively

inelastic. In the case of comforts and luxury items like car, air conditioners, etc. demand will be elastic.

(2) **Availability of substitutes:** If the commodity has a number of substitutes the demand will be elastic and vice versa. For e.g. cold drinks, tea, coffee, etc. have a number of substitutes. Therefore demand for them will be elastic. Certain goods like salt, potato, etc. do not have a substitute. Hence demand will be inelastic.

(3) **Number of uses:** If a commodity can be used for a variety of purposes then demand will be elastic.

e.g.: If electricity is available in abundance it will be used for a variety of uses. Hence demand will be elastic. If it's supply is inadequate, it will be used only for essential purposes. Then the demand for the same good becomes relatively inelastic.

(4) **Habits and customs:** If people are habituated to a particular commodity demand will be inelastic. If the society has certain customs and traditions then certain commodities will be purchased whatever be the price. Hence demand will be inelastic. For example smokers will buy cigarettes whatever be the price. During festival time people have a tendency to buy gold due to customs and traditions.

(5) **Level of income:** In the case of high level income groups demand will be inelastic whereas in the case of poor people demand will be elastic.

(6) **Time:** In the short run, demand for certain goods and services is inelastic whereas in the long run demand becomes elastic.

(7) **Range of prices:** If the commodities are expensive then demand will be elastic. e.g.: T.V., refrigerator, air conditioner, etc. If the commodities are less expensive then demand remains inelastic. e.g.: Match box.

(8) **Proportion of income spent by the people:** If people spent a small percentage of their income on certain goods then demand for such goods will be inelastic. e.g.: Newspaper. On the contrary, if a larger percentage of income is spent on certain goods, demand for it will be elastic. e.g.: Luxury goods.

(9) **Possibility of postponement:** If consumption of certain goods can be postponed, demand will be elastic and vice versa.

(10) **Complementary goods and their prices:** A change in the availability of complementary goods and their prices will affect the demand for certain goods. If the price of petrol increases the demand for cars will decline and vice versa. In this case, demand will be relatively elastic. In certain other goods like salt which is used with other goods, demand will be relatively inelastic.

THEORETICAL AND PRACTICAL APPLICATIONS OF ELASTICITY OF DEMAND:

The concept of elasticity of demand has both theoretical and practical utility. **It is useful in theory in the following cases:**

(1) It is useful to identify the market structure. If the cross elasticity is infinite, then it indicates perfect substitutability of the goods and hence it implies the existence of perfect competition. If cross elasticity is zero, it implies the existence of monopoly.

(2) It is widely used by the finance minister while formulating the tax policy. He can impose a higher tax rate on those goods which have inelastic demand. Those goods which have relatively elastic demand will not attract higher tax rates. The government uses the concept to give tax exemption also.

(3) It is very useful to the monopolist in determining the output and price. Generally it is believed that a monopolist has unlimited powers and he can charge any price for his commodity. In reality it is not so. Even he has to consider the sensitiveness of demand to the price he is charging. If the demand for his product is relatively elastic, he has to charge less and vice versa.

(4) The policy of devaluation is adopted by the government after considering elasticity of demand. Devaluation refers to an official reduction in the external value of the currency. It is adopted by the government to correct disequilibrium in the balance of payments position. If the exchange rate is 1$ = Rs. 25 and if the balance of payments is adverse the

government may use devaluation and the exchange rate may become 1$ = Rs. 40. After devaluation for the same 1$, people in USA will get Rs. 40 worth of goods. Hence demand for exports from India will increase. At the same time Indians have to pay more to get 1 $ worth of goods. Hence demand for imports from USA will reduce. Thus devaluation helps to correct adverse balance of payments position. However, its success depends upon elasticity of demand. The demand for exports and imports should be elastic. Then only when the price changes, demand will also change.

PRACTICAL APPLICATIONS:

(1) It is used by the business firms in determining a number of things like the size of output to be produced, price to be charged, promotional expenditure to be incurred, etc. In fact without elasticity it is not possible to take any business decision.

(2) It is very useful in determining the prices of agricultural goods. The demand for agricultural goods is relatively inelastic. When the farmer produces a surplus, demand being inelastic, prices will start falling. The farmers will be penalised for producing a good output. At this point, the government has to interfere and purchase the surplus output from the farmers at a remunerative price. The government can undertake buffer stock operations and release the output at the time of scarcity. By doing this, prices can be stabilised. The farmers also get good revenue and are encouraged to produce more.

(3) Trade unions use this concept to their advantage. If the labourers know that their products are in demand, they can demand higher wages. Elasticity helps them to improve their bargaining power.

(4) The concept of cross elasticity of demand is widely used by multiproduct firms while determining the prices of products which are close substitutes to each other.

(5) Classification of goods into complementary and substitute goods can be done with the help of cross elasticity of demand.

(6) Promotional elasticity of demand helps the business firms to decide their outlay on advertisement. Income elasticity help the firms in formulating their marketing strategies.

Thus the concept of elasticity of demand has immense theoretical and practical significance.

RELATIONSHIP BETWEEN AVERAGE REVENUE, MARGINAL REVENUE AND PRICE ELASTICITY OF DEMAND:

There is a close relationship between average revenue, marginal revenue and price elasticity of demand. While average revenue is the revenue per unit of the commodity sold, marginal revenue is the addition made to the total revenue by selling one more unit of the output. Price elasticity refers to the responsiveness of demand to a given change in price. The average revenue curve is also the demand curve for the product of the firm. Therefore elasticity of demand at any point on the demand curve is the same for the average revenue curve at that point. The relationship between AR, MR and elasticity of demand is symbolically expressed as

$$Ed = \frac{AR}{AR - MR}$$

where Ed = elasticity of demand
AR = average revenue and
MR = marginal revenue

It is also expressed as:

$$e = \frac{A}{A - M}$$

Out of these three variables, if two are known it is possible to calculate the third one. This relationship can be explained with the help of the following diagram:

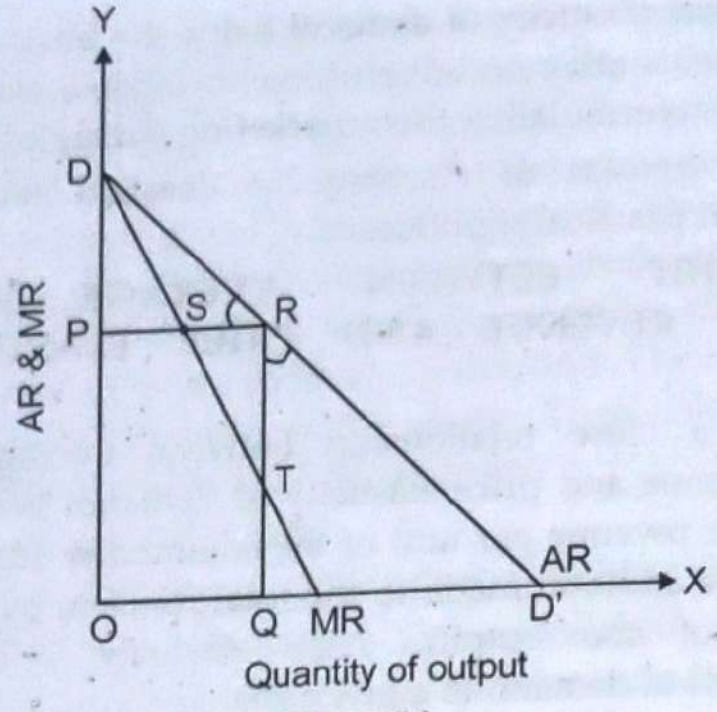


Fig. 4.14

In the above fig. 4.14, DD' is the demand curve as well as the average revenue curve. MR is the marginal revenue curve and it lies at half the distance between AR and Y axis as AR is a linear curve. At point R on the demand curve elasticity of demand is equal to lower segment/upper segment i.e. RD'/RD.

Let us consider the triangle PDR and RQD'.

$\angle DPR = \angle RQD'$ (right angles)

$\angle DRP = \angle RD'Q$ (corresponding angles)

$\therefore \quad \angle PDR = \angle QRD'$

$\therefore$ Triangles DPR and RQD' are equiangular.

Therefore $RD'/RD = RQ/DP$ ... (1)

Next let us consider triangles PDS and RTS.

Here $PS = RS$ (S is the mid point of the perpendicular RP)

$\angle DSP = \angle RST$ (vertically opposite angles)

$\angle DPS = \angle SRT$ (right angles)

$\therefore$ Triangles DPS and RST are similar in all respects.

$\therefore \quad PD = RT$ ... (2)

Let us consider (1) and (2) together

$$\frac{RD'}{RD} = \frac{RQ}{DP} = \frac{RQ}{RT} \quad (\because PD = RT)$$

∴ Elasticity of demand at point

$$R = \frac{RQ}{RT}$$

$$= \frac{RQ}{RQ - TQ}$$

It is clear from the figure that RQ is the average revenue and TQ is the marginal revenue.

∴ Price elasticity at point

$$R = \frac{AR}{AR - MR}$$

Thus at a given level of output, price elasticity, average revenue and marginal revenue are closely interlinked. Out of these three, if two are known it is possible to estimate the third variable. For e.g. if elasticity of demand is equal to one then MR will be equal to zero. This can be explained as follows:

$$e = \frac{A}{A - M}$$

$$eA - eM = A$$

$$eA - A = eM$$

$$A(e - 1) = eM$$

$$\therefore \quad M = \frac{A(e-1)}{e}$$

$$= \frac{A(1-1)}{1} = \frac{A \times 0}{1}$$

$$= 0$$

It can also be proved that MR will be equal to ½ of AR if elasticity of demand is equal to 2. Thus MR at any given point of time depends on AR and elasticity of demand. If elasticity of demand is greater than one, than MR will be positive. If elasticity of demand is less than one, then MR will be negative.

NUMERICALS FROM UNIVERSITY EXAMS

Ex. 1: *(March 18)*

Calculate the price elasticity of demand with the help of following information:

(i) If price falls from Rs. 110 to Rs. 100 and consequently demand increases from 200 units to 280 units.

(ii) If there is no change in the quantity demanded of commodity X, what will be the nature or the price elasticity of demand?

Solution:

(i) **Price falls from Rs. 110 to Rs. 100. $\therefore \Delta P = 10$.**

Demand increases from 200 to 280 units. $\therefore \Delta Q = 80$.

$$\therefore Ed = \frac{\Delta Q}{P} \times \frac{P}{Q} = \frac{80}{10} \times \frac{110}{200} = 4.4$$

(ii) If there is no change in demand then nature of price elasticity of demand is perfectly inelastic.

Ex. 2:

(i) The price of onion per kg. is Rs. 100 and the quantity demanded is 4 kgs. If price falls to Rs. 80 and elasticity of demand is 2, what will be the demand for onion with the change in price?

(ii) Calculate income elasticity of demand from the following and identify the nature of commodity.

Income (Rs.)	Quantity Demanded (Units)
2000	500
4000	600

Solution:

(i)
$$Ed = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$2 = \frac{\Delta Q}{20} \times \frac{100}{4}$$

$\therefore$
$$\Delta Q = \frac{2 \times 20 \times 4}{100}$$

$$= \frac{160}{100}$$

$$= 1.6 \text{ Kg.}$$

$\therefore$ DD for onion with the change in price $= Q + \Delta Q$

$$= 4 + 1.6 \text{ Kg.}$$

$$= 5.6 \text{ Kgs.}$$

(ii) Income elasticity of demand $= \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$

$$= \frac{100}{2000} \times \frac{2000}{500}$$

$$= \frac{1}{5} = .2$$

Income elasticity of demand is .2. It is less than one.

∴ The commodity is a necessary good.

Ex. 3:

	₹	₹
Income (Rs.)	60,000	80,000
Quantity demanded (in units)	1,000	1,800

(i) Calculate the income elasticity of demand from the information given above.

(ii) Indicate the type of income elasticity of demand.

Solution:

$\Delta Q = 1800 - 1000 = 800$; $\Delta Y = 80000 - 60000 = 20000$

$$\text{Income elasticity of demand} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

$$= \frac{800}{20000} \times \frac{60000}{1000} = \frac{24}{10}$$

$$= 2.4$$

Income elasticity of demand greater than unity.

Ex. 4: ***(March 19)***

The demand function for commodity X is given as $Qx = 1000 - 20Px$.

(i) Workout the quantity demanded for price at Rs. 5, 10, 20 and 25 and derive the demand schedule.

(ii) With the help of above demand schedule draw the demand curve.

(iii) Calculate the price elasticity of demand when price changes form Rs. 10 to Rs. 20.

Solution:

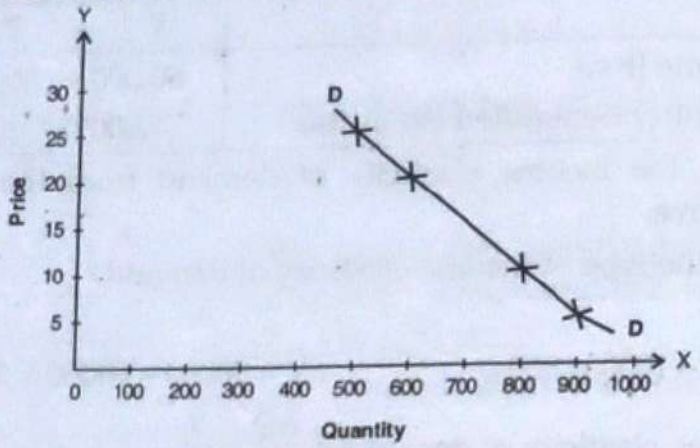
(i) Demand function for commodity X is $Q_x = 1,000 - 20\ P_x$

Price (Rs.)	Quantity (Units)
5	$Q_x = 1,000 - 20 \times 5 = 900$
10	$Q_x = 1,000 - 20 \times 10 = 800$
20	$Q_x = 1,000 - 20 \times 20 = 600$
25	$Q_x = 1,000 - 20 \times 25 = 500$

Demand Schedule

Price (Rs.)	Quantity (Units)
5	900
10	800
20	600
25	500

(ii) Demand Curve:



(iii) Elasticity of Demand = = $\frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

$\Delta Q = 800 - 600 = 200$ $\Delta P = 20 - 10 = 10$	$\Delta P = 10$ $\Delta Q = 800$
$\therefore Ed = \frac{200}{10} \times \frac{10}{800} = \frac{1}{4} = .25$	

QUESTIONS FOR REVIEW

(1) Define the following:

(a) Elasticity of demand.
(b) Cross elasticity of demand.
(c) Promotional elasticity of demand.
(d) Income elasticity of demand.
(e) Arc elasticity of demand.
(f) Devaluation.

State whether the following statements are true or false:

(a) When demand is perfectly elastic, the demand curve will be a vertical straight line. ***(Oct. 16)***
(b) In the case of inferior goods, income elasticity is negative.
(c) The cross elasticity of demand between unrelated goods is zero.
(d) Devaluation will succeed only when demand for exports and import is elastic.
(e) The concept of elasticity of demand does not have practical applications.
(f) Cross elasticity of demand between substitutes is positive.
(g) Income elasticity of demand for normal goods is negative. ***(March 17, 19)***
(h) Cross elasticity of demand for substitutes is positive. ***(BIM, Oct. 17; March 18)***

(i) Geometric method measures the elasticity of demand at a point on the demand curve. ***(Oct. 18)***
(j) The perfectly inelastic demand curve is horizontal to X-axis. ***(BIM, Oct. 18)***
(k) The substitute goods have positive cross elasticity of demand. ***(BIM, Oct. 18)***
(l) Price elasticity of demand for necessary commodities is less than one. ***(BIM, March 19)***
(m) Relatively inelastic demand is represented by a vertical demand curve.
(n) Demand for salt is highly elastic.
(o) Habit makes demand inelastic.
(p) Inferior goods have negative income effect but positive substitution effect.

*[**Ans.:** (a) False; (b) True; (c) True, (d) True; (e) False; (f) True; (g) False; (h) True; (i) True; (j) False; (k) True; (l) True; (m) False; (n) False; (o) True; (p) True]*

Fill in the Blanks:

(a) If two goods are complementary goods then it is _____ cross elasticity of demand.

*[**Ans.:** (a) Negative]*

Select the best answer from the given options:

(a) The demand for gold is _____. (realistic inelastic, relatively inelastic)
(b) When AED is _____ than 1, firm can incur heavy expenditure on advertisement. (higher, lesser, greater)
(c) Demand is relatively inelastic when _____. (Elasticity of demand is equal to one, Elasticity of demand is greater than one, Elasticity of demand is less than one, Elasticity of demand is equal to zero)
(d) When a 1% change in price leads to more than 1% change in quantity demanded, demand is _____. (Relatively elastic, relatively inelastic, unit elastic, all the above)

*[**Ans.:** (a) relatively inelastic; (b) greater; (c) Elasticity of demand is less than one; (d) relatively elastic]*

Match the following:

(A)	(B)
(1) Devaluation	(a) Advertisement outlay/effect
(2) Demand for salt	(b) Balance of Payments
(3) Higher tax rates	(c) Zero income elasticity/zero income elastic demand/ Inelastic demand
(4) Positive cross elasticity of demand ***(Oct. 17)***	(d) Inelastic demand goods.
(5) Promotional elasticity of demand	(e) Substitutes
(6) Negative income effect ***(Oct. 17)***	(f) EP > 1
(7) Inferior goods ***(BIM, Oct. 17)***	(g) Inferior goods
(8) Relatively elastic demand ***(BIM, Oct. 17)***	(h) EP < 1
(9) Promotional elasticity of demand ***(BIM, Oct. 18)***	(i) Point method
(10) Geometric method ***(BIM, Oct. 18)***	(j) Advertisement expenditure
(11) Demand for petroleum products ***(March 19)***	(k) Inferior goods
(12) Negative income elasticity ***(BIM, March 19)***	(l) Relatively price inelastic
(13) Point Methods	(m) Geometric Method
(14) Cross elasticity	(n) Tea and Coffee
(15) Promotional elasticity	(o) Advertisement effect

*[**Ans.:** (1 – b); (2 – c); (3 – d), (4 – e); (5 – a); (6 – g); (7 – h); (8 – f); (9 – j); (10 – i); (11 – l) (12 – k); (13 – m); (14 – n); (15 – o)]*

(2) Define Elasticity of demand. Explain the various types of elasticity of demand.
(3) Discuss types of Elasticity of Demand.
(4) Explain with suitable diagrams the different types (degrees) of price elasticity of demand. ***(Oct. 16)***
(5) Discuss the factors which influence elasticity of demand.

(6) What are the theoretical and practical applications of elasticity of demand?
(7) Differentiate between price elasticity of demand and income elasticity of demand.
(8) What are the factors determining elasticity of demand? Explain. ***(Oct. 16)***
(9) Explain the geometrical measurement of price elasticity of demand. ***(March 17)***
(10) Explain the different types of income elasticity of demand. ***(Oct. 17)***
(11) Define 'price elasticity of demand' concept. Discuss factors affecting price elasticity of demand. ***(March 18)***
(12) Explain the different types of cross elasticity of demand. ***(BIM, Oct. 17)***
(13) Discuss the types of cross elasticity of demand. ***(Oct. 18)***
(14) Define income elasticity of demand and discuss the practical importance of income elasticity of demand. ***(BIM, Oct. 18)***
(15) Explain the point method of measuring price elasticity of demand. ***(March 19)***
(16) "Elasticity of demand has important application in economics and business." Justify the statement. ***(March 19)***
(17) Explain the types of price elasticity of demand. ***(BIM, March 19)***
(18) Explain various degrees of price elasticity of demand.
(19) Explain with the help of diagrams point and are elasticities of demand.
(20) Explain price elasticity of demand with diagram.
(21) Explain elasticity of demand and methods used for measuring it.
(22) Discuss Income and Cross Elasticity of Demand.
(23) Throw light on relationship between Elasticity of Demand and Revenue Concepts.
(24) **Write Short Notes:**
  (a) Promotional elasticity of demand. ***(BIM, Oct. 17)***
  (b) Income elasticity of demand. ***(March 18)***
  (c) Types of price elasticity of demand. ***(Oct. 18)***
  (d) Promotional elasticity of demand. ***(BIM, March 19)***
  (e) Price elasticity of demand.
  (f) Cross elasticity of demand.
(25) **Comment on the following statements:**
  (a) A bumper harvest reduces the income of the farmers.
  (b) The success of devaluation depends on elasticity of demand.
  (c) Cross elasticity of demand is useful to determine the relationship between commodities.
(26) **Solve the following.**
  (a) The initial price of a commodity is Rs. 20 and the quantity demanded is 60 units, when the price falls to Rs. 10, quantity demanded increases to 80 units. Calculate price elasticity.
  (b) The demand for a commodity is 100 units when the price is Rs. 5. It declines to 60 units when the price increases to Rs. 6 per unit. Calculate the elasticity coefficient.
  (c) Which of the following combination of goods are complements and which are substitutes?
    (i) College education and online education.
    (ii) Private tuitions and coaching classes.
    (iii) Shoes and Socks.
    (iv) Tennis ball and Racket.
    (v) Plane Trip and Train trip.
    (vi) Mobile and Mobile charger.
    (vii) Mobile and Landline telephone.
    (viii) Personal computer and laptop.
    (ix) Computer and printer.
    (x) Crude oil and Shale gas.
    (xi) Post office service and courier service.
    (xii) CFL bulbs and LED lamps.
    (xiii) Smart phones and traditional cameras.

(d) Find out income elasticity of demand from the following.

	Rs.	Rs.
Income	50,000	80,000
Quantity demanded (in units)	1000	1600

(e) **Solve the following problems:**

(i) The price of a commodity increases from Rs. 5 to Rs. 8. The corresponding change in quantity demanded is 100 and 80 units. Calculate price elasticity.

(ii) Calculate income elasticity of demand from the following data. Identify the nature of the commodity.

Income (Rs.)	Quantity demanded (units)
1000	500
2000	600

(iii) Classify the goods as substitutes and complements from the following information:

Commodity	Cross price elasticity with respect to price of	Coefficient of cross elasticity of demand
Cheese	Butter	1.25
Tea	Coffee	1.40
Bread	Butter	– 0.50
Car	Petrol	– 0.82
Shoes	Potato	Zero

(f) Calculate arc elasticity of demand from the following information:

	Original	New
Price (Rs.)	25	15
Quantity demanded	100	150

(g) The coefficient of promotional elasticity of a firm is 1. The advertisement expenditure has been increased from Rs. 10,000 to Rs. 20,000. The change in quantity sold is 500 units. What is the original quantity sold by the firm?

(h) Calculate cross elasticity of demand from the following data.

Commodity	Before		After	
	Price (Rs.)	Qty (units)	Price (Rs.)	Qty (units)
Maruti 800	4 lakh	1000	4 lakh	1500
Maruti Esteem	6 lakh	900	5 lakh	800

(27) (a) Explain cross elasticity of demand with suitable examples.

(b) Find out the relationship between the two goods using cross elasticity of demand.

Commodity	Before		After	
	Price	Qty	Price	Qty
X	10	20	10	40
Y	20	40	30	30

(28) The price of bananas per dozen is Rs. 30. The quantity demanded is 4 dozens. The price elasticity of demand for bananas is 3. If the price falls to Rs. 20 per dozen calculate how many dozens will be demanded with the change in price.

(29) The price of onion per kg. is Rs. 100 and the quantity demanded is 4 kgs. If price falls to Rs. 80 and elasticity of demand is 2, what will be the demand for onion with the change in price?

(30) The price of onion has increased from Rs. 60 to Rs. 80 per kg. The demand for chicken has declined by 20% due to the rise in price of onion. If the original demand for chicken is 100 kgs. When onion price is Rs. 60 per kg. calculate the cross elasticity of demand.

(31) The price of crude oil declined from $150 per barrel to $75 per barrel. The quantity demanded increased from 50 barrels to 60 barrels. Calculate elasticity of demand and identify the type of elasticity of demand.

5

Demand Estimation and Forecasting

MEANING AND TYPES
STEPS/STAGES INVOLVED
METHODS
CHARACTERISTICS OF A GOOD FORECASTING METHOD
SIGNIFICANCE

MEANING AND TYPES:

Demand forecasting is one of the main activities of a business economist. A forecast is an estimation of a situation in future. Demand forecasting is estimating the demand for a product in future. Past experience is analysed and demand forecasting is done on this basis. Forecast is an attempt to foresee the future by examining the past. It is done to minimise risk and uncertainty. It is very essential for forward planning. It cannot be hundred percent precise but it can be relied upon. It is not a mere guesswork. It is based on scientific methods and statistical tools are used to arrive at a good forecast. It is also not a speculative work. It is based on the law of probability. It is very crucial for every type of business firm as it serves as the reference point for all types of business decisions.

Demand forecasting is done by all types of organisations like business firms, schools, colleges, churches, etc. It is important to develop a new product, to schedule production, for inventory

control and to create a good distribution system. It is an integral part of corporate planning and decision making. Over production and under production can be avoided with forecasting. In short it is indispensable for every type of business firm. Individual firms use macro economic forecasts for deriving their micro forecasts. Forecast of the economy has a profound influence on the operations of the individual firms. **There are various types of demand forecasting. Some of them are:**

(1) **Passive demand forecasting:** The demand of the previous years is extrapolated and future demand is predicted on this basis. The impact of new policies on demand can be analysed with this method.

(2) **Active demand forecasting:** In this type the future demand is estimated by taking into account the impact of new policies and impact of its own plans and actions. This type is considered better than passive forecasting.

(3) **Firm level demand forecasting:** When the demand for the product of an individual firm is forecasted it is called firm level or micro forecasting.

(4) **Industry level demand forecasting:** When the demand for the product of an entire industry is estimated it is termed as industry level demand forecasting.

(5) **National level demand forecasting:** It refers to the estimation of demand at the macro level i.e. estimation of future demand for all goods produced in the economy.

(6) **Short term demand forecasting:** If demand is forecasted for less than a year it is known as short term demand forecasting. It is useful to the business firm for a variety of purposes like price determination, formulation of sales policy, determination of sales targets, etc.

(7) **Long term forecasting:** When demand forecasting is related to 5 years or more, it is said to be long term forecasting. This type of forecasting helps in expansion, diversification, financial planning, etc.

(8) **Medium term forecasting:** If demand is forecasted for a period of one to five years, it is included under medium term forecasting. This type is useful to plan promotional

expenditure, modify designs and to bring about quality improvements.

(9) **Ex-ante forecast:** When forecasting is done for a number of periods in future, it is called as ex-ante forecast.

(10) **Ex-post forecast:** When forecast for the past and the present are considered to find out the credibility of the forecasting model then it is termed as ex-post forecasting.

(11) **Total market forecasting:** If the demand for a product is forecasted for the entire market, it is called total market demand forecasting. For e.g. if the total demand for sugar for the entire market is estimated, it is termed as total market forecasting.

(12) **Market segment forecasting:** If demand is estimated for a particular region or a particular group, it is termed as market segment forecasting. For instance if the demand for mangoes is estimated for the domestic market and external market, it is known as market segment forecasting.

STEPS/STAGES INVOLVED IN DEMAND FORECASTING:

Demand forecasting is a systematic exercise. It has to be done carefully. A number of factors have to be taken into account at each and every stage. It is a complex process. **It involves the following steps:**

(1) **Determination of objectives:** The business firm should clearly identify the objective of demand forecasting and utility of the forecast for its future plans. Accordingly the right type of forecast like short term or long term has to be selected.

(2) **Nature of the product and market:** The nature of demand forecasting depends upon the type of product and the nature of market in which it is sold. Different type of products require different type of demand forecasting. Goods may be consumer goods or producer goods or they may be durable or perishable. While forecasting demand for any of these goods, a number of factors should be taken into account. For e.g. if the commodity is a finished good, then demand for the intermediary goods, scope for advertising and price policy to be followed keeping in mind the competitors etc. should be

taken into account. Similarly, in the case of perishable goods like flowers, fruits, vegetables etc. facilities like storage, transport etc. should be considered. Another factor which deserves attention while forecasting demand is the stage to which the product can be identified with like introductory stage, growth stage etc. The nature of the market structure is another significant factor which influences demand forecasting. Markets are broadly classified into perfect and imperfect markets. Different market structures require different type of demand forecasting.

(3) **Identification of demand determinants:** The various determinants of demand should be clearly identified. The demand determinants are different for different types of products. While the demand for durable goods depends upon the level of income, availability of credit, the demand for non-durable goods depends upon the price level, taste and preferences of the people, income level etc. Along with the specific factors which influence the demand for a product, other sociological, psychological and demographic factors should also be identified.

(4) **Selection of the method of demand forecasting:** There are various methods of demand forecasting. Depending upon the nature of the product a particular method has to be selected. Sometimes it may be necessary to select a combination of two or three methods. The selection of a particular method depends upon the time period available for forecasting demand, expected degree of accuracy, expenditure involved etc. Adequate data should be collected for the purpose of forecasting. The data required for demand forecasting can be collected from two sources namely primary sources and secondary sources. Data collected from primary sources are called primary data and those collected from secondary sources are termed as secondary data. Primary data are collected for the first time. They are in the form of raw materials and need to be processed before they are used. They are original in nature. Secondary data on the other hand are obtained from the existing records. They are like finished products and can be used readily. Example of primary data is

census data while the main sources for secondary data are official publications of the government like budget, plan document, journals, publications of research institutions, international bodies like the WTO, IMF etc. While using secondary data utmost care should be taken. Reliable sources should be depended upon for collecting secondary data.

(5) **Interpretation of data and testing the accuracy of forecasting:** Once the required statistical data is collected, it has to be processed and interpreted properly. Interpretation of statistical data is a complicated process. On the basis of the data collected, demand estimates have to be made.

The statistical accuracy of demand forecasting can be tested by various methods. The testing is done to avoid or minimise error. The difference between the forecast value and the actual value indicates the absolute level of forecasting error.

METHODS OF DEMAND FORECASTING:

Forecasting methods range from simple ones to sophisticated ones. Some of the methods are quantitative while others are qualitative in nature. Some techniques are complex and expensive while others are cheaper and take less time and effort. Different methods are used for different purposes. For example for short term forecast barometric method is used. On the other hand input-output method is used for long term forecasting. Each method has its own merits and demerits. Firms may select a particular method or a combination of methods according to their requirements. Following are some of the important techniques of demand forecasting under two broad categories namely survey method and statistical method.

(A) Survey Method:

(a) **Census Method and Sample Method:** It is a direct method to collect information about future demand. Surveys are generally conducted through interviews or by sending questionnaires. **Surveys are of two types:**

(1) Complete enumeration or Census survey and

(2) Sample survey method.

(1) **Complete Enumeration:** Under this method all the consumers of a product are questioned about the product. Their future plans for the product, their reactions to changes in the price of the product, design, advertisement, etc. are ascertained. The information thus collected is classified, tabulated and analysed. This method is highly reliable as it covers the entire group of consumers and free from the personal prejudices of the investigator. However, it is an expensive and time consuming process. When the number of consumers is large, this method cannot be used.

(2) **Sample Survey Method:** An alternative to the census method is the sample survey method. From a large group of consumers, some are selected at random and they are interviewed about the demand for a product in future. The information is then processed and used for demand forecasting. This method is a simple one. It is less time consuming and less expensive. To get good results, the sample selected should be representative of the population and should be selected at random to avoid bias.

Though the above two methods are quite useful in collecting information, in reality many problems are faced while using them. Sometimes customers may not give the right response or they may not be able to visualise a hypothetical situation and give proper information. The success also depends on the style of the questionnaire and skill of the interviewer. This method is quite expensive and hence it can be used only by the big firms.

(b) **Expert Opinion Method:** In this method the opinion of experts are taken into account to predict future demand for a product. The experts may be from within the organisation or hired from outside. Different methods are used to obtain experts' opinion. One popular method is the Delphi Technique. This method involves the opinion of three or four experts. Each expert will be asked to give his opinion about future demand. Then the opinion of other experts would be revealed to them and their view in reviewing their opinion in

the light of the comments from other experts will be obtained. The process of reviewing will continue till a consensus is reached. This method is widely used in USA. The success of this method depends on the ability of the experts. It may be expensive if the services of experts are not easily available. Sometimes they may not be willing to accept the views of others and hence consensus may not be possible.

(c) **Sales Force Opinion:** Another method is to obtain the opinion of the sales force. The sales people are the ones who actually deal with the market and hence their opinion is sought. The opinion of all the sales people are summed up and then the information is used for demand forecasting.

The advantages of this method are that it is cheaper and easier to do. By involving the sales people in the exercise, they can be motivated to achieve the targets. The problem with this method is that the sales force may be biased. Some of them may project a very optimistic picture while others may be pessimistic about the sales.

(d) **Market Experimentation:** Market experimentation is also used by firms for demand forecasting. Sometimes survey method does not give the expected results. Hence market experimentation is used. It is of two types namely:

(1) Test marketing and

(2) Controlled experimentation.

Under test marketing a particular area or a particular region is selected. A new product will be introduced in this area and the behaviour of the consumers will be judged. The firm can conduct the same experiment in more than one area. The response of the consumers towards pricing, packaging, advertising, etc. can also be ascertained by the firm. This technique is based on the actual behaviour of the consumer. Hence results may be reliable. However it is expensive and time consuming. The market or region selected should be representative of the population. Many factors like economic condition, competition, government intervention, etc. which affect demand are not under the control of the government. Hence the results of market experimentation may be affected.

Another type of market experimentation is controlled experiments. A sample of the customers for a product is selected and are asked to visit a nearby shopping store where various brands of a product will be displayed. The customers are asked to express their preferences and the same is recorded. Sometimes a certain amount of money is given to them to make purchases and their preferences are observed. Their opinions may also be obtained through a questionnaire. By changing the price, advertising, model, etc. the changes in the preferences of the consumers are also recorded.

The problems in this method are:

(1) The selection of the sample should be a proper one.

(2) It is expensive.

(3) Consumers know that they are being observed. Hence they may not express themselves freely.

The advantage of this method is that it is said to be more accurate as consumers reveal their actual purchases rather than their intentions.

(B) Statistical Methods:

Business firms use statistical methods for demand forecasting as they are considered to be more accurate and scientific. Various types of statistical methods are used. Some of the important ones are:

(1) Time Series Analysis:

This method is widely used by business firms. It uses historical or past data to explain future demand. It does not explain the casual relationship between variables and how they will behave in future. It simply assumes that past behaviour of the variable will continue in future also. The data is related to a time period. Hence time series analysis tries to find out the factors which affect the behaviour of the variable. The changes in the variable over a period of time are divided into four components. They are:

(a) **Trends:** There may be a long term change in the demand for a product due to changes in population, tastes and preferences of the people etc. This is known as trend and it implies long term increase or decrease in time series of a variable.

(b) **Seasonal Variations:** Seasonal factors bring about changes in demand series over a period of time. For example weather changes bring about fluctuations in the time series data.

(c) **Cyclical Variations:** It refers to fluctuations in the data due to cyclical variations i.e. ups and downs in business.

(d) **Random Fluctuations:** Other factors which do not fall under any of the above categories are called random factors.

Time series analysis basically tries to explain the changes in a variable over a period of time. Various methods are used to determine a trend in demand and thereby predict the future demand for the product. Trend projection is a widely used technique. Many models of trend projection are used. Some of them are:

(a) **Naïve Model:** This model assumes that the demand for the product in future will be the same as the demand for the product at present. This model is useful when the demand for a product changes slowly and when forecasting has to be done for a short period of time.

(b) **Proportional Change Model:** This model considers the present change and it is added to the past value. On this basis demand is forecasted. In other words future demand is expressed as sum of past demand and changes in demand in the current period.

Other methods of trend projection are:

(1) Method of Moving Averages

(2) Method of Least Square.

Under the method of Moving Averages, a moving average for either a three year period or a four year period is calculated. Then the moving average is plotted on a graph. The curve thus obtained is extended to project demand for the product in future. Method of least squares is a statistical device. Here the relationship between the independent and dependent variable is expressed in the form of an equation. The popular equation used is $Y = a + bx$. The trend projection method is often used by business firms as it is simple and gives accurate information.

Numerical Example on Trend Analysis:

(1) Trend analysis by using the Method of Moving Averages:

From the following data, demand for commodity X can be forecasted for the year 2010, 2011 and 2012 by using moving averages. Here a three years, average is considered.

Year	Demand for Commodity X	Moving averages
2000	500	–
2001	1,000	–
2002	1,500	$\frac{3,000}{3} = 1,000$
2003	2,000	$\frac{4,500}{3} = 1,500$
2004	2,500	$\frac{6,000}{3} = 2,000$
2005	3,000	$\frac{7,500}{3} = 2,500$
2006	3,500	$\frac{9,000}{3} = 3,000$
2007	4,000	$\frac{10,500}{3} = 3,500$
2008	4,500	$\frac{12,000}{3} = 4,000$
2009	5,000	$\frac{13,500}{3} = 4,500$

The moving averages are obtained for a group of three years. In the above example quantity demand for the first three years 2000, 2001, 2002 is added and then divided by three.

Therefore the moving average is $\frac{3,000}{3} = 1000.$

Then the total of three years namely 2001, 2002 and 2003 is calculated and divided by three i.e. $\frac{4,500}{3} = 1,500.$

Thus while calculating moving averages for the subsequent year the earlier year should be dropped.

The above information has to be plotted on a graph with years on the X Axis and moving averages on the Y Axis. The moving average curve will indicate the trend. By extrapolating the curve to the years ahead, demand forecasting can be done for the subsequent years.

(2) Method of Semi average can also be used to forecast demand.

The following example illustrates this:

Year	Demand for mangoes (dozen)	Three year total and average
2005	100	
2006	300	$\frac{1000}{3} = 333.3$
2007	600	
2008	1000	
2009	1500	$\frac{4600}{3} = 1533.3$
2010	2100	

As per this method in the year 2006 the demand for mangoes must be 333.3 dozens. In 2009, the demand must be equal to 1533.3 dozens.

The yearly increase can be calculated as follows:

$$\frac{(1533.3 - 333.3)}{3} = \frac{1200}{3} = 400$$

For the year 2013, the demand can be estimated as

semi average in 2009 + 4 × yearly increase.

Here semi average in 2009 = 1533.3.

4 refers to the no. of years from 2010 to 2013.

Yearly increase = 400.

= 1,533.3 + 4 × 400

= 1,533.3 + 1600

= 3,133.3 dozens.

In 2013, the estimated demand is equal to 3,133.3 dozens.

(2) Econometric Method:

This method combines economics and statistics. It explains the cause and effect relationship between economic variables and changes in variables can be quantitatively measured. Both magnitude and direction of change can be estimated with the help of this technique. The econometric models can be adjusted according to the requirement. Models here can be a single equation or multiple equation model.

(3) Regression Analysis Method:

The statistical method most frequently used to estimate demand is regression analysis. This analysis can provide a demand function without much cost.

There are various steps in regression analysis as stated below:

(i) The first step is to specify the independent variables like price of a product, income of consumers etc., and dependent variables which are likely to influence demand. So sales depend upon various variables like income, prices, etc. The quantity of a product demanded is a dependent variable.

(ii) The second step in a regression analysis is to make accurate estimates of the variables mentioned in the first step.

(iii) The third step: After the variables have been specified and necessary information is collected, we have to specify the form of the equation or the way in which the independent variables mentioned earlier are assumed to interact to determine the level of demand.

Linear Functions: The most common specification is a linear relationship (i.e., linear function) such as the following:

$Q = a + bP + cA + dY.$

In this 'Q' stands for the quantity of product demanded.

'P' stands for the price charged.

'A' stands for the advertisement expenditure.

'Y' stands for per capita disposable income.

a, b, c and d are parameters.

The quantity demanded is assumed to change linearly with changes in each of the independent variables. In this case, the demand curve is a straight line.

Linear demand function is very popular for many demand functions are approximately linear. It is also a convenient statistical technique.

The method of least squares can be used to estimate parameters a, b, c and d, and the regression coefficients, for linear equations.

Power Functions: The second most commonly specified demand relationship is the multiplicative form:

$Q = aP^b A^c Y^d$

This equation indicates that the marginal effects of each independent variable on demand for a product depend upon the value of the variable as well as upon the value of all other variables in the demand function.

When, for instance, income increases, the demand may increase in a greater or lesser proportion. So an increase in demand may not be linear.

With a multiplicative relationship, the demand functions have constant elasticities for all variables.

Thus, if the income elasticity of demand for commodity X is constant, then an increase in income will result in a proportionate increase in demand for commodity X over wide ranges of income.

Choosing the form of Equation: The algebraic form of demand function - linear or multiplicative or any other form - may be selected so as to show the real relationship between the variables in an economy affecting demand.

The regression model shows an important relationship between the dependent variables and the independent variables as a group.

Such numerical analysis helps in forecasting sales.

The regression analysis can greatly improve the reliability and accuracy of forecasts. It is also economical. This method is useful when there are time-lags concerning data pertaining to demand.

Simple Linear Regression:

In this method, the dependent and independent variables have to be identified first. Then the regression analysis and the form of equation are to be selected. The following examples are useful to understand the same.

A linear demand function is expressed as follows:

$Q_X = a + bP_X$

where, Q_X refers to quantity demanded of X,

'a' is the intercept which remains constant as other determinants of demand apart from price, are assumed to be constant.

Px is the price of commodity X.

'b' is the coefficient which indicates the extent of change in demand due to change in price.

Example:

(1) Suppose $Q_X = 100 - 1P$.

If P = 10 then

$Q_X = 100 - (1 \times 10)$

$= 90$ units.

Here two variables are considered.

(2) When three variables have to be used then the equation can be

$Q_X = 600 - .5P + .4Y$

If P = 100 and income(Y) = 0 then

$Q_X = 600 - (.5 \times 100) + (.4 \times 0)$

$= 600 - 50$

$= 550$ units.

(3) Suppose the equation is $Y = 1000 + 2X$ where Y refers to the sale of television sets, X is expenditure incurred on research and development.

Suppose X is equal to Rs. 500 then

$Y = 1000 + 2 \times 500$

$= 1000 + 1000 = 2000$ units.

(4) Consider another example where in the equation is

$Q_X = 500 - 4P + .4Y$

If income (Y) is zero, price (P) is equal to 100 then

$Q_X = 500 - (4 \times 100) + (.4 \times 0)$

$= 500 - 400 = 100$ units.

If price (P) is zero, income (Y) is Rs. 400 then

$Q_X = 500 - (4 \times 0) + (.4 \times 400)$

$= 500 - 0 + 160$

$= 660$ units

Limitations of Regression Analysis:

(i) For demand forecasting of a product, it is difficult to determine an appropriate economic indicator.

(ii) This method cannot be used for forecasting demand for new products. This is because there are no past data in the case of new products.

(iii) A past regression relationship may not be valid in future. This is because the structural relations may be unknown.

All the above methods have their own merits and demerits. Business firms select that method which is suitable to their needs. Sometimes a combination of two three methods is used for effective demand forecasting.

CHARACTERISTICS OF A GOOD FORECASTING METHOD:

Every business firm is in need of a good forecasting method. Depending on their objectives, business firms select a particular method. The following are said to be characteristics of a good method:

(1) Simplicity is an important characteristic of a good forecasting method. It should be easy to use and comprehend.

(2) Accuracy is the next attribute. That method which can give accurate results is said to the most reliable one. Past results of the method are ascertained and on that basis accuracy is determined.

(3) Economy is another feature of a good forecasting method. Any method which involves least cost and at the same time gives good results is said to be the best method.

(4) The ability to give quick results is another requirement for a good method. If the method involves too many complexities, then it will not be preferred by business firms.

(5) A good demand forecasting method should be flexible and it should be possible to adapt itself according to the requirement. While remaining flexible, it should be able to give quick results according to the requirements and at all times.

Demand forecasting is very important for every business firm. There is no choice between forecasting and non-forecasting.

Today's world is a dynamic world. Changes are the only constant thing at present. To face competition, demand forecasting has become indispensable to any business firm. Its utility to any business firm is immense. For planning production, formulating sales policy, price policy, etc. forecasting is absolute necessary. Even for planning at the national level demand forecasting is used. It helps in fixing targets for saving, investment, etc. In short future growth and diversification of a business firm depends upon demand forecasting.

SIGNIFICANCE OF DEMAND FORECASTING:

Business decision making in the modern times depends upon demand forecasting to a considerable extent. It is useful to the firm in the following ways:

(1) The production planning of a business firm can be a meaningful exercise if it is based on demand forecasting. It is essential for the business firm to do so to avoid over production or shortages in supply. In other words losses can be avoided by using demand forecasting.

(2) A proper sales policy can be formulated with the help of demand forecasting. It is necessary for the firm to set realistic targets to achieve the objectives. If the targets are too high, the sales force will find it difficult to achieve. On the other hand if it is low then incentives offered by the firm will be meaningless.

(3) To formulate a proper purchase policy, demand forecasting is absolutely essential. It also helps in effective inventory control.

(4) Pricing policy of any business firm depends upon demand conditions. Demand forecasting helps to ensure price stability and enables the firm to adopt a suitable policy when demand is expected to fluctuate.

(5) Financial planning of business firms depends upon level of demand. Demand forecasting helps the firms to plan their financial requirements and get adequate finance at reasonable rate and in time.

(6) Future investment plans and growth prospects can be determined properly by the firms with the help of demand forecasting.

(7) Demand forecasting is not only useful to business firms but it is useful to the government to formulate various policies, plans and for allocation of resources.

While short term demand forecasting is useful for the above purposes, long term forecasting is essential for proper manpower planning i.e. for training labour and human resource development. Expansion, diversification, capital budgeting, financial planning etc. depend upon demand forecasting. Demand forecasting thus helps the firms in strategic decision-making. In short survival and growth of business firms depend upon demand forecasting.

NUMERICALS FROM UNIVERSITY EXAMS

Ex. 1: *(BIM, Oct. 18)*

The following are the annual sales of bicycles from the period 2001 to 2008.

Years	2001	2002	2003	2004	2005	2006	2007	2008
Sales in (Rs. Lakh)	21	25	29	35	28	31	34	32

Question:

Find the trend value of sales by using the three yearly moving average method.

Ans.:

Years	Sales in (Rs. Lakhs)	Moving Averages
2001	21	–
2002	25	–
2003	29	$\frac{75}{3} = 25$
2004	35	$\frac{89}{3} = 29.66$
2005	28	$\frac{92}{3} = 30.66$
2006	31	$\frac{94}{3} = 31.33$
2007	34	$\frac{93}{3} = 31$
2008	32	$\frac{97}{3} = 32.33$

QUESTIONS FOR REVIEW

(1) Define the following concepts:

(a) Demand forecasting.
(b) Active demand forecasting.
(c) Passive demand forecasting.
(d) Ex-ante demand forecasting.
(e) Ex-post demand forecasting.
(f) Complete enumeration.
(g) Sample survey.
(h) Econometric method.

Fill in the blanks:

(a) Demand function explains the relationship between demand for a good and its _____.
(b) Econometric methods combine economics and _____.
(c) Under _____ method of demand forecasting, all the consumers are questioned about the product.
(d) _____ method involves contacting each and every buyer. (Delphi, census, sample)
(e) Delphi method is a _____. (Survey method, Statistical method, Both (a) and (b), None of the above)
(f) Demand forecasting is an estimate of the _____ demand.

[Ans.: (a) determinants; (b) Statistics; (c) Complete enumeration; (d) census; (e) None of the above; (f) Future]

Match the following:

(A)	(B)
(1) Trend Analysis ***(March 19)***	(a) Statistical Method
(2) Trend Method ***(BIM, March 19)***	(b) Method of demand forecasting
(3) Active demand forecast	(c) Impact of new policy
(4) Mail survey method	(d) Economical method of demand forecasting

[Ans.: (1 – b); (2 – a); (3 – c); (4 – d)]

State whether the following statements are true or false:

(a) Demand forecasting is done only by large scale industries.
(b) Under Delphi Technique, the opinions of sales force are obtained to fore cast demand.
(c) Sample survey method is simple and less time consuming.
(d) A good demand forecasting method should be flexible, simple and accurate.
(e) The Delphi method uses time series data. ***(March 17)***
(f) Regression method forecasts demand accurately. ***(Oct. 17)***
(g) Demand forecasts are essential to plan future production. ***(March 18)***
(h) Choice of method is an important factor in demand forecasting. ***(BIM, Oct. 17)***
(i) Statistical methods of demand forecasting are more accurate and scientific. ***(BIM, Oct. 18)***
(j) Demand forecasting is not necessary for inventory planning. ***(March 19)***
(k) Small firms do not need to forecast demand. ***(BIM, March 19)***
(l) The Delphi method is a variant of the expert opinion method.
(m) Long term forecasts are required for capital investments.
(n) Passive forecasts take into account future changes.
(o) There cannot be limitations of the sample survey methods.

[Ans.: (a) False; (b) False; (c) True; (d) True; (e) False; (f) True; (g) True; (h) True; (i) True; (j) False; (k) False; (l) True; (m) True; (n) False; (o) False]

(2) Define demand forecasting. Explain the various types of demand forecasting.
(3) Describe in detail the different methods of demand forecasting.

(4) Distinguish between market survey and market experimentation.
(5) What are the characteristics of a good forecasting method?
(6) Write a short note on statistical methods of demand forecasting.
(7) What is the significance of demand forecasting? Why is it done by all business firms?
(8) Explain the various steps involved in demand forecasting.
(9) What are the steps involved in demand forecasting? Explain briefly. ***(Oct. 16)***
(10) Enumerate the importance of demand forecasting. ***(Oct. 16)***
(11) What is demand forecasting? Explain the survey method of demand forecasting. ***(March 17)***
(12) Describe in detail the different methods of demand forecasting. ***(Oct. 17)***
(13) Define 'Demand forecasting'. State and explain steps involved in demand forecasting. ***(March 18)***
(14) Explain the survey methods of demand forecasting. ***(BIM, Oct. 17)***
(15) Discuss the survey method of demand forecasting. ***(Oct. 18)***
(16) What are the advantages of moving average method? ***(BIM, Oct. 18)***
(17) What is demand forecasting? Explain fully the consumer survey method. ***(BIM, Oct. 18)***
(18) Define demand forecasting. Discuss the significance of demand forecasting. ***(March 19)***
(19) Explain the statistical method of demand forecasting. ***(BIM, March 19)***
(20) Define demand forecasting and its need for organization.
(21) Discuss the types of demand forecasting.
(22) What is the significance of demand forecasting?
(23) What is demand forecasting? What are the steps involved in demand forecasting.
(24) What is demand forecasting? What is / explain the significance of demand forecasting?
(25) Discuss the methods of demand forecasting.
(26) What is consumer survey method of demand forecasting? Discuss the advantages and disadvantages of consumer survey method.
(27) **Write short notes on:**
  (a) Types of demand forecasting. ***(March 17)***
  (b) Time series method of demand forecasting. ***(BIM, Oct. 18)***
  (c) Consumer survey method of demand estimation. ***(March 19)***
(28) The University of Mumbai has been introducing a variety of new courses in recent times. Forecast the demand for the old and new courses at the University level as well as at the College level.
(29) The Indian economy was liberalised in 1991. Since then the domestic sector has been exposed to competition from the foreign sector. Select a particular sector or industry of the Indian economy and analyse the impact of liberalisation on this sector or industry. Forecast the demand for the same under the present conditions.
(30) In 2019-20, India has received good rainfall according to the weather forecasts. Give a demand forecast for the products used by agriculture assuming the above statement as true. What will be the impact of this on other sectors of the economy?

MODULE – III:
SUPPLY AND PRODUCT DECISIONS AND COST OF PRODUCTION

6

Production Function in the Short Run and the Long Run

FEATURES OF PRODUCTION FUNCTION
TYPES OF PRODUCTION FUNCTION
PRODUCTION FUNCTION AND ISOQUANTS
PROPERTIES OF ISOQUANTS
LAW OF VARIABLE PROPORTIONS
LAWS OF RETURNS TO SCALE
PRODUCER'S EQUILIBRIUM

An economy's ability to produce food grains, cars, electricity, etc. depends upon its productive capacity. Productive capacity in turn is determined by the size and quality of labour, quantity and quality of capital stock, technological knowledge and the nature of public and private institutions. A variety of economic activities are pursued by the economy. Every business firm attempts to produce the maximum level of output for a given dose of inputs

avoiding wastages wherever possible. The relationship betwee the amount of input required to produce a certain amount o output is called production function. Transformation of input int output during a given period of time given the technology i termed as production function. In economics, it is the creation o form, place and time utility. In short it is nothing but a catalogue of output possibilities.

Production function can be estimated by statistical techniques using historical data on inputs and outputs. It can be represented by schedules, curves, mathematical equations, graphs, etc. It is symbolically represented as

Q = f {K, L, l, O} where Q represents the quantity of output, K refers to capital, L refers to land, l refers to labour and O refers to organisation, f represents functional relationship between input and output.

FEATURES OF PRODUCTION FUNCTION:

The important features of production function are:

(1) Production function is a flow concept. It implies the continuous flow of inputs to produce the output.

(2) It is a physical concept implying that the output is measured in physical terms, not in monetary terms.

(3) It depends on the state of technology and the inputs used. Technology is a broader term. It includes the level of knowledge of the society about the various sectors, organisational methods and techniques of production. Techniques used by a firm may be labour intensive or capital intensive. Production function is significantly influenced by the technique of production. Inputs refer to anything that is used by the firm to produce the output. A set of inputs is required to produce a given output. Inputs are of various types. Some are complementary to each other while others are substitutes. Certain inputs like sophisticated machines or skilled labour have less scope for substitution.

(4) Production function also indicates the objective of a rational firm which is nothing but producing the maximum output with a combination of given factors of production. The firm is not interested in the various combinations of factors of

production, but only in that combination which yields the maximum output.

(5) Production function is of various types. In fact for every product or service there is a production function. In some cases like computer software or biotechnology the production function becomes obsolete very fast. In certain other cases, production function is specific to a particular use. Modern economies produce multitudes of products. Hence there are millions of production functions.

TYPES OF PRODUCTION FUNCTION:

Some of the types of production function are:

(1) **Fixed and variable production function:** In the case of fixed production function, land and capital are used in a fixed proportion. There is no scope for substitutability. Variable production function is one in which the factors of production can be varied. Here a given output can be produced by several alternatives.

(2) **Linear production function:** It is one of the most popular production functions. The change in output equals the change in input. For e.g. if input is increased by 10%, then output will also increase by 10%. In symbolic terms it can be represented as:

$$nQ = f(nk, nl)$$

(3) **Cobb-Douglas Production function:** Two American economists analysed the manufacturing sector between 1899 to 1922. They considered two factors of production labour and capital. According to them capital contributes to one fourth of the increase in production and labour, three fourth of the increase in production. According to these economists increase in output will be equivalent to the increase in inputs. Hence this production function is said to be a linear function. Symbolically, this production function is expressed as $Q = L^{\alpha}K^{\beta}$ where Q – refers to the quantity of output, L refers to labour, K refers to capital, α and β are positive constants.

(4) **Short run and long run production function:** The short run production function has both fixed and variable factors. The variations in output will be due to the variations in the

variable factor. In the case of long run production function all the factors become variable. All fixed factors become variable in the long run. These is scope for altering the size of plant and hence the scale of operation. The two functions are expressed as follows:

Short run production function $Q = f(a, b^*, c^*, d^*, \ldots n^*, \bar{T})$.

Here,

Q stands for quantity of output,

a is the variable factor, $b^*, c^*, d^*, \ldots n^*$ are fixed factors.

$\bar{T}$ indicates constant technology and

f denotes functional relationship between input and output.

Long run production function $Q = f(a, b, c, d, \ldots n, \bar{T})$.

Here,

Q is output, a, b, c, d, ...n refer to the factors which are variable and

$\bar{T}$ indicates constant technology.

The short run production function is explained by the law of variable proportions while the long run production function is explained by the laws of returns to scale.

PRODUCTION FUNCTION AND ISOQUANTS:

The concept of production function can be explained through isoquants. A firm can change the factor proportions, scale of output, etc. in the long run. To some extent it can substitute one factor of production for the other. Let us consider two factors of production labour and capital. These two can be combined in different proportions to produce a certain amount of output. These are various possibilities of combining labour and capital to produce the output. An isoquant is a curve which shows the various combinations of the two factors of production giving the same level of output. It is also known as equal product curve. The curve is based on an isoquant schedule. The isoquant schedule is a tabular representation of the various combinations of the two factors of production. The schedule and the curve can be shown as follows:

Combinations	Units of Capital	Units of Labour
A	1	14
B	2	10
C	3	7
D	4	5
E	5	4

The above table can be plotted on a graph with labour on the X axis and capital on the Y axis. A downward sloping curve can be obtained and this is termed as the isoquant. It can be represented as follows:

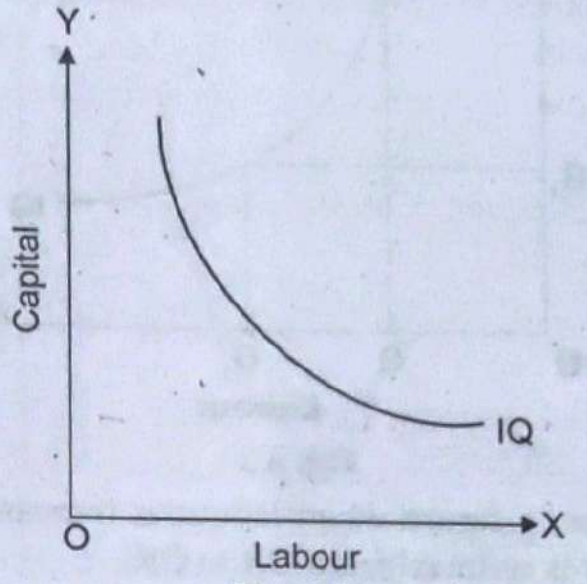


Fig. 6.1

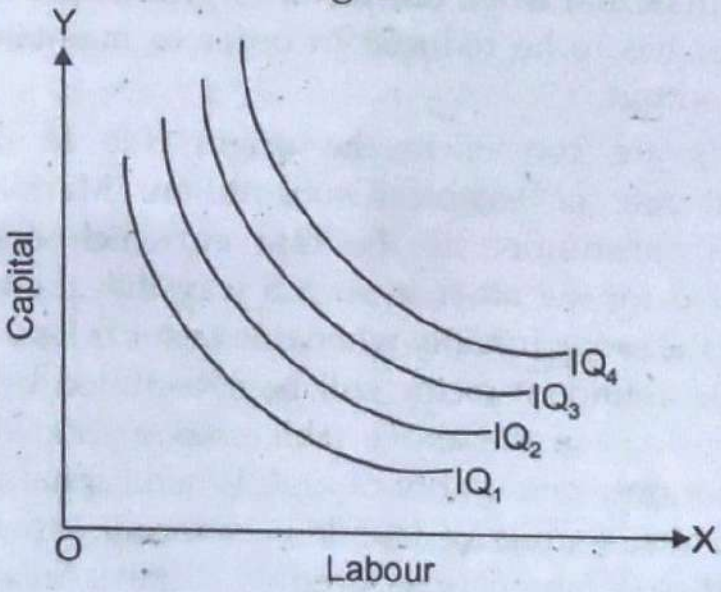


Fig. 6.2

Fig. 6.1 represents an isoquant indicating a certain level of output. Fig. 6.2 is a collection of indifference curves, each curve

denoting a particular level of output. This collection of isoquants is called an isoquant map.

PROPERTIES OF ISOQUANTS:

(1) An isoquant has a negative slope i.e. it slopes downwards from left to right as shown in the following figure.

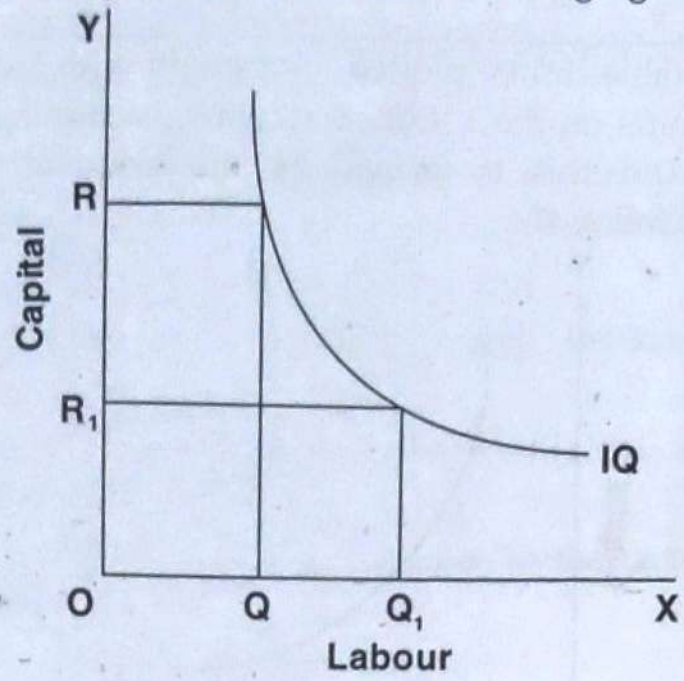


Fig. 6.3

In the above figure when labour is increased from OQ to OQ_1, capital is reduced from OR to OR_1.

It implies that when one factor of production is increased, the other has to be reduced in order to maintain the same level of output.

(2) Isoquants are convex to the origin due to diminishing marginal rate of technical substitution. Marginal rate of technical substitution is the rate at which one factor is substituted for the other in such a way that the total output remains the same. Initially when one factor is less, the other is more, the abundant factor will be substituted by the scarce factor. For e.g. in the above table combination A has more labour but only one unit of capital. When capital is increased to two units, 4 units of labour is reduced. When capital is increased to 3, labour is reduced by 3 units. Subsequently it can be seen that less and less units of labour is reduced to employ one more unit of capital. Thus marginal rate of

technical substitution has a tendency to diminish. Due to this an isoquant is always convex to the origin.

In the diagram given above the convexity of the curve implies diminishing marginal rate of technical substitution.

(3) **Isoquants do not intersect each other:** Each isoquant represents a certain level of output. If two curves intersect each other, the point of intersection represents two different levels of output. This is a logical contradiction. Hence isoquants cannot intersect each other.

This can be explained with the help of the following figure:

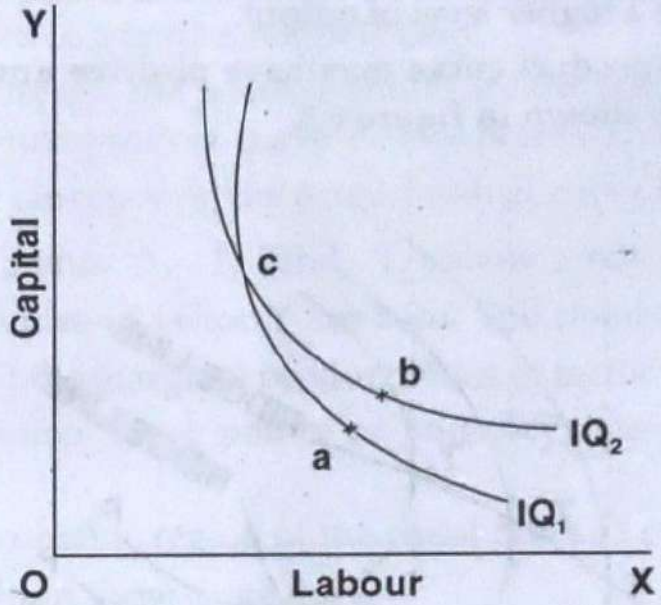


Fig. 6.4

In the above figure, IQ_1 and IQ_2 intersect each other at point C. Points a and c are on a lower indifference curve IQ_1. Point b is on the higher indifference curve IQ_2. Points b and c lie on IQ_2. All points on an isoquant represent the same level of output. Therefore here a = c; b = c.

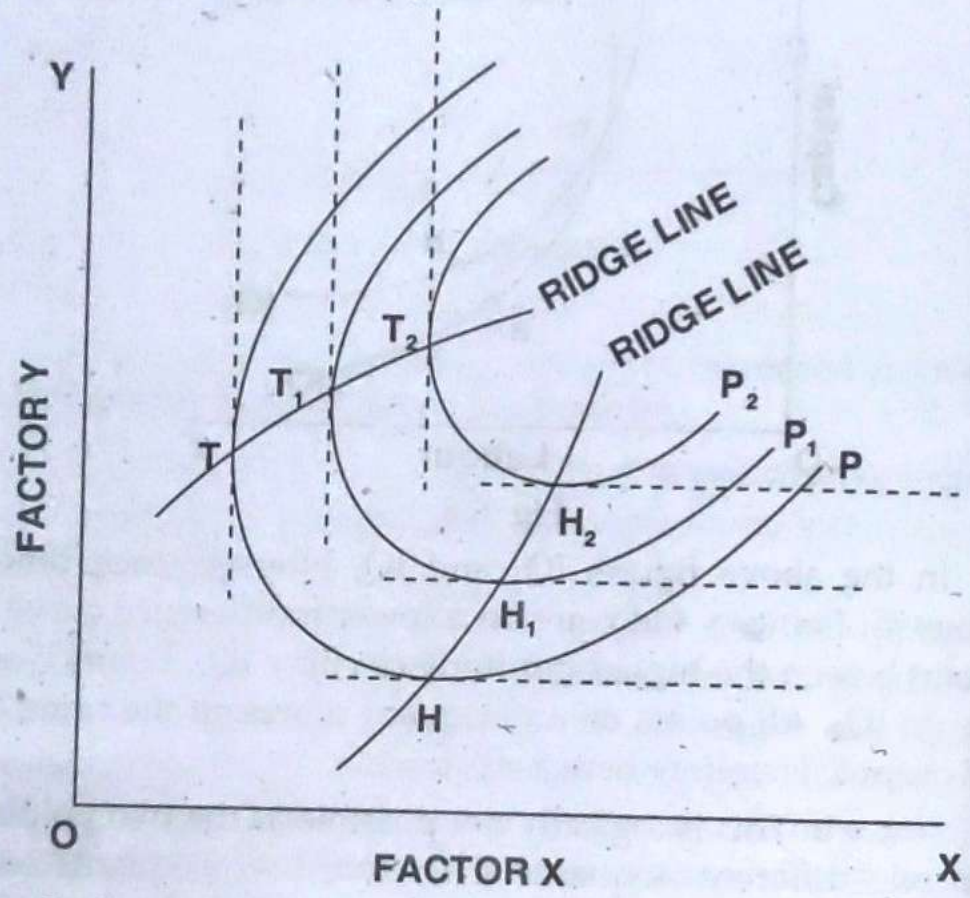
$\therefore$ a = b. This is logically not possible as the two points are on two different isoquants. Therefore two isoquants cannot intersect each other.

(4) **Isoquants do not intercept either axis:** If an isoquant touches one of the axis it implies that output can be produced only with the help of one factor of production. This is not possible. Hence isoquants do not touch either axis.

(5) **Isoquants can be oval shaped:** If the isoquant is oval shaped it indicates that small amount of one factor of production is combined with a larger quantity of the other factor of production. In this case the marginal productivity of the abundant factor will be negative and the total output has a tendency to decline.

(6) **Higher isoquants indicate higher level of production:** Each isoquant represents a particular level of output. The isoquant which is close to the origin represents a lower level of output whereas the isoquant which is farther away from the origin represents a higher level of output.

(7) **An equal-product curve may have positive upward slope at its ends as shown in figure 6.5.**



In figure 6.5, we have shown three equal-product curves, P, P_1 and P_2 having positive upward slopes at their ends. An equal-product curve will have positive upward slopes at its ends when a large amount of a factor is used with a small amount of another factor to produce a commodity. These factors may be combined in such a way that the marginal

productivity of the factor used in a large amount may become negative. As a result, the total output would decline.

Fig. 6.5

Hence the positive upward slopes at their ends should be regarded as uneconomical. So the economic region of the equal-product curves has to be determined. For this purpose, tangents have to be drawn to the equal-product curves P, P_1 and P_2. These tangents are parallel to the X-axis and the Y-axis.

At the points of tangency, the marginal productivity of the factor used in a large amount is zero.

In figure 6.5, the points T and H are the points of tangency on the equal-product curve P. The points T_1 and H_1 are the points of tangency on the equal-product curve P_1 and so on.

The points T, T_1 and T_2 show that the marginal productivities of factor Y are zero. The points H, H_1 and H_2 show that the marginal productivities of factor X are zero.

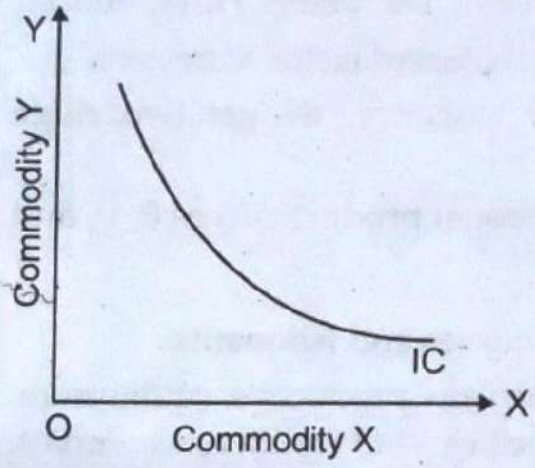
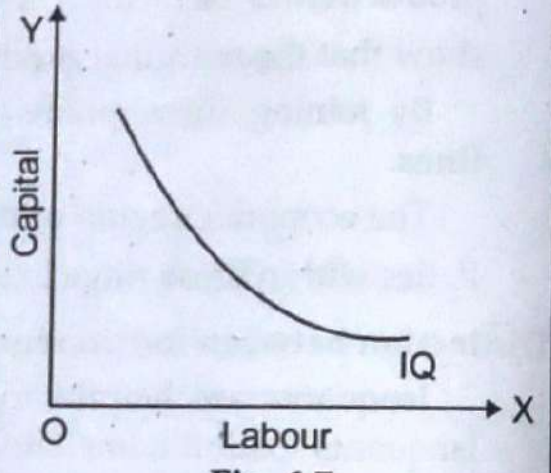
By joining these points of tangency, we get two ridge lines.

The economic region of the equal product curves P, P_1 and P_2 lies within these ridge lines.

Distinction between indifference curves and isoquants:

Isoquants are helpful to explain producer's equilibrium. Isoquants exhibit some similarities with indifference curves. Both the curves are downward sloping, both are convex to the origin, and both do not intersect each other. At the same time there are distinct differences between the two and hence both are not the same. The differences are given below:

Indifference Curves	Isoquants
(1) An indifference curve shows the various combinations of two goods giving the same level of satisfaction.	(1) An isoquant is a curve showing all the combinations of two factors of production giving the same level of output.

(2) It is used to explain consumer's equilibrium.	(2) It is used to explain producer's equilibrium.
(3) It deals with the level of satisfaction.	(3) It deals with the level of output.
(4) Here the level of satisfaction cannot be quantified.	(4) Here the level of output can be quantified.
(5) The concept of marginal rate of substitution is used in indifference curve analysis.	(5) Here the concept of marginal rate of technical substitution is used.
(6) The distance between two indifference curves cannot be quantified.	(6) The distance between two isoquants can be measured easily.
(7) An indifference curve is represented as follows:  Fig. 6.6	(7) An isoquant is drawn below:  Fig. 6.7

LAWS EXPLAINING PRODUCTION FUNCTION:

Production function is broadly classified as short run production function and long run production function. The law of variable proportions explains the short run production function and the law of returns to scale explains the long run production function.

Law of Variable Proportions:

The law of variable proportions is a fundamental law explaining the basic relationship between inputs and output.

According to this law when one factor is varied other factors remaining constant, the total output will increase at a diminishing rate. There are two approaches to the law of variable proportions. They are:

(1) Classical approach, and

(2) Modern approach.

The classical approach was developed by Adam Smith and Ricardo. According to them this law is applicable only to agriculture. In their opinion if more and more units of labour and capital are applied in the cultivation of land, the output has a tendency to increase in a lesser proportion, unless it coincides with improvements in agriculture. To explain this law the following concepts have been used:

(a) **Total product:** It is the total quantity of the commodity produced by using fixed and variable factors of production.

(b) **Average product:** It is the total output divided by the total units of input.

(c) **Marginal product:** It is the addition made to the total output by employing one more unit of the input. It is expressed as $MP = TP_n - TP_{n-1}$, where TP = total product and MP is marginal product. Suppose there are four labourers and produce 100 units of a commodity and if the fifth labourer joins and the total output increases to 115 units, then marginal product is equal to (115 – 100) 15 units.

This version of the law can be explained with the help of the following table:

Units of Labour	Total Product	Marginal Product	Average Product
1	20	–	20
2	30	10	15
3	38	8	12.6
4	44	6	11
5	48	4	9.6
6	50	2	8.3

The above table clearly shows that as the amount of labour increases, the total output increases at a diminishing rate. This version of the law has been criticised by many economists. The major criticisms are:

(a) It has not considered the improvements in the methods of cultivation.

(b) It assumes a combination of fixed and variable factors. If some factors are not fixed, then this law will not operate.

(c) It has a limited scope as it is applicable only to agriculture.

Later on Marshall extended this law to mining, fishing and forestry. However according to him it is applicable mainly to agriculture as land plays a predominant role.

Modern Approach: It is associated with economists like Boulding, Samuelson and Stigler. According to them the law of variable proportions is applicable to all types of production where variable factor is added to a fixed factor. According to this version when a variable factor is added to a fixed factor, initially the total product will increase at an increasing rate, then at a diminishing rate and finally it will start diminishing. Marginal and average product will also decrease eventually when more of variable factor is combined with a fixed factor. The law is based on the following assumptions:

(1) The state of technology is given and constant.

(2) One factor of production is fixed while the other factor is variable.

(3) Effect of the variable factor on the output can be measured precisely.

(4) It is possible to combine the factors in variable proportions.

(5) All units of the variable factor are homogeneous.

(6) Input prices remain the same.

According to Stigler "As equal increments of one input are added, the input of other productive services being held constant, beyond a certain point the resulting increments of products will decrease i.e. the marginal product will diminish". In the words of Samuelson "An increase in some inputs relative to other fixed inputs will, in a given state of technology cause output to increase, but after a point the extra output resulting from the same addition of extra inputs will become less". This law is also known as the law of diminishing returns. Let us suppose there are two factors

land and labour. Labour is the variable factor while land is the fixed factor. When more and more variable factor is added to the fixed factor, the total product will increase at an increasing rate initially, then at a diminishing rate and then it starts diminishing. Following table can be used to explain the law.

Units of Labour	Total Product	Average Product	Marginal Product	
1	50	50	50	Increasing returns
2	140	70	90	
3	240	80	100	
4	338	84.5	98	Decreasing returns
5	400	80	62	
6	450	75	50	
7	474	67.55	24	
8	474	59.25	0	
9	465	51.66	−9	Negative returns
10	450	45	−15	

When this table is plotted on a graph, we can obtain the TP, MP and AP curves. The X axis represents units of the variable factor while Y axis represents the output produced.

In the diagram 6.8 (on the next page), total product increases initially and then declines. AP and MP also follow the same pattern. This law is explained through three stages.

I Stage: This is said to be the stage of increasing returns. In this stage total product increases at an increasing rate upto point F. The marginal product also rises in this stage. From point F onwards the total product increases at a diminishing rate. MP starts falling but is still positive. Point F is called the point of inflection. Corresponding to this point MP is maximum. After this point MP starts declining. Still it is greater than the average product. In this stage the quantity of the fixed factor is too much to the variable factor. The marginal productivity of the fixed factor is said to be negative. The output continues to increase because the average product of the variable factor continues to increase.

II Stage: In this stage the total product increases but at a diminishing rate until it reaches the maximum point P where the second stage ends. Here AP and MP are declining but positive. At the end of the stage MP is equal to zero where the total product is

the maximum. In this stage both AP and MP are declining. This stage is considered as important for the business firm.

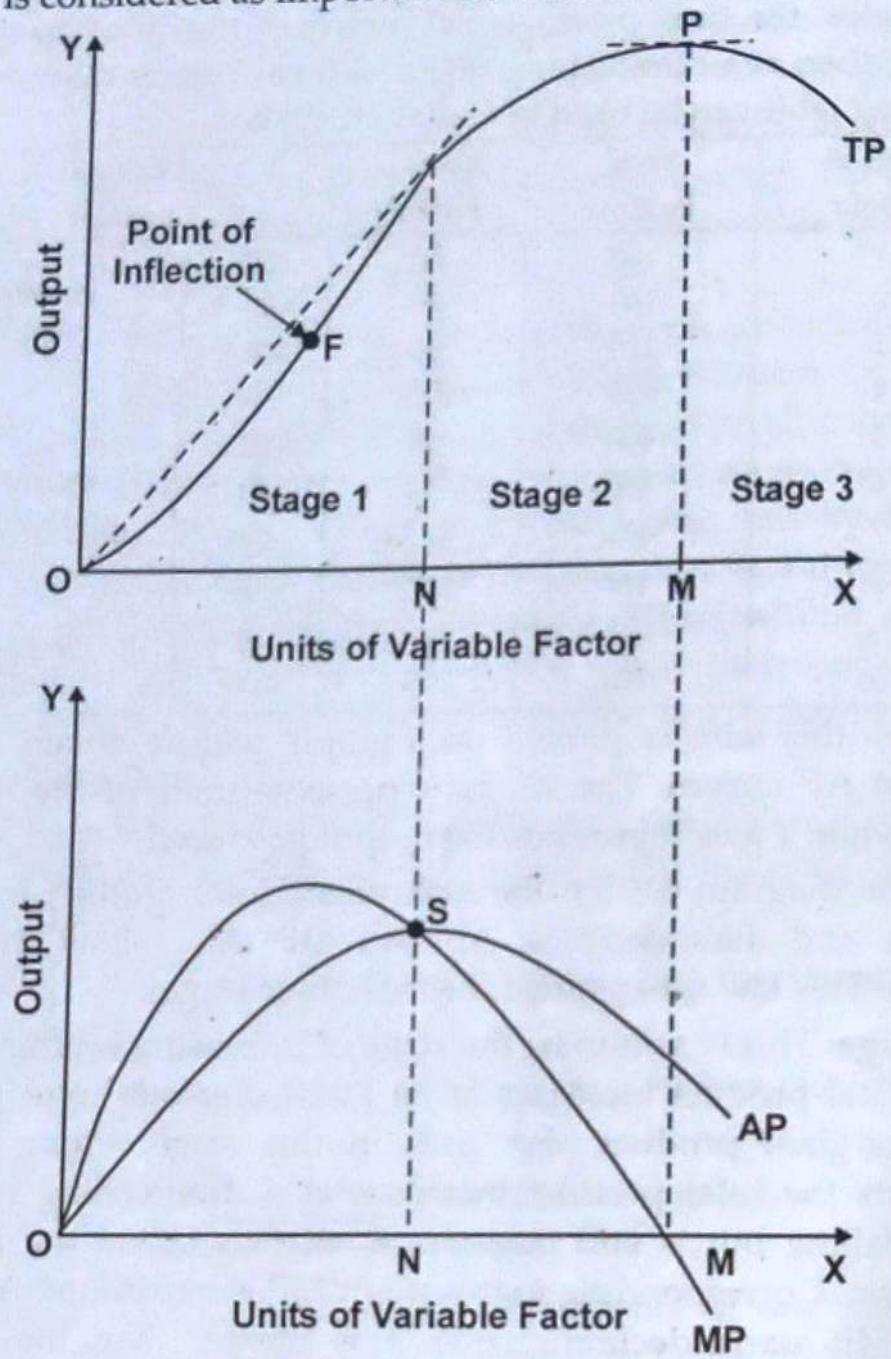


Fig. 6.8

III Stage: The total product curve starts sloping downwards in this stage. The variable factor is too much for the fixed factor. Hence the marginal product of the variable factor is negative. The marginal product curve enters the negative quadrant in this stage. Stage I and III are somewhat symmetrical. In stage I the marginal product of the fixed factor is negative while in stage III, the

marginal product of the variable factor is negative due to their relative abundance in the respective stages.

Reasons for Increasing, Decreasing and Negative Returns:

In the first stage, the increase in the variable factor leads to an increase in the output in a larger proportion. This is because when the variable factor is increased, the fixed factor is used intensely and effectively. Initially some amount of fixed factor may be unused. Later on it is used efficiently. Fixed factors are **indivisible.** A minimum amount of the factor has to be used whatever be the level of output. Indivisibility of the fixed factor, efficiency of the variable factor and division of labour leads to higher productivity and this in turn causes increasing returns.

In the second stage diminishing returns occur. If variable factor is increased continuously, then the factor proportions get disturbed. Variable factor becomes more than the fixed factor. Variable factor gets less and less aid from the fixed factor. Therefore marginal and average product start declining. Indivisibility of the fixed factor helps to increase returns upto a particular point. After the optimum point, if the variable factor is increased continuously, the factor proportion between fixed and variable factors gets disturbed. If fixed factors are perfectly divisible then neither increasing or decreasing returns to a variable factor would have occurred. Optimum proportion between the factors can be achieved in each and every case. However, in reality fixed factors are indivisible. Hence this characteristic of the fixed factor puts a limit to increasing returns. Prof. Bober rightly remarks, "Let divisibility enter through the door, law of variable proportions rushes out through the window."

The third stage signifies negative returns. Here variable factors become too excessive relative to the fixed factor. This affects the efficiency of the fixed factor as well as variable factors. Hence the total product starts diminishing.

Of the three stages, any competitive firm would like to operate in the second stage. In stage one; total product, average product and marginal product are increasing. Hence to is not advisable to stop production at this stage. The third stage is uneconomical

stage as there is too much of the variable factor leading to negative returns. Hence the second stage is the most relevant stage for a business firm as the total output continues to increase though at a diminishing rate.

This law is applicable to agriculture as well as industries. The law assumed technology to be constant. In reality in many advanced countries technology has improved significantly. Hence they could arrest diminishing returns. Developing countries like India should aim at technological development which can prevent diminishing returns in the various sectors.

LAWS OF RETURNS TO SCALE:

The relationship between input and output in the long run is explained by the laws of returns to scale. In the long run the firm can vary the scale of operation, technology used and the amount of capital employed. In fact all factors can be varied in the long run. This law explains the change in output due to change in the factor inputs. According to this law "As a firm in the long run increases the quantity of all factors employed, other things being equal, the output may rise at a more rapid rate than the rate of increase in inputs, then output may increase in the same proportion of output and ultimately output may rise less than proportionately."

The law is based on certain assumptions. They are:

(1) Technology of production remains unchanged.

(2) All units of the factors are homogeneous.

(3) Returns are measured in physical terms.

This law also explains the relationship between input and output through three stages. They are:

(1) Increasing returns to scale,

(2) Constant returns to scale, and

(3) Diminishing returns to scale.

These three stages can be elaborated as follows:

(1) **Increasing Returns to Scale:** When the inputs are increased in a certain proportion, the output tends to increase at a higher rate. Suppose, the inputs are increased by 5%, output may increase by 8%. Symbolically, it is expressed as

$$\frac{\Delta P}{P} > \frac{\Delta f}{f}$$

where $\frac{\Delta P}{P}$ = Proportionate change in output

$\frac{\Delta f}{f}$ = Proportionate change in inputs

This implies that the change in output is more than the change in factors of production. The reasons for the increasing returns to scale are:

(a) When the inputs are increased, it is possible to have the right combination of factors.

(b) Division of labour is possible to practice.

(c) It is possible to use machines and equipments effectively.

(d) When the firm produces on a large scale, it gets economies of scale.

(2) **Constant Returns to Scale:** In this stage an increase in input leads to an increase in the output in the same proportion. Symbolically, it is expressed as

$$\frac{\Delta P}{P} = \frac{\Delta f}{f}$$

This stage occurs when economies of scale are equal to diseconomies of scale. This stage is often used in economic theories for simplification. This stage is experienced when there is perfect substitution of factors of production, perfect divisibility of factors of production and elastic supply of factors of production at a given price.

(3) **Decreasing Returns to Scale:** When the firm expands continuously, diseconomies of scale also start increasing. Due to this diminishing returns sets in. The increase in output will be less than the increase in inputs. It can be expressed as

$$\frac{\Delta P}{P} < \frac{\Delta f}{f}$$

There are various causes for decreasing returns to scale. The notable ones are:

(1) Diseconomies of scale arise due to too much expansion of the firm.

(2) The firm faces problems of coordination, control and management due to its huge size.

(3) Factors of production are not perfect substitutes for each other.

This stage is said to be a special case of laws of returns to scale. While all other factors can be varied, entrepreneur is a fixed factor. When more and more of the variable factors are combined with the fixed factor it may be overused. According to some economists even if the entrepreneur is a variable factor, decreasing returns to scale will set in as it will be difficult to manage, supervise and coordinate a huge firm. There are also limits to entrepreneurial efficiency. In short decreasing returns to scale implies that incremental output is possible by increasing the inputs in a larger proportion.

Isoquants and Laws of Returns to Scale:

The laws of returns to scale can be explained with the help of isoquants. An isoquant is a curve showing the various combinations of the two factors of production which give the same level of output. The three stages of laws of returns to scale are explained in the following figures:

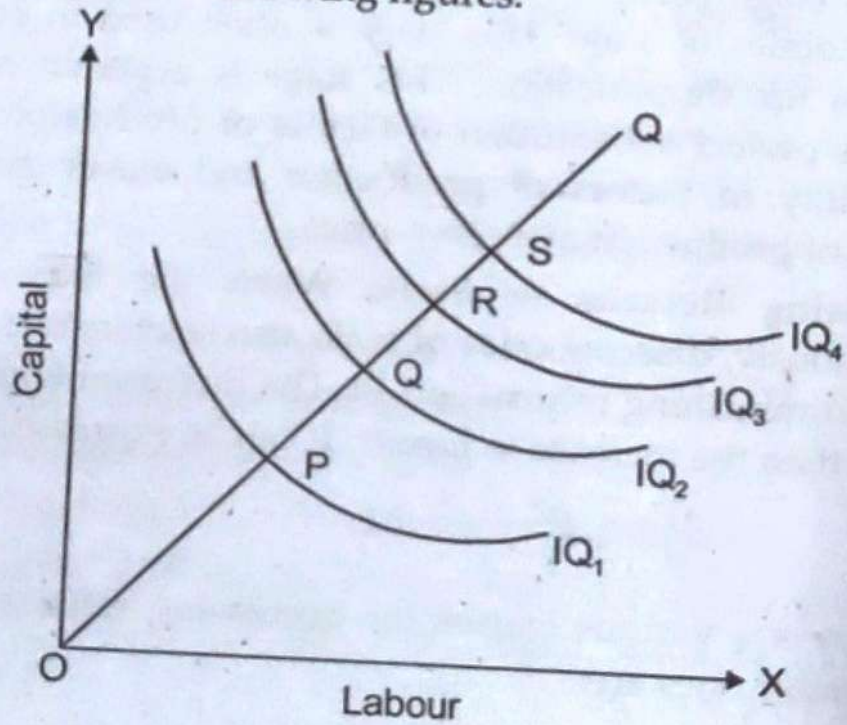


Fig. 6.9

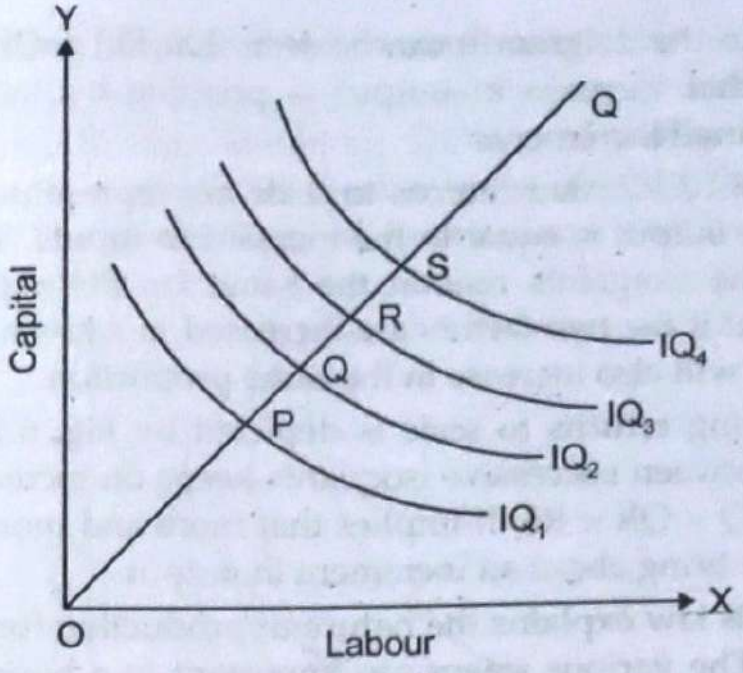


Fig. 6.10

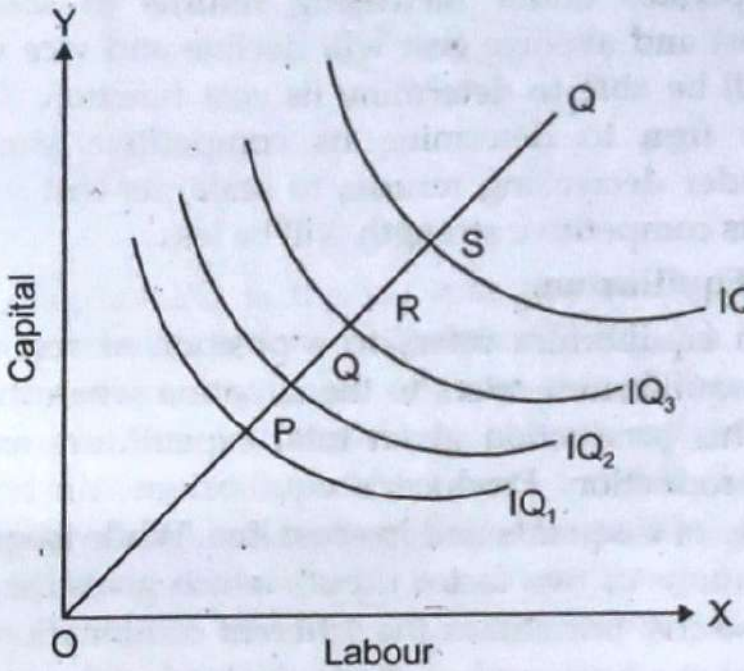


Fig. 6.11

Fig. 6.9 represents increasing returns to scale. The ray OQ represents the scale of operation. It also known as the scale line. It shows how the firm uses the factor combinations to produce the different quantities of output at minimum cost. The isoquant map and the iso cost line are combined to explain the laws of returns to scale. In Fig. 6.9, the successive isoquants lie at decreasingly smaller distances along the scale line OQ i.e. when the scale of operation expands, the distance between the successive isoquants

decrease. In the diagram it can be seen that PQ > QR > RS. This indicates that increase in output is possible by increasing the inputs in small increments.

In Fig. 6.10 constant returns to scale are represented. Here the increase in output is equal to the increase in inputs. The distance between the isoquants remain the same i.e. PQ = QR = RS. It implies that if the two factors are increased in a given proportion, the output will also increase in the same proportion.

Decreasing returns to scale is depicted by Fig. 6.11. Here the distance between successive isoquants keeps on increasing. In the diagram PQ < QR < RS. It implies that more and more inputs are required to bring about an increment in output.

Thus this law explains the nature of production function in the long run. The various stages are important to a business firm. If the firm operates under increasing returns to scale then its marginal cost and average cost will decline and vice versa. Thus the firm will be able to determine its cost function. This further enables the firm to determine its competitive strength. If it operates under decreasing returns to scale, its cost will be high and hence its competitive strength will be less.

Producer's Equilibrium:

The term equilibrium refers to a position of rest or balance. Producer's equilibrium refers to the situation when the producer maximizes his production given total expenditure and price of factors of production. Producer's equilibrium can be explained with the help of isoquants and iso-cost line. While isoquant shows the combinations of two factor inputs which gives the same level of output, iso cost line shows the different combinations of labour and capital that a firm can buy given the total outlay and prices of factors of production. The iso cost line is also known as the budget line. The producer will attain equilibrium at that point at which the budget line is tangent to the isoquant. At this point, the isoquant should be convex to the origin. Producer's equilibrium can be interpreted in two ways. The first one is maximizing the output subject to a cost constraint and the second one is minimizing the cost subject to an output constraint. These two situations can be elaborated as follows:

(1) Maximising output subject to a cost constraint:

The producer, here has to maximise his output within a given cost structure. In this situation, an isoquant map has to be combined with a single iso cost line to identify the point of equilibrium. The equilibrium of the producer can be explained with the help of the following diagram.

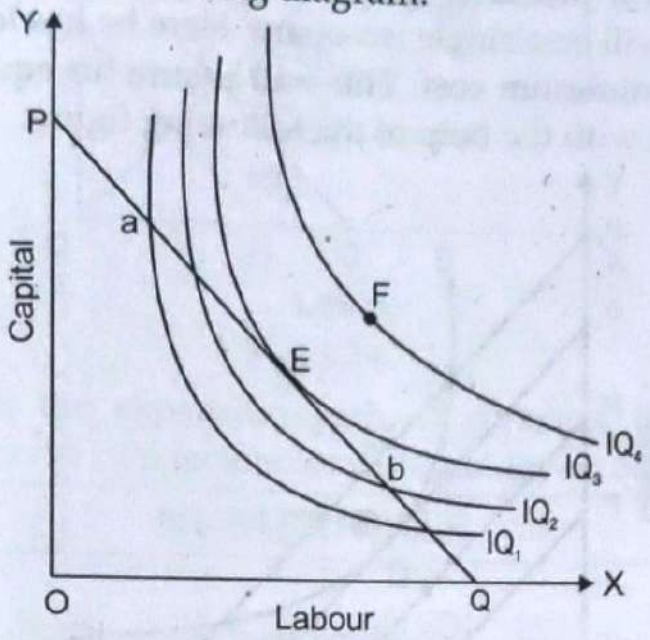


Fig. 6.12

In this diagram PQ is the iso cost line or budget line. The isoquant map consists of four isoquants IQ_1, IQ_2, IQ_3 and IQ_4. The producer can select any point on any one of the indifference curves. However he will attain equilibrium only at one point where the conditions are satisfied. Points a and b can be selected but the producer will not be in equilibrium as they are on lower iso-quants and he can move to higher isoquants. Point f is beyond his capacity. Hence he will be in equilibrium at point E where the two conditions are satisfied. The two conditions are:

(a) The iso cost line is tangent to isoquant and

(b) Iso quant is convex to the origin at the point of equilibrium.

At point E, the slope of the isocost line is equal to the slope of the isoquant. The slope of the isoquant is the marginal rate of technical substitution (MRTS) which is nothing but the trade off of one factor for another. MRTS measures the degree of sub-suitability of one factor with that of the other. The slope of the iso cost line is the ratio of price of labour to price of capital. At point

E, $MRTS_{LK} = \frac{P_L}{P_K}$ and the isoquant is convex to the origin. The above figure explains the maximization of output subject to the cost constraint.

(2) Minimising cost subject to an output constraint:

Sometimes a producer may have to produce a given output. Hence there will be a single iso-quant. Here he has to produce that output with minimum cost. This will ensure his equilibrium. This can be shown with the help of the following figure:

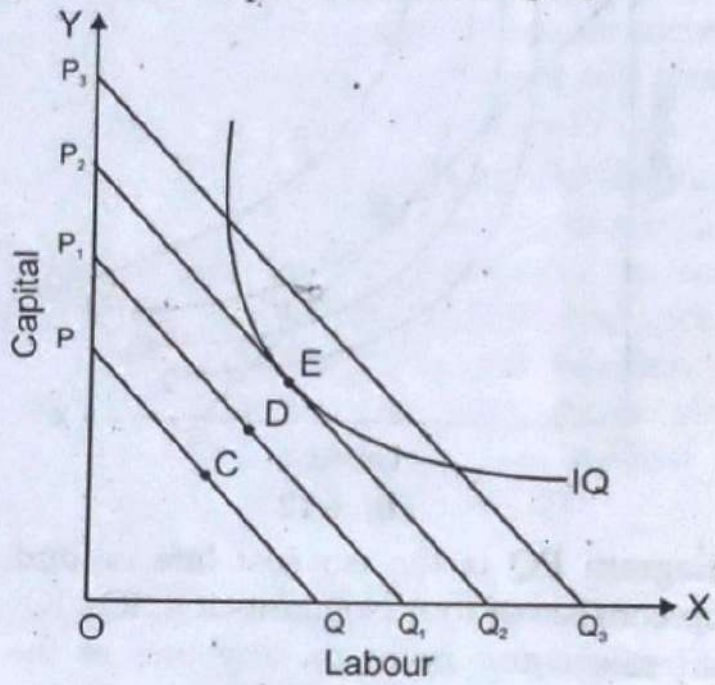


Fig. 6.13

In the above figure, there is only one isoquant indicating output constraint. PQ, P_1Q_1, P_2Q_2 and P_3Q_3 represent iso cost lines. Equilibrium is attained at point E where the given output can be produced at the minimum cost. Points C or D indicate lower cost, but they are not equilibrium points. E is the point of equilibrium and at this point the iso cost line is tangent to the isoquant and the isoquant is convex to the origin.

EXPANSION PATH:

The concept of isoquants and isocost curves are used to explain the Expansion path. The following diagram can be used to illustrate the concept of Expansion of Path.

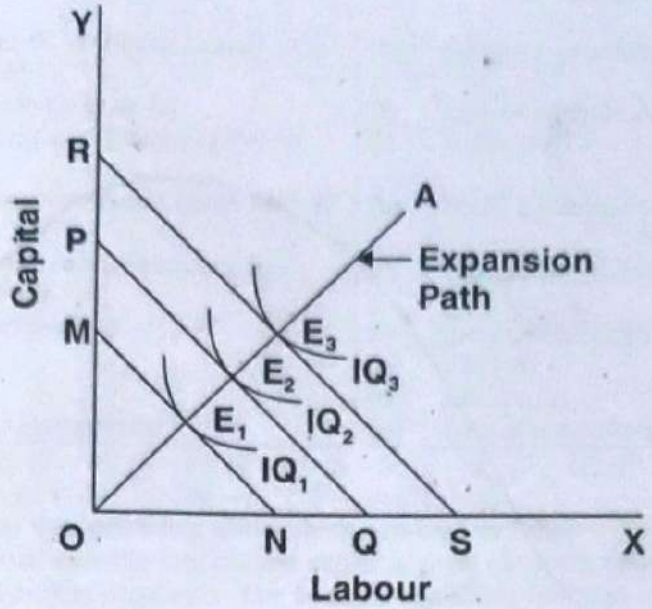


Fig. 6.14

Here OA is the expansion path. It connects the least cost combinations of the two factors for different levels of output.

NUMERICALS

Ex. 1:

The following table shows total product of a firm due to increase in labour inputs used in combination with a fixed input of capital.

Labour Input	0	1	2	3	4	5	6	7	8	9	10
Total Input	0	5	14	30	56	75	90	98	102	102	98

(i) Calculate average product and marginal product.

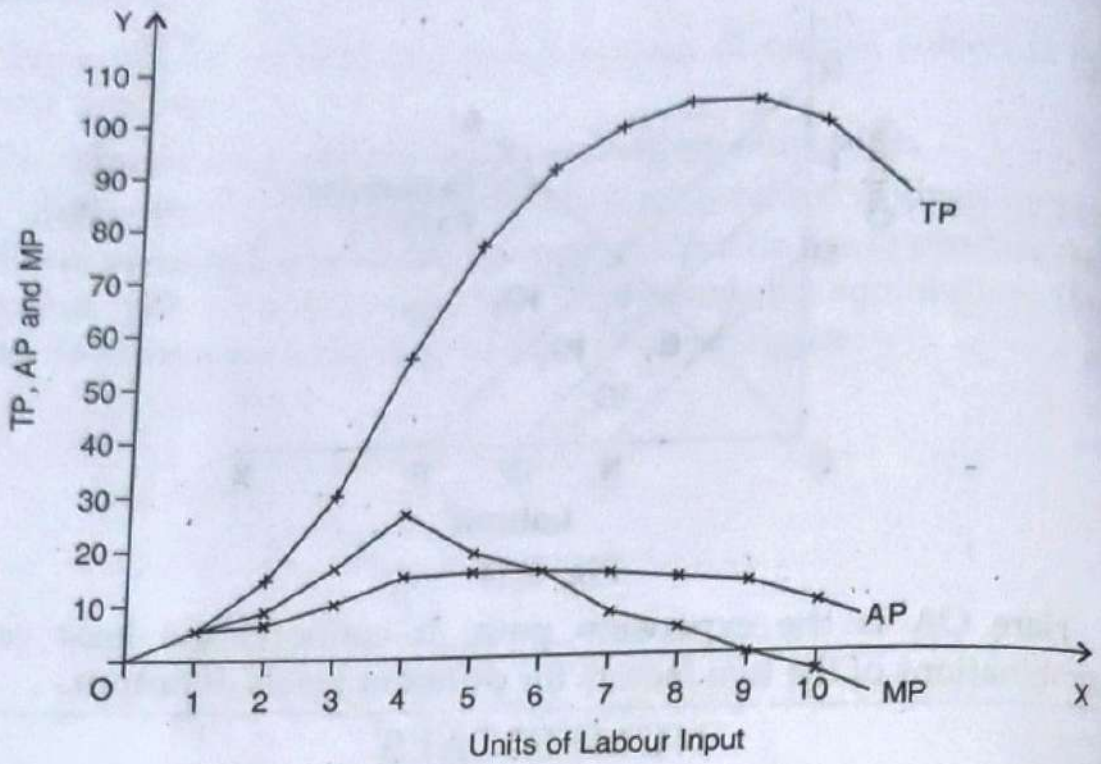
(ii) Explain the above table with the help of diagram.

Solution:

(i)

Labour Input	Total Product	Average Product TP/ Units of input	Marginal Product $TP_n - TP_{n-1}$
0	0	0	0
1	5	5	5
2	14	7	9
3	30	10	16
4	56	14	26
5	75	15	19
6	90	15	15
7	98	14	8
8	102	12.75	4
9	102	11.33	0
10	98	9.8	-4

(ii)



QUESTIONS FOR REVIEW

(1) Define the following:

(a) Linear Production Function.
(b) Production Function.
(c) Short Run Production Function.
(d) Isoquant.
(e) Long Run Production Function.
(f) Total Product.
(g) Fixed and Variable Production Function.
(h) Marginal Product.
(i) Marginal Rate of Technical Substitution.
(j) Average Product.
(k) Iso-quant map.
(l) Iso-cost line.
(m) Equilibrium.
(n) Expansion path.

Select the best answer from the given options:

(a) In the long run production function all factors are _____. (constant, variable, fixed)

(b) The narrowing distance between successive isoquants denotes _____. (increasing returns to scale, decreasing returns to scale, constant returns to scale, none of the above)

[Ans.: (a) variable; (b) increasing returns to scale]

Match the following:

(A)	(B)
(1) $\frac{\Delta P}{P} > \frac{\Delta f}{f}$	(a) Relative abundance of variables
(2) MRTS	(b) Marginal product
(3) $TP_n - TP_{n-1}$	(c) Law of variable proportion
(4) Indivisibility of factors of production	(d) Increasing returns to scale.
(5) Iso-cost line *(Oct. 17)*	(e) Slope of the isoquant / isoquant
(6) Negative marginal return *(BIM, Oct. 17)*	(f) Budget line
(7) Law of returns to scale *(Oct. 18)*	(g) Slope of Iso-quant

(8)	Marginal Rate of Technical Substitution ***(BIM, Oct. 18)***	(h)	Long-run production
(9)	Expansion path ***(March 19)***	(i)	Law of variable proportion
(10)	Short run production function ***(March 19)***	(j)	Scale line
(11)	Smooth Convex Iso-quant ***(BIM, March 19)***	(k)	Fixed combination of inputs
(12)	Fixed proportion production function ***(BIM, March 19)***	(l)	Continuous substitution
(13)	Law of Return to scale	(m)	Increasing/Diminishing/Constant
(14)	AP	(n)	TP/TVF
(15)	Isoquant	(o)	Short run
(16)	Law of variable proportion	(p)	Law of return to scale

*[**Ans.:** (1 – d); (2 – e); (3 – b); (4 – c); (5 – f); (6 – a); (7 – h); (8 – g); (9 – j); (10 – i); (11 – l); (12 – k); (13 – m); (14 – n); (15 – p); (16 – o)]*

State whether the following statements are true or false:

(a) The law of variable proportions explains short run production function.
(b) Cobb-Douglas production function is a non-linear function.
(c) An Isoquant represents various combinations of two inputs giving the same level of output.
(d) In the long run all factors can be varied.
(e) Isoquants are convex to the origin.
(f) Production function is a stock concept.
(g) Isoquants do not intersect each other.
(h) Factors of production are perfect substitutes for each other.
(i) Isoquants normally intersect 'y' axis. ***(Oct. 16)***
(j) Average cost increases due to increasing return to scale. ***(March 17)***
(k) A technically efficient-production function indicates absence of wastage of resources. ***(Oct. 17)***
(l) Two iso-quants never intersect each other. ***(March 18, BIM, Oct. 17)***
(m) The concept of iso-quants is used to explain the expansion path. ***(Oct. 18)***
(n) Under law of variable proportion, the total product curve becomes negative in the third stage. ***(BIM, Oct. 18)***
(o) Iso-quants are also known as equal product curve. ***(BIM, Oct. 18)***
(p) Two isoquants never intersect each other. ***(March 19)***
(q) Iso-cost line shows combination of labour and its cost. ***(BIM, March 19)***
(r) An isoquant has a negative slope.
(s) In long run all factors tend to be variable.
(t) Iso-quants never intersect each other.
(u) Two iso-quant curves intersect each other.
(v) In economics, the term production applies only to manufacturing of goods.
(w) Fixed proportion production is characterized by constant returns to scale.

*[**Ans.:** (a) True; (b) False; (c) True; (d) True; (e) True; (f) False; (g) True; (h) False; (i) False; (j) False; (k) True; (l) True; (m) True, (n) True; (o) True; (p) True; (q) False; (r) True; (s) True; (t) True; (u) False; (v) False; (w) True]*

Fill in the Blanks:

(a) The point of tangency between iso-cost line and iso-quant is the point of _____.

*[**Ans.:** (a) Producer's Equilibrium]*

(2) **Comment on the following statements:**

(a) Isoquants and indifference curves are one and the same.
(b) Law of variable proportions is applicable only to agriculture.
(c) An increase in one input or all inputs will always lead to an increase in output.
(d) Indivisibility of factors of production is one of the reasons for the law of variable proportions to operate.

(3) What is an isoquant? Explain its properties using diagrams. ***(Oct. 16)***
(4) Define production function. Explain its various properties using diagrams. ***(Oct. 16)***
(5) Explain the various types of production function.
(6) Examine the law of variable proportions with the help of an illustration and a suitable diagram.
(7) Explain/Discuss the law of returns to scale. ***(BIM, March 19)***
(8) Explain the laws of returns to scale with the help of isoquants.
(9) Distinguish between law of variable proportions and laws of returns to scale.
(10) Explain producer's equilibrium with suitable diagrams.
(11) Analyse producer's equilibrium subject to cost constraint and output constraint.
(12) Explain 'Expansion Path' briefly.
(13) Discuss briefly the law of variable proportions. ***(Oct. 16)***
(14) Explain the causes for the various stages in the law of variable proportions. ***(March 17)***
(15) Discuss the laws of returns of external economies of scale. ***(Oct. 17)***
(16) Outline Law of returns to scale with the help of suitable diagrams. ***(March 18)***
(17) Explain the concept of Iso-quant. What are the types of Iso-quant? ***(BIM, Oct. 17)***
(18) How the firm can maximize profit by choosing the least cost combination of factors? ***(BIM, Oct. 17)***
(19) Explain the law of diminishing marginal returns with the help of an illustration and suitable diagram. ***(Oct. 18)***
(20) Explain the laws of returns to scale with the help of Iso-quants. ***(BIM, Oct. 18)***
(21) Outline the law of returns to scale with the help of isoquant curves. ***(March 19)***
(22) Examine the law of variable proportions with the help of an illustration diagram.
(23) Explain the law of variable proportion with diagram.
(24) State and explain the law of variable proportion.
(25) Describe properties of Isoquants with the help of diagram.
(26) Explain producer's equilibrium with the help of iso-quant.
(27) Explain the types of isoquants.
(28) **Write short notes on:**
  (a) Producer's equilibrium. ***(March 17)***
  (b) Types of Production function. ***(Oct. 17)***
  (c) Short run and long run production function. ***(March 18)***
  (d) Ridge lines. ***(Oct. 18; BIM, March 19)***
  (e) Expansion path. ***(BIM, Oct. 18)***
  (f) The laws of returns to scale.
(29) Calculate average product and marginal product.

No. of Units of Labour Output	1	2	3	4	5
Total Output	200	360	500	620	720

7

Economies of Scale

INTERNAL ECONOMIES OF SCALE
EXTERNAL ECONOMIES OF SCALE
DISECONOMIES OF SCALE
ECONOMIES OF SCOPE
INTERNATIONAL ECONOMIES OF SCALE

Internal and external economies of scale are related to firm and industry and their scale of production. A firm refers to an enterprise involved in the production of a commodity while an industry refers to a group of firms producing a specific commodity. When a firm expands its scale of production it derives certain advantages which are termed as internal economies of scale. In other words it refers to anything which helps the firm to reduce the cost of production. Internal economies are also termed as economies of large scale production. Internal economies accrue to a firm when its size expands. External economies refer to the benefits enjoyed by all the firms in the industry when their size expands.

TYPES OF INTERNAL ECONOMIES:

Internal economies are of various types. The main types are as follows:

(1) **Labour Economies:** It refers to the benefits which arise due to division of labour. When the firm expands its scale of operation, scope for division of labour widens. Division of labour refers to splitting the production process into several

units and each unit is given to a group of workers. Thus each worker will specialise in the production of that part of the commodity. Such a process improves the skill and dexterity of the workers and their productivity increases significantly. Division of labour saves time and improves the innovative skills of the labourers. All these benefits lead to reduction in cost of production. Adam Smith in his book Wealth of Nations pointed out the advantages of division of labour. However according to him division of labour is possible only in large scale production. In other words, he stated that the size of the market limits division of labour. Thus when the size of production is increased, division of labour can be adopted and economies of scale can be reaped.

(2) **Managerial Economies:** It refers to the benefits enjoyed by the firm due to specialisation in managerial functions. When the firm expands, the various functions of the management can be divided into marketing, finance, administration, etc. and can be delegated to juniors and the manager can concentrate on the main issues. It is possible for the firm to have specialised managers for various branches. All these cannot be done in a small firm. A large firm can enjoy managerial economies when its size expands.

(3) **Technical Economies:** These are related to the technique of production. Various factors contribute to technical economies. Some of them are:

(a) Some factors of production like machines are indivisible. To use them fully a certain quantity of output has to be produced. When the firm produces more, such factors are utilised in a better way and this leads to reduction in cost of production.

(b) A big firm can afford to use superior technique of production. Specialised or sophisticated machines can be used which will lead to a reduction in cost of production. Such machines or techniques are generally beyond the reach of the small firms.

(c) Some machines and equipments, due to their sheer size confer more benefits to the firm. For e.g. huge ships, big

cars can be operated more effectively and economically with the same number of people required to operate a smaller one. This increased dimension also leads to greater output at a lesser cost.

(d) Large scale production enables the firm to use power more efficiently than a small firm.

(e) Waste products are efficiently used by large firms to produce a number of by-products. It is often seen in the case of sugar and chemical industries. A large firm is in a position to install the necessary technology and other requirements whereas it may not be possible for a small firm.

(f) Big firms also reap benefits by having the production process on a continuous basis. This is very common in the case of printing press. It makes more sense for them to print more copies of a particular matter. This is because the composing cost remains constant and the printing charges vary only marginally.

(4) **Marketing Economies:** They refer to the benefits while buying inputs and selling the finished product. The bargaining power of big firms is very strong and they can negotiate in their purchases to their advantage. Generally they buy inputs on large scale and hence they get a preferential treatment. They get adequate quantity of inputs at a lesser rate. Specialists like purchase manager are appointed to buy inputs at the most economical rates. While selling the output also it has many advantages. It can economise on a number of things like transportation cost, advertising cost, administration cost, etc. A large firm enjoys the flexibility of buying and selling more when the market conditions are favourable.

(5) **Financial Economies:** Finance is an essential input for any business firm. Large firms are able to get finance easily and quickly compared to small firms. This is because they have their own reputation and considerable influence on the financial institutions. Big firms are considered less risky by banks and institutions and are ever willing to provide

financial help to them. They can also raise equity capital and debt capital. Big firms are not only able to get adequate capital but also at a lower rate of interest.

(6) **Economies of Integration:** By integrating successive processes in the production of a commodity, large firms are able to cut down cost of production. Generally iron and steel firms, printing presses adopt an integration process. For e.g. in the case of the iron and steel industry, right from melting the iron to converting it into different shapes and sizes are done in the same premises. This leads to greater efficiency and productivity.

Apart from the above types, a large firm can easily diversify its production. It can produce variety of items and different varieties of a product. Through this it tries to minimise its business risk i.e. loss in one can be compensated by gain in the other product. Moreover the firm can easily expand its market throughout the country.

Internal economies of scale are also classified as real economies and pecuniary or monetary economies. Real economies of scale refer to the reduction in the quantity of raw materials, number of labour employed, units of capital etc. when the firm expands its scale of production. Example labour economies, marketing economies etc. Pecuniary or monetary economies of scale imply the advantages of lower payments to factors of production and reduction in distribution costs. Example lower prices for raw materials due to bulk buying, finance at low rate of interest etc.

Thus large scale production enables a business firm to reap variety of benefits. All these benefits lead to a reduction in cost of production.

EXTERNAL ECONOMIES:

External economies refer to the benefits enjoyed by all the firms in the industry when their scale of operation expands. While internal economies of scale are restricted to a particular firm, external economies accrue to all firms in the industry.

External economies are also of various types. Some of them are:

(1) **Localisation Economies:** Localisation refers to the concentration of firms in a particular region or locality. When

several firms of a particular industry are localised, several advantages can accrue to them. Facilities like transport, infrastructure, maintenance, etc. can be shared by all the firms. Mutual exchange of skilled labour, research facilities, lab facilities, etc. are possible when there is localisation. All these advantages help the firm to reduce cost of production.

(2) **Research and Information Economies:** When the industry expands, it becomes possible for it to invest on research and development significantly. Instead of each firm doing research, a joint effort reduces cost and benefits all the firms in the industry. Networking with each other enables them to avail marketing and technical information easily.

(3) **Disintegration Economies:** This implies that a growing industry can split up its operations and get it done through subsidiaries. The firm which does this operation will be able to get economies of scale when it operates on a large scale. The benefits are passed on to the industry in terms of reduced charges.

(4) **By-products Economies:** Waste materials are generally used by big industries to churn out a by-product. This helps all the firms in the industry.

When all the firms in the industry enjoy these benefits, cost of production tends to decline automatically.

DISECONOMIES OF SCALE:

Initially when a firm expands, it gets a number of advantages. Once the optimum limit is reached, the same advantages will become disadvantages. The disadvantages of large-scale production are called diseconomies of scale. These diseconomies put a limit to the expansion of the firm. Some of the diseconomies are:

(1) The entrepreneur cannot have an effective control over the organisation when it becomes unwieldy. Coordination, supervision and management become difficult leading to wastage of resources and higher cost of production.

(2) In the process of expansion, many people might have been employed resulting in a large labour force. Due to this the firm may incur a huge administrative expenditure.

(3) If the firm expands beyond a limit, delays in decision making will be the norm. Too many people have to be consulted and it is difficult to arrive at a consensus.

(4) Financial constraints, infrastructural bottlenecks, scarcity of raw material may be faced by individual firms and industry when there is too much expansion. All these will severely affect the profitability of the firm and industry.

(5) When all the firms in an industry expand, the competition between them will be cut–throat. To succeed in the market they may have to incur huge promotional expenditure. They may also have to introduce innovations. All these may prove to be expensive for the firms.

Thus the size of a firm or industry is limited by the diseconomies of scale.

ECONOMIES OF SCOPE:

Economies of scope is concerned with the firms producing more than one product. Generally economic theories analyse the behaviour of business firms producing a single commodity. However, in reality many firms provide multiple products. For e.g. automobile firms producing cars, trucks, two wheelers, electronic firms supplying television, DVDs, washing machines, educational institutions offering teaching and research facilities etc. Economies of scope exist when it is economical for the firm to produce multiple products jointly rather than producing them separately. For e.g. if a firm produces cars and two wheelers then economies of scope will be realised by the firm if total cost of producing cars and two wheelers is less than the cost of producing them when they are manufactured separately by various firms.

Symbolically, it can be represented as

$$T_C (C, T_W) < T_C (C) + T_C (T_W)$$

Here, T_C refers to total cost,

C refers to cars,

Tw refers to two wheelers.

Sometimes it may be economical to produce related goods in an industry separately than jointly. If the cost of producing them jointly is more than the cost of producing them separately, then it is termed as diseconomies of scope.

Economies of scope are possible when two or more goods can be produced by using common production facilities. For instance when an automobile firm produces cars and two wheelers, some of the inputs can be used for both and cost of production can be reduced. To quote another example railways can reduce cost by offering multiple services like, transporting people, goods etc. Other factors which give rise to economies of scope are:

(a) Utilising common marketing and administration facilities.

(b) New products may be produced to use the byproducts which arise from the production of a commodity.

(c) Availability of adequate infrastructure and skilled labour may induce business firms to provide similar goods and services.

Economies of scope ultimately lead to reduction in cost of production like economies of scale. However, economies of scope are different from economies of scale. While economies of scale refers to the benefits derived by the firm while expanding its size, economies of scope refers to benefits enjoyed by the firm when it specialises in multiple products at the same time.

In the present era marked by globalisation and liberalisation, two distinct trends are emerging. On the one hand some firms producing multiple products are consolidating themselves, other firms deliberately decide to split their firms into distinct units to operate more efficiently.

INTERNATIONAL ECONOMIES OF SCALE:

International trade has been growing significantly since the beginning of 90's under the influence of liberalisation, privatisation and globalisation. All business firms are facing severe competition and to remain competitive in the global market, new strategies are being adopted by many firms. One such important strategy is 'outsourcing of inputs and overseas production'. A large number of multinational corporations today

buy inputs from a number of countries and also establish production facilities abroad. The basic reason for this new trend is to reduce production cost. Outsourcing of inputs and operations has become indispensable for many firms simply to remain competitive. Firms which are not using this option often become unviable not only in the international market but even in the domestic market. This process of procuring inputs from other countries and operations from other nations is termed as 'international economies of scale'. It helps the firm to reduce cost and compete effectively.

In the earlier decades multinationals used to have operations in few countries. But at present they have expanded their horizon to as many countries as possible. Many multinational giants like IBM, General Motors, Nestle, Ford, Gillette etc. have adopted this technique of outsourcing to remain as the main global players. For e.g. according to a news report in 1985, the cost of producing an IBM PC was $ 860. Out of this $ 625 worth of parts and components were outsourced from countries like Korea, Japan and Singapore. Similarly, many components required for Boeing 777 jetliner is also being outsourced. Apart from outsourcing inputs many transnational companies are establishing production facilities in various countries. Due to globalisation the world is becoming a global village. Business firms are constantly in search of new sources for outsourcing their business operations. While the 80's forced many firms to rationalise their operations within the domestic economy, the 90's compelled them to integrate their operations in various countries. To get international economies of scale business firms should constantly search for sources from which they can procure their requirements.

Through outsourcing business firms try to achieve international economies of scale in five specific areas namely designing the product, production, purchasing, management of demand and fulfillment of orders. While designing the product many firms take into account the local requirements and accordingly design their product. As far as production is concerned, major part of production can be concentrated in low cost producing centres, leaving the final assembly stage near the local markets. While purchasing raw materials and intermediary

products, the firms should access the global market rather than local market. Demand forecasting can be used by the firms to have effective global demand management. Better economies of scale can be achieved by the firm by supplying goods from the plants close to the final consumers and by maintaining low inventory.

Thus international economies of scale play an important role in today's global economic order.

QUESTIONS FOR REVIEW

(1) **Define:**
- (a) Internal economies of scale.
- (b) External economies of scale.
- (c) Economies of scope.
- (d) International economies of scale.

Fill in the blanks:

(a) Which of the following is an example of Internal Economics Of Scale _____. (Labour Economics, Technical Economics, Managerial Economics, All The above)

[Ans.: (a) All the above]

State whether the following statements are true or false:

- (a) The size of a firm is limited by diseconomies of scale.
- (b) Economies of scale lead to reduction in cost of production. ***(Oct. 16)***
- (c) Economies of scope are derived when firm concentrates on a single product.
- (d) MNCs outsource their operations to derive international economies of scale.
- (e) Internal economies continue to occur with every expansion of output.
- (f) Size of the market limits division of labour.
- (g) Economies of scale and economies of scope are one and the same.
- (h) External economies may occur due to division of labour. ***(Oct. 17, March 18)***
- (i) Internal economies of scale are advantages of large scale production. ***(BIM, Oct. 17)***
- (j) Economies of scale help to reduce the cost of production. ***(Oct. 18)***
- (k) Internal economies of scale are termed as economies of large scale production. ***(BIM, Oct. 18)***
- (l) Cheapening of materials and equipment is one of the external economies of scale. ***(BIM, March 19)***
- (m) There is no diseconomics of scale.

[Ans.: (a) True; (b) True; (c) False; (d) True; (e) False; (f) True; (g) False; (h) False; (i) True; (j) True; (k) True; (l) False; (m) False]

Match the following:

	(A)		(B)
(1)	Division of labour	(a)	External economies.
(2)	Multiple products	(b)	Diseconomies of scale
(3)	Localisation economies ***(Oct. 17)***	(c)	Pecuniary economies
(4)	Unwieldy organisation	(d)	Economies of scope
(5)	Economies of scale	(e)	Internal economies of scale
(6)	Internal economies ***(BIM, March 19)***	(f)	Reduction in cost of production/ one level of production

[Ans.: (1 – e); (2 – d); (3 – a); (4 – b); (5 – f); (6 – c)]

(2) Define internal economies of scale. Explain its various types.
(3) How external economies are different from internal economies of scale? What are the various forms of external economies of scale?
(4) Write a short note on diseconomies of scale.
(5) In recent years many educational institutions have expanded by introducing new courses. List down the economies and diseconomies of scale that might have been experienced by them.
(6) Name some of the industries which have experienced economies of scale due to expansion. What will be the diseconomies of scale if they continue to expand?
(7) Explain briefly the concept of international economies of scale and its effects on international trade.
(8) India is as an attractive destination for the automobile manufacturers of the world. Many firms are already operating in India and export their products from India. Analyse the economies and diseconomies of scale related to the automobile sector.
(9) Explain different types of internal and external economies of scale. ***(Oct. 16)***
(10) Explain the various types of external economies of scale. ***(Oct. 17)***
(11) Write a short note on economies of scale.
(12) Discuss the types of internal economies of scale. ***(Oct. 18)***
(13) What are economies of scale? Discuss the types of external economies of scale. ***(BIM, Oct. 18)***
(14) How external economies are different from internal economies of scale? Explain the various types of external economies of scale. ***(March 19)***
(15) Explain diseconomies of scale and its types.
(16) What are internal economies and diseconomies of scale?
(17) Explain internal economies of scale.
(18) **Distinguish between:**
  (a) Internal and external economies of scale.
  (b) Economies of scale and economies of scope.
(19) **Write Short Notes:**
  (a) Diseconomies of scale. ***(BIM, Oct. 17)***
  (b) External Economies.

8

Cost Concepts and Cost Behaviour

COST CONCEPTS
SHORT RUN COST CURVES
LONG RUN COST CURVES
OPTIMUM FIRM
THE LEARNING CURVE

Cost of production is an influential factor on the supply side. It refers to the expenditure incurred on the various factors of production like land, labour, capital and organisation which are used in the production of a commodity. It denotes the remuneration paid to the factors of production for their services. The various cost concepts are as follows:

COST CONCEPTS:

(1) **Real Cost:** It refers to the actual quantities of various factors used in producing a commodity. For e.g. the real cost of producing a chair is the amount of wood, nails, carpenter's labour, etc. According to Alfred Marshall the real cost of production should include the toils, troubles involved, pollution generated, etc. Since this concept is an abstfact one, it is very difficult to measure it precisely.

(2) **Money Cost:** It is the cost of production expressed in terms of money. It is the money spent on the various resources used in the production process.

(3) **Explicit Cost:** It refers to the cost incurred on the factors of production hired from the market. E.g. cost of raw materials, wages and salaries, power charges, transport expenses, etc. This expenditure is actually incurred by the firm. Since they are recorded, they are also known as accounting cost.

(4) **Implicit Cost:** It is the cost incurred by the business firms on the factors of production owned by it. These are not actually paid by the firm. For e.g. the entrepreneur may be using his own land. Rent may not be paid for this. If he had rented it out to somebody he would have earned some rent. This should be considered and some amount of rent should be included in the cost of production. Other examples of implicit cost are:

(a) wages to be paid to the entrepreneur for his labour services,

(b) interest on capital contributed by him, and

(c) normal profit i.e. wages to be paid to him for organisation and management.

In the accounting sense, only explicit costs are considered. But in the economic sense, implicit cost has to be considered while estimating profits.

Thus implicit cost is the amount the business firm would have got in the next best alternative use. It is also termed as imputed cost. It is estimated on the basis of the potential earnings that could be earned by the factors of production in the next best alternative use.

(5) **Economic Cost and Accounting Cost:** Economic cost refers to the total cost of production incurred by a firm for producing a commodity. It includes both explicit cost and implicit cost. The firm is said to be making profits if its total revenue is more than the economic cost. This profit is termed as economic profit. Economic cost consists of all types of resources, both paid and unpaid.

Accounting cost on the other hand is concerned only with explicit cost. It consists of only those factor payments which are actually made. It includes fixed and variable cost like wages for labour, rent for land, depreciation etc. It is

concerned with only those transactions which involve monetary payments. The factors of production contributed by the entrepreneur himself are not taken into account while computing accounting cost.

The difference between the two concepts can be explained with the help of an example. Let us suppose a firm gets total sales revenue of Rs. 2,00,000 by selling a commodity. The total cost incurred by the firm in terms of labour charges, rent, interest and depreciation is calculated as Rs. 1,70,000. In the accounting sense, the firm's profit would be Rs. 30,000. However, in the economic sense, the payments to be made for the factors of production owned by the firm should also be included in cost of production. Suppose the entrepreneur has used his own capital and contributed his services, then payments for the same should be calculated. Suppose it is estimated as Rs. 20,000 then the total profit of the firm would be only Rs. 10,000 instead of Rs. 30,000. The above example indicates the difference in the calculation of cost by economists and accountants.

(6) **Fixed Cost and Variable Cost:** While producing goods and services, business firms use various factors of production. Some of the factors are variable while others are fixed. For e.g. land, machinery, top officials, etc. are considered as fixed factors whereas factors like daily labour, raw materials, transport requirements are considered as variable factors. The cost incurred on fixed factors of production is called fixed cost, while those incurred on variable factors of production is called variable cost. The differences between the two can be enlisted as follows:

Fixed Cost	Variable Cost
(1) It refers to the cost incurred on the fixed factors of production.	(1) It refers to the cost incurred on the variable factors of production.
(2) This cost remains constant irrespective of the level of output.	(2) It varies with the level of output.

(3) Even if the output is nil, fixed cost will be incurred.	(3) This cost will increase/ decrease with the level of output.
(4) This is also known as supplementary costs or overhead costs.	(4) This is also known as prime costs.
(5) It includes: (a) rent for the building (b) interest paid on capital (c) insurance premium, (d) property taxes, (e) depreciation and maintenance allowances, etc.	(5) It includes: (a) prices of raw materials, (b) wages of labour, (c) excise duties, sales tax (d) transport expenditure, etc.

The distinction between the two is relevant only in the short run. In the long run all the factors are variable. Hence the firm will incur only variable cost in the long run. The distinction is significant in the short run. This is because any firm must recover the variable cost in the short run if it wants to continue production. Even if the firm is closed down fixed cost will be incurred. Hence it is necessary to recover variable cost of production in the short run.

(7) **Historical Cost and Replacement Cost:** Historical cost refers to the actual cost incurred for producing a commodity or service. It is also known as actual cost or pecuniary cost. It includes the actual amount paid as wages, interest, rent etc. Conventional accounting systems value the assets of a company on the basis of historical cost. Replacement cost refers to the cost of replacing the asset i.e. the value of the asset in the current period. Historical cost and replacement cost will remain the same if the price level remains constant. However, price level does not remain constant. When there is inflation in the economy, replacement cost will be higher than historical cost and vice-verse when there is deflation. While historical cost is widely used in traditional accounting systems, replacement cost has greater validity in practical

decision making. The business firms, in reality give importance to replacement cost as the current value of the asset is more important than the cost incurred in the past.

(8) **Private Cost and Social Cost:** The cost incurred by an individual firm for producing a commodity is called private cost. Both explicit and implicit cost are taken into account here. It is estimated to find out the quantum of profit. All business firms aim at minimising the cost of production. The cost incurred by the society as a whole for producing a commodity is known as social cost. It is not borne by the firm. It consists of both direct and indirect cost. Social profits can be estimated once the social benefits and social cost are known. When business firms produce a commodity both benefits and drawbacks accrue to society. These are called external benefits and external costs respectively. External benefits do not involve any cost. It is available to all the people without any payment. For e.g. if a private firm improves the lighting arrangement in the locality where it is located or if it improves the road and transport system, all people in that area will be benefited. When a firm or a factory is located in a particular area, it will create disturbances in the form of air and water pollution, transport congestion etc. This problem of cost has to be borne by the society. If private cost is more than social cost, then there is said to be **external benefit** or **positive externality.** On the other hand if social cost is more than private cost, then there is an **external cost** or **negative externality.** The distinction between private and social cost is important for the government to formulate regulatory policies. Social cost and social benefit concepts are useful for rational utilisation of limited resources.

(9) **Marginal and Incremental Cost:** Marginal cost refers to the cost incurred in producing an additional unit of the output. If total cost of producing 10 units is Rs. 100 and by producing the 11th unit, if the total cost increases to Rs. 115, then the difference between the two total cost i.e. Rs. 15 is termed as the marginal cost. Incremental cost refers to the change in total cost due to a policy decision implemented by the management. For e.g., introduction of new marketing and

advertising strategies, production of a component of the product instead of outsourcing etc. will affect the total cost.

(10) **Sunk Cost and Future Cost:** The costs which are incurred already and which cannot be recovered are called sunk costs. Changes in policy decisions do not affect this cost. Since it is irreversible, it is irrelevant for decision making. For e.g. the expenditure incurred on a machine with a specific function is said to be sunk cost. It is also called as unavoidable costs or uncontrollable costs. The costs which are incurred on the basis of forecasts are called future cost. It is concerned with the control of expenses, policy decisions related to pricing, expansion, diversification etc. It is also called as controllable cost or avoidable cost.

(11) **Opportunity Cost:** It is an important cost concept. It arises due to the universal economic problem i.e. wants are unlimited, means are limited and they have alternative uses. Hence the use of resources has to be selected. At a particular time, they can be used for a particular purpose. The other uses have to be sacrificed. When a factor of production is employed in one use, the production of other good where it can be used is sacrificed. Therefore opportunity cost of a factor of production is the next best alternative that is sacrificed. It is also called as alternative cost or social cost of production. For e.g. a particular plot of land can be used for multiple purposes like construction of a house or a school or a hospital or cultivation of a crop. Once the purpose is decided, others have to be sacrificed. The next best alternative that is sacrificed is opportunity cost. Thus opportunity cost is opportunity lost.

It is useful to a businessman for a number of purposes:

(1) It is useful to determine the relative prices of different goods. For e.g. the same factors can be used to construct 1 bungalow or 10 flats. While determining the price, the firm will see to it that the price of the bungalow is at least equal to the price of the ten flats.

(2) It helps in determining the normal earnings of a factor. If the factor has to be retained in the present job, it should be paid

atleast the amount it can get in the next best job. For example, if a person is employed by a college, his salary may be Rs. 10,000 per month. He can be employed by a financial institution and if the salary offered is Rs. 12,000, then the college should pay him at least Rs. 12,000 if it wants to retain him in the present job.

(3) It helps in decision-making and optimum allocation. For example, a builder has a choice to build a bungalow or ten flats using the same plot of land. In order to arrive at a decision, he has to compute the opportunity cost of building either of these two. Suppose he decides to construct 1 bungalow, then his opportunity cost will be the ten flats he has to sacrifice. Let us suppose the price of each flat is Rs. 20 lakhs then the total income he will get will be Rs. 2 crores. Suppose the price of bungalow is quoted as Rs. 3 crores, it is worthwhile for him to construct one bungalow rather than ten flats, as he can make more profits. Rational decision making is possible with the help of opportunity cost. Once a proper decision is taken, it ensures efficient use of resources.

While analysing the cost data of a firm, the following types of costs are considered:

(1) **Total Cost (TC):** It is the total expenditure incurred by the firm in producing a given level of output. It is obtained by multiplying factor prices with their quantities. Symbolically it is expressed as TC = f (Q) which implies that total cost varies with output. Total cost includes explicit, implicit and money costs. In the short run TC is also equal to Total variable cost + Total fixed cost i.e. TC = TVC + TFC.

(2) **Total Fixed Cost (TFC):** It is the total cost incurred on the fixed factors of production. TFC remains the same at all levels of output in the short run.

(3) **Total Variable Cost:** In the short run some factors are variable. The cost incurred on these variable factors is called total variable cost. It varies with the level of output.

(4) **Average Fixed Cost (AFC):** AFC is the total fixed cost divided by total units of the output.

i.e. $AFC = \frac{TFC}{Q}$. AFC is the fixed cost per unit of the output.

(5) **Average Variable Cost:** It is the total variable cost divided by the total units of output.

$AVC = \frac{TVC}{Q}$. It is the variable cost per unit of output.

(6) **Average Total Cost (ATC):** It is total cost divided by the units of output. $ATC = \frac{TC}{Q}$. It is the average cost per unit of the output. It can also be calculated as the sum of average fixed and average variable cost.

(7) **Marginal Cost:** It is the cost of producing an extra unit of the output. It is calculated as $MC = TC_n - TC_{n-1}$ i.e. Total cost of producing n units of the output – total cost of producing (n – 1) units of the output. It indicates the change in the total cost due to the production of an additional unit.

The above cost concepts can be explained with the help of the following table:

Units of output	Total fixed cost (Rs.)	Total variable cost (Rs.)	Total cost (Rs.)	Average variable cost (Rs.)	Average fixed cost (Rs.)	Average cost (Rs.)
0	30	0	30	0	0	0
1	30	30	60	30	30	60
2	30	40	70	20	15	35
3	30	52	82	17.3	10	27.3
4	30	65	95	16.25	7.5	23.75
5	30	90	120	18	6	24
6	30	120	150	20	5	25
7	30	160	190	22.8	4.2	27
8	30	210	240	26.2	3.7	29.9
9	30	270	300	30	3.3	33.3
10	30	340	370	34	3	37

It is clear from the above table that the variable cost varies with the output. While the average variable cost falls initially, reaches a minimum point and then starts increasing, the average fixed cost keeps falling down indicating that as more units of output is produced, fixed cost spreads over a number of units and the fixed

ost per unit declines gradually. Average cost is the summation of average fixed cost and average variable cost.

SHORT RUN AND LONG RUN COST CURVES:

Short run is a time period in which a firm varies the output by changing the variable factors. Hence both variable and fixed costs are incurred in the short run.

The cost function of a firm can be expressed in the form of a cost curve. The TFC, TVC and TC curves in the short run will be as follows:

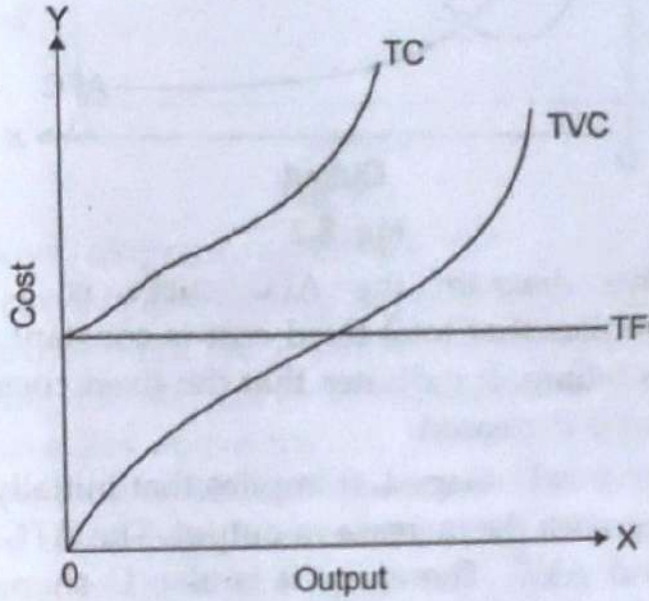


Fig. 8.1

In the above diagram the TFC curve is a horizontal straight line indicating that whatever be the level of output, TFC will remain the same. The TVC curve starts from the origin. Initially it rises gradually and then becomes steeper denoting a sharp rise in total variable cost. The TC curve is obtained by adding TVC and TFC. TC is largely influenced by the total variable cost. The distance between TC and TVC represents TFC.

The AVC, ATC, AC and MC curves in the short run are represented as follows:

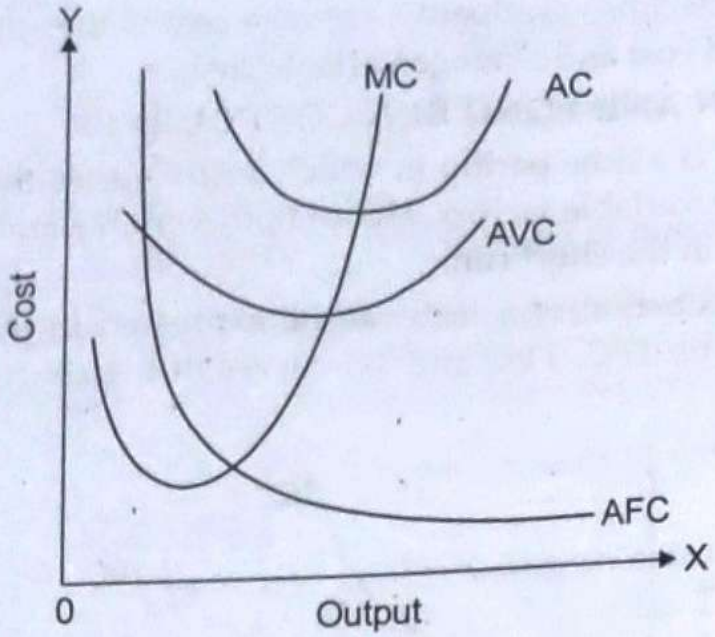


Fig. 8.2

In the above diagram the AFC curve is a rectangular hyperbola. It implies that total fixed cost is constant throughout. The AFC keeps falling. It indicates that the fixed costs are spread out when output is increased.

The AVC curve is U shaped. It implies that initially it falls and then starts rising with the increase in output. The ATC curve is the sum of AFC and AVC. Therefore, it is also U shaped. The MC curve also slopes downwards initially and then rises upwards. Therefore, it is also U shaped. It is derived from the TVC curve.

RELATIONSHIP BETWEEN AVERAGE AND MARGINAL COST:

Average cost refers to the cost per unit of the output. Marginal cost is the addition made to the total cost by producing one more unit of the output. When marginal cost is less than AC, average cost will fall and when marginal cost is more than AC, average cost will rise. The relationship between the two can be explained with the help of an example. Suppose the average score of a student is 60%. In the next examination if he scores 70%, then his average score will increase to 65%. On the other hand if the student secures 50% in the second exam, then his average score will decline to 55%. Thus average cost changes according to the change in marginal cost. The following diagram can be used to explain the relationship between the two.

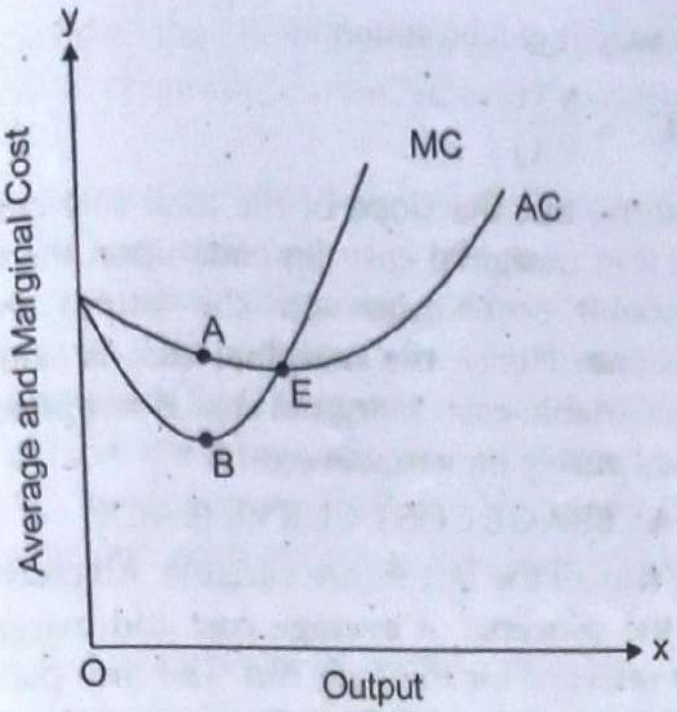


Fig. 8.3

In the above diagram, when the MC curve is falling, the average cost curve is also falling. At point E the MC curve cuts the AC curve. At that point AC is neither falling nor rising. The MC curve is cutting the AC curve at its minimum point. After this point MC curve lies above the AC curve and average cost also starts rising. As long as MC curve lies below the AC curve, the AC curve will be declining. Even while lying below, MC may be falling or rising. In the above figure upto point B, MC is falling. But after this point MC is rising. However AC continues to fall. Thus when the average cost is falling, marginal cost may be falling or rising. Suppose a student has secured an average of 60% in the first few tests in Economics. In the next test if he scores 45%, then his average score will fall. However, this score of 45% may be better than his earlier test score of 40%. Thus it is not possible to ascertain whether marginal cost will fall or rise with a fall or rise in average cost.

AC is the cost per unit. It is also expressed as:

$$AC = AFC + AVC.$$

Marginal cost is the addition made to the total cost by producing one more unit of the output. It is expressed as:

$$MC = TC_n - TC_{n-1}.$$

In another way it can be stated as:

$$MC = \frac{\Delta TC}{\Delta Q}$$

This is nothing but the slope of the total cost curve. It is also worth noting that marginal cost depends upon the variable cost. While the variable cost varies with the output, the fixed cost remains the same. Hence the marginal cost is nothing but the change in the variable cost. Marginal cost is not affected by fixed cost. It depends purely on variable cost.

LONG RUN AVERAGE COST CURVE (LAC):

In the long run all the factors are variable. All costs are variable costs. Hence the concepts of average cost and marginal cost are the only ones relevant for the long run. The firm plans its course of action in the long run. While doing so it takes into account numerous aspects of the short run. Therefore, long run comprises of all possible short run situations. The LAC envelops a number of short run average cost curves. The LAC curve can be represented as follows:

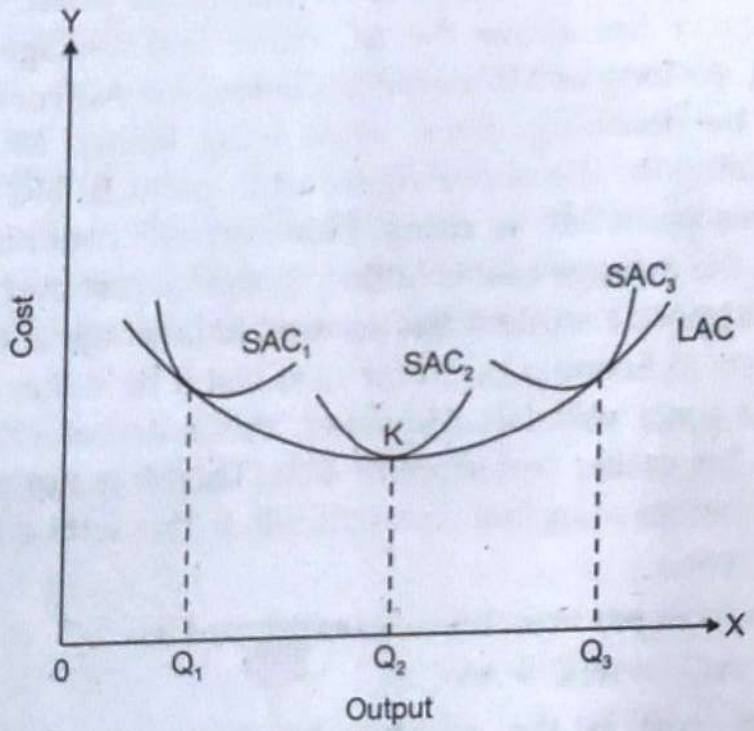


Fig. 8.4

The LAC curve drawn above has the following features:

(1) It is tangent to a number of short run average cost curves. Hence it is called as a tangent curve.

(2) It is also called as the "Envelope curve" as it envelops a group of short run average cost curves, relevant to different levels of output.

(3) It is also termed as the long run planning device as it indicates the least unit cost of producing each possible level of output. A rational entrepreneur would select the optimum scale of output. The optimum size of the plant is that size of the plant at which SAC is tangent to the LAC such that both the curves have the minimum point of tangency. In the above figure SAC_2 is tangent to LAC at OQ_2 level of output. This output is the optimum output as it has the minimum cost per unit.

(4) The cost levels represented by LAC indicate the minimum cost combinations of inputs to be used by the firm at each long-run level of output.

(5) The LAC curve is less U shaped or rather dish shaped. It implies that in the beginning it gradually slopes downwards and then after reaching a point it gradually begins to slope upwards. This is due to the law of returns to scale. It slopes downwards in the beginning due to increasing returns and constant returns cause constant costs and finally the LAC slopes upwards due to diminishing returns to scale.

Long run average cost is the long run total cost divided by the total units of output produced. In the above diagram, there are three possible short run average cost curves which correspond to a plant size. If the firm wants to produce OQ_1 level of output, then it will be operating on SAC_1. When the firm wants to expand the output, it will select the next short run average cost curve. It will employ that plant which can produce a given level of output at the minimum cost. In the figure the firm is able to produce OQ_2 level of output at the minimum average cost. At point K in the diagram, the minimum point of SAC and LAC coincide with each other. The long run average cost curve is not tangent to the various short run average cost curves at their minimum point. When LAC is declining it is tangent to the falling portion of SACs and when it is rising, it is tangent to the rising portion of SACs. It is only at point K, LAC is tangent to SAC at its minimum point.

The long run average cost curve is generally U shaped. Initially when output increases, LAC declines. Then it reaches a minimum point and then it starts rising. This behaviour is due to the laws of returns to scale. While short run average cost curve is influenced by the law of variable proportions, the LAC curve is influenced by the laws of returns to scale. This law explains the relationship between inputs and output in the long run when all factors are variable. There are three stages in the laws of returns to scale. Initially when the inputs are increased in a particular proportion, the output will increase more than proportionately. It enjoys internal economies of scale. They arise due to the possibility of increased division of labour and better utilisation of capital equipments. Due to this the average cost starts declining. Another factor attributed to this falling average cost is the indivisibility of certain factors of production like capital equipments. When they are used to the full capacity, average cost starts declining. The long run average cost curve slopes downwards upto a particular point and then it starts sloping upwards. If the firm continues to expand beyond a particular point, then it will experience diseconomies of scale. Beyond a certain limit, the firm will find it difficult to have effective supervision and management. While other factors can be increased, entrepreneur is a fixed factor. When more and more of other factors are added, the fixed factor is overutilised. This leads to decreasing returns. LAC starts sloping upwards due to all these reasons. Thus the shape of LAC depends upon economies and diseconomies of scale.

Some economists are of the opinion that LAC is not U shaped as shown in the figure. In reality LAC is said to be saucer shaped. This implies that there is a large flat portion in the centre. This happens when the firm exhausts economies of scale at a modest scale of operation and diseconomies of scale do not occur for a relatively large expansion of the output. Such a shape arises when technological economies of scale are very strong. The flatter, saucer shaped LAC can be depicted as follows:

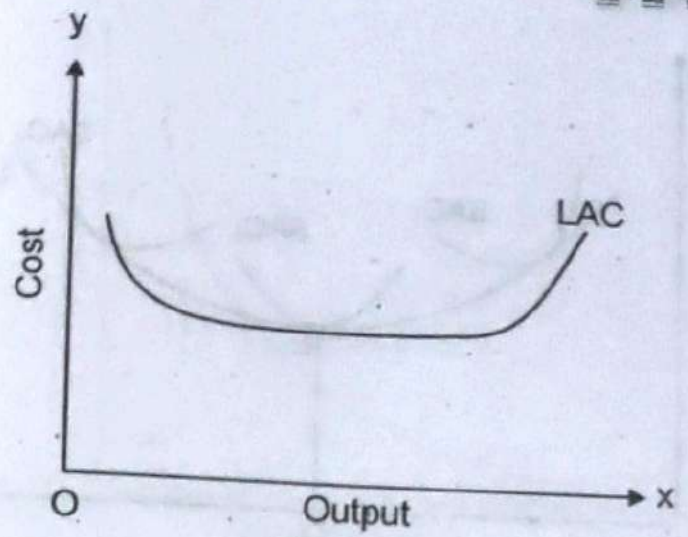


Fig. 8.5

The LAC curve here has a large middle portion which is flatter in nature. The curve implies the emergence of diseconomies of scale after a relatively large portion of the output is produced.

The long run LMC curve is also U shaped indicating that initially it falls and then starts rising. It is derived from the slope of the total cost curve at various points relating to the given output.

OPTIMUM FIRM:

The term optimum refers to the best or ideal. An optimum firm is therefore the firm which is the best. It is that firm which produces the most appropriate level of output at the minimum cost. In other words it is that firm which operates at the lowest average cost. At the minimum point of the long run average cost curve, the resources are utilised optimally. The optimum size is reached when the internal economies are fully obtained and the diseconomies of scale are yet to start. The concept of optimum firm differs from industry to industry. It is a relative concept. It changes from time to time and from place to place. It is analysed under the given conditions of technology. The following diagram represents an optimum firm.

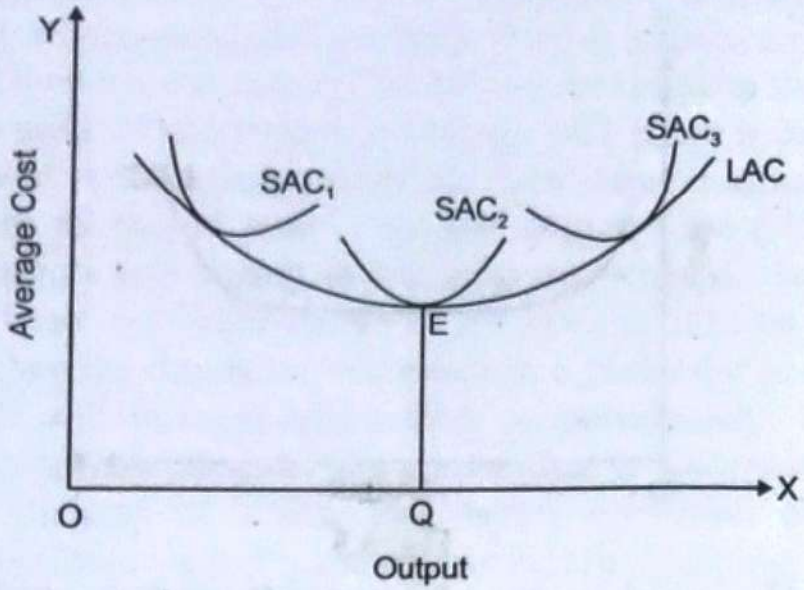


Fig. 8.6

In the diagram, the LAC curve is enveloping a number of short run average cost curves. The firm is said to be optimum when it employs the plant SAC_2. It produces OQ level of output at the minimum cost of production. Here the minimum point of SAC and LAC coincide with each other. Thus an optimum firm is one which produces at the minimum point of the long run average cost curve. Optimum size differs from industry to industry. In the case of agriculture, wholesale and retail trade optimum size is smaller compared to certain industries like steel, automobiles, transport, etc. Thus optimum firm is the best firm which operates at the lowest cost of production.

THE LEARNING CURVE:

This concept is of recent origin. It was developed by the economist Arrow. According to him, a firm learns through experience, uses the resources in the best possible manner and lowers the cost of production. This is termed by him as "Learning By Doing". Over a period of time a firm masters the technique of utilising the resources efficiently. As more and more output is produced, labourers become familiar with the production process. They work efficiently and ensure minimum wastage. They also learn to economise the use of resources. The Learning curve can be depicted as follows:

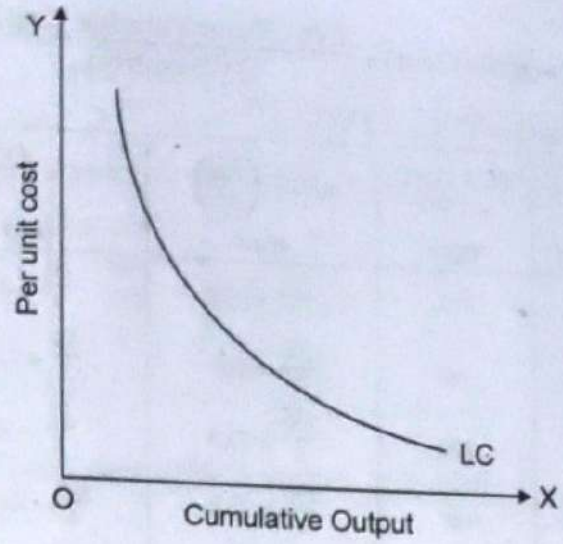


Fig. 8.7

Here the Learning curve slopes downwards indicating the decline in cost as the output increases. Work experience enables the firm to bring down the cost per unit. The learning curve effect is always denoted as a constant percentage. This percentage is nothing but the proportion by which cost of production declines when the cumulative output increases. Suppose labour input cost in a firm experiences a learning curve effect of 60%. This implies that if initially the labour input cost is Rs. 100, when the next unit is produced, labour input cost will be Rs. 60. Learning curve effect is different from economies of scale. Economies of scale refers to the reduction in the cost per unit of the output as the output of the firm increases per time period. Learning curve effect is the reduction in cost per unit of output as the cumulative output of the firm increases over a period of time.

NUMERICALS FROM UNIVERSITY EXAMS

Ex. 1: ***(March 17)***

Given TFC as Rs. 145. Calculate TC, ATC, AVC and MC from the following data:

Units	1	2	3	4	5	6
TVC	30	55	75	105	155	225

Solution:

Formula:

TC (Total Cost) = TVC (Total Variable Cost) + TFC (Total Fixed Cost)

$$\text{ATC (Average Total Cost)} = \frac{\text{TC (Total Cost)}}{\text{Q (Quantity)}}$$

$$\text{AVC (Average Variable Cost)} = \frac{\text{TVC (Total Variable Cost)}}{\text{Q (Quantity)}}$$

$$\text{MC (Marginal Cost)} = TVC_n - TVC_{n-1}$$

Units (Q)	TVC (Rs.)	TFC (Rs.)	TC = (TVC + TFC) (Rs.)	ATC = $\left(\frac{TC}{Q}\right)$ (Rs.)	AVC = $\left(\frac{TVC}{Q}\right)$ (Rs.)	MC = $(TVC_n - TVC_{n-1})$ (Rs.)
1	30	145	175	$\frac{175}{1} = 175$	$\frac{30}{1} = 30$	30
2	55	145	200	$\frac{200}{2} = 100$	$\frac{55}{2} = 27.5$	25
3	75	145	220	$\frac{220}{3} = 73.3$	$\frac{75}{3} = 25$	20
4	105	145	250	$\frac{250}{4} = 62.5$	$\frac{105}{4} = 26.25$	30
5	155	145	300	$\frac{300}{5} = 60$	$\frac{155}{5} = 31$	50
6	225	145	370	$\frac{370}{6} = 61.6$	$\frac{225}{6} = 37.5$	70

Ex. 2: *(Oct. 16)*

The total fixed cost incurred by a firm is Rs. 1000. Calculate TC, AC and VC from the following data:

Units of output	1	2	3	4	5	6	7	8
Marginal cost	100	200	300	400	500	600	700	800

Solution:

TFC is given as Rs. 1000

Total Cost (TC) = Total Variable Cost (TVC) + Total Fixed Cost (TFC)

$$\text{Average Cost (AC)} = \frac{\text{(Total Cost) TC}}{\text{(Quantity) Q}}$$

Units of Output (Q)	MC (Rs.)	TVC (Rs.)	TFC (Rs.)	TC = (TVC + TFC) (Rs.)	AC = $\left(\frac{TC}{Q}\right)$ (Rs.)
1	100	100	1000	1100	1100
2	200	300	1000	1300	650
3	300	600	1000	1600	533.3
4	400	1000	1000	2000	500
5	500	1500	1000	2500	500
6	600	2100	1000	3100	516.6
7	700	2800	1000	3800	542.8
8	800	3600	1000	4600	575

Ex. 3: *(Oct. 17)*

Given TFC as Rs. 150, Calculate TC, ATC, AFC and MC from the information given below:

Units	1	2	3	4	5	6
TVC	35	60	80	110	160	230

Solution:

Units (Q)	TVC (Rs.)	TFC (Rs.)	TC = (TVC + TFC) (Rs.)	ATC = $\left(\frac{TC}{Q}\right)$ (Rs.)	AFC = $\left(\frac{TFC}{Q}\right)$ (Rs.)	MC = ($TVC_n - TVC_{n-1}$) (Rs.)
1	35	150	185	185	150	35
2	60	150	210	105	75	25
3	80	150	230	76.6	50	20
4	110	150	260	65	37.5	30
5	160	150	310	62	30	50
6	230	150	380	63.3	25	70

Ex. 4: *(March 18)*

Given Total Fixed cost (TFC) as Rs. 100. With the help of following information Calculate:

(i) Total Cost (TC)

(ii) Average Fixed Cost (AFC)

(iii) Average Variable Cost (AVC)

(iv) Marginal Cost (MC)

Output (Units)	0	1	2	3	4	5	6
Total Variable Cost (in Rs.)	0	20	25	40	50	80	120

Solution:

Units (Q)	TVC (Rs.)	TFC (Rs.)	TC = (TVC + TFC) (Rs.)	AFC = $\left(\frac{TFC}{Q}\right)$ (Rs.)	AVC = $\left(\frac{TVC}{Q}\right)$ (Rs.)	MC = ($TVC_n - TVC_{n-1}$) or ($TC_n - TC_{n-1}$) (Rs.)
0	0	100	100	–	–	–
1	20	100	120	100	20	20
2	25	100	125	50	12.5	5
3	40	100	140	33.3	13.3	15
4	50	100	150	25	12.5	10
5	80	100	180	20	16	30
6	120	100	220	16.6	20	40

Ex. 5: *(BIM, Oct. 17)*

A firm operating under perfect competition is faced with following cost schedule.

Output	Price	Total Cost
1	5	10
2		12
3		15
4		19
5		24

(i) Calculate TR, MR and MC with the help of above table.

(ii) What is the profit maximizing level of output?

(iii) Fixed cost is Rs. 5. Find the TVC schedule.

Solution:

Units of Output (Q)	Price (AR) (Rs.)	TR (P × Q) (Rs.)	TC (Rs.)	TFC (Rs.)	TVC (Rs.)	MR (AR = MR) (Rs.)	MC (Rs.)
1	5	5	10	5	5	5	–
2	5	10	12	5	7	5	2
3	5	15	15	5	10	5	3
4	5	20	19	5	14	5	4
5	5	25	24	5	19	5	5

MR = MC = 5 when the output is 5 units.

∴ The profit maximizing level of output is 5 units.

Ex. 6: *(Oct. 18)*

From the following cost function:

$$TC = 100 + 50Q + 4Q^2$$

Questions:

(1) Calculate TFC, TVC, AVC.

(2) Find out AC, ATC, and AFC if the output is 10.

Solution:

(1)

$$TC = 100 + 50\,Q + 4Q^2$$

$$Q = 10$$

$$\therefore TC = 100 + 50 \times 10 + 4 \times 10^2$$

$$= 100 + 500 + 400$$

$$TC = \text{Rs. } 1{,}000$$

$$TFC = \text{Rs. } 100$$

$$TVC = TC - TFC$$

$$= 1{,}000 - 100$$

$$= \text{Rs. } 900$$

$$AVC = \frac{TVC}{Q}$$

$$= \frac{900}{10}$$

$$= \text{Rs. } 90$$

(2)

$$AFC = \frac{TFC}{Q}$$

$$= \frac{100}{10}$$

$$= \text{Rs. } 10$$

$$AC\ (ATC) = AFC + AVC$$
$$= 10 + 90$$
$$= Rs.\ 100$$

Ex. 7: *(BIM, Oct. 18)*

Calculate the short-run Total Fixed Cost, Total Variable Cost, Average Cost and Marginal Cost from the following cost schedule.

Output [in units]	0	1	2	3	4	5	6
TC (in Rs.)	100	125	140	150	170	200	245

Solution:

Output	TC (in Rs.)	TFC (Rs.)	TVC (TC – TFC)	AC (TC/Q)	MC ($TVC_n - TVC_{n-1}$)
0	100	100	–	–	–
1	125	100	25	125.00	25
2	140	100	40	70.00	15
3	150	100	50	50.00	10
4	170	100	70	42.50	20
5	200	100	100	40.00	30
6	245	100	145	40.83	45

Ex. 8: *(March 19)*

The total cost schedule of a firm is given below:

Units of output	0	1	2	3	4	5	6
Total Cost (TC) (Rs.)	150	300	420	600	790	1000	1260

Given the Total Fixed Cost (TFC) as Rs. 150. From the following information, calculate:

(i) Average fixed cost of producing 4 units.

(ii) Average variable cost of producing 5 units.

(iii) Total variable cost of producing 6 units.

(iv) Marginal cost of producing the 3rd unit.

Solution:

Units of Output	Total Cost (Rs.)	TFC (Rs.)	TVC (TC – TFC) (Rs.)	AVC (Rs.)	AFC (Rs.)	MC (Rs.)
0	150	150	–	–	–	–
1	300	150	150	150	150.00	150
2	420	150	270	135	75.00	120
3	600	150	450	150	50.00	180
4	790	150	640	160	37.50	190
5	1,000	150	850	170	30.00	210
6	1,260	150	1,110	185	25.00	260

(i) Average fixed cost of producing 4 units = Rs. 37.50

(ii) Average variable cost of producing 5 units = Rs. 170.00

(iii) Total variable cost of producing 6 units = Rs. 1,110

(iv) Marginal cost of producing 3rd unit = Rs. 180

Ex. 9: *(March 19)*

Given TFC (Total Fixed Cost) Rs. 145. Calculate TC, AVC, AFC and MC.

Units	0	1	2	3	4	5
TVC	0	30	55	75	105	155

Solution:

Units	TVC (Rs.)	TFC (Rs.)	TC (TVC + TFC) (Rs.)	AVC (TVC/Q) (Rs.)	AFC (TFC/Q) (Rs.)	MC ($TC_n - C_{n-1}$) (Rs.)
0	0	145	145	0.0	–	–
1	30	145	175	30.0	145.00	30
2	55	145	200	27.5	72.50	25
3	75	145	220	25.0	48.33	20
4	105	145	250	26.25	36.25	30
5	155	145	300	31.00	29.00	50

Ex. 10:

Given TFC as Rs. 145, calculate TC, ATC, AVC, AFC and MC from the following table:

Units	1	2	3	4	5	6
TVC	30	55	75	105	155	225

Solution:

Units	TVC	TFC	TC (TVC + TFC)	ATC (TC/Q)	AVC (TVC/Q)	AFC (TFC/Q)	MC ($TVC_n - TVC_{n-1}$)
1	30	145	175	175	30	145	30
2	55	145	200	100	27.5	72.5	25
3	75	145	220	73.3	25	48.33	20
4	105	145	250	62.5	26.25	36.25	30
5	155	145	300	60	31	29	50
6	225	145	370	61.6	37.5	24.16	70

Ex. 11:

Calculate TVC, AFC, AVC, ATC and MC from the following data:

Units	0	1	2	3	4
TC	100	120	125	140	200

Solution:

Units (Q)	TC	TFC	TVC (TC -TFC)	ATC (TC/Q)	AVC (TVC/Q)	MC ($TVC_n - TVC_{n-1}$)
0	100	100	0	0	0	-
1	120	100	20	120	20	20
2	125	100	25	62.5	12.5	5
3	140	100	40	46.6	13.3	15
4	200	100	100	50	25	60

Ex. 12:

Calculate TC, AFC, AVC, ATC and MC:

TFC IS 50.

Units	0	1	2	3	4	5
TVC	0	70	90	130	150	170

Solution:

Output (Q)	TVC	TFC	TC (TVC+TFC)	AFC TFC/Q)	AVC (TVC/Q)	ATC (TC/Q)	MC ($TVC_n - TVC_{n-1}$)
0	0	50	50	0	0	0	-
1	70	50	120	50	70	120	70
2	90	50	140	25	45	70	20
3	130	50	180	16.66	43.33	60	40
4	150	50	200	12.5	37.50	50	20
5	170	50	220	10	34	44	20

Ex. 13:

The total fixed cost of a firm is Rs. 90/-. Calculate TVC, AC, MC from the following table:

quantity	1	2	3	4	5
Price	180	160	140	120	100
Total Cost	175	200	220	250	300

Solution:

Quantity	Price (Rs.)	Total Cost (TC) (Rs.)	Total Fixed Cost (TFC) (Rs.)	TVC (TC – TFC) (Rs.)	AC (TC/Q) (Rs.)	MC ($TVC_n - TVC_{n-1}$) (Rs.)
1	180	175	90	85	175	-
2	160	200	90	110	100	25
3	140	220	90	130	73.3	20
4	120	250	90	160	62.5	30
5	100	300	90	210	60	50

Ex. 14:

Complete the following table:

Units	TFC	AVC	TC	AFC	AVC	AC	MC
0		0					
1		12					
2		16					
3		26					
4		50					
5		150					
6	10	360					

Solution:

Units	TFC	AVC	TVC (AVC x Q)	TC (TVC +TFC)	AFC (TFC/Q)	AVC	AC (TC/Q)	MC ($TVC_n - TVC_{n-1}$)
0	10	0	0	10	0	0	0	-
1	10	12	12	22	10	12	22	12
2	10	16	32	42	5	16	21	20
3	10	26	78	88	3.3	26	29.3	46
4	10	50	200	210	2.5	50	52.5	122
5	10	150	750	760	2	150	152	550
6	10	360	2160	2170	1.66	360	361.6	1410

QUESTIONS FOR REVIEW

(1) Define the following concepts:

(a) Real cost. (b) Implicit cost. (c) Explicit cost.
(d) Fixed cost. (e) Variable cost. (f) Opportunity cost.
(g) Marginal cost. (h) Optimum firm. (i) Learning curve.

Fill in the blanks:

(a) The cost incurred on hired factors of production is known as _____.
(b) Economic cost includes both _____ cost and _____ cost.
(c) _____ is the next best alternative that is sacrificed.
(d) When output increases AFC keeps _____.
(e) Long run average cost curve is also known as _____ and _____.
(f) Opportunity cost is also known as _____.
(g) _____ is the cost of producing an additional unit of output.
(h) Marginal cost depends upon _____.
(i) The AFC curve has the shape of a _____.
(j) Minimum point of LAC curve implies _____ output.

[Ans.: (a) Explicit cost; (b) Implicit and explicit; (c) opportunity cost; (d) falling; (e) envelope curve and Tangent curve; (f) alternative cost or social cost; (g) marginal cost; (h) variable cost; (i) rectangular hyperbola; (j) Optimum]

State whether the following statements are true or false:

(a) An optimum firm is the firm which produces at the lowest average cost.
(b) Learning curve indicates the relationship between decrease in output and increase in cost of production.

(c) The distinction between fixed and variable cost is valid only in the long run.
(d) Marginal cost depends upon total fixed cost.
(e) Accounting cost considers only explicit cost.
(f) The long run average cost curve is generally U shaped.
(g) Real cost can be measured accurately.
(h) A firms aims at recovering the fixed cost in the short period.
(i) Average cost increases due to increasing returns to scale. ***(March 17)***
(j) In the short run, the firm has to only incur variable costs. ***(March 18)***
(k) In the long run a firm *must* cover all the cost. ***(BIM, Oct. 17)***
(l) There is no difference between economic and accounting costs. ***(March 19)***
(m) The long-run average cost curved (LAC) is also referred to as the 'Envelope curve'. ***(March 19)***
(n) Opportunity cost is opportunity lost.
(o) AFC never becomes zero.
(p) Average cost curve is U shaped.

*[**Ans.**: (a) True; (b) False; (c) False; (d) False; (e) True; (f) True; (g) False; (h) False; (i) False; (j) False; (k) True; (l) False; (m) True; (n) True; (o) True; (p) True]*

Match the following:

(A)		(B)	
(1)	Explicit cost ***(BIM, Oct. 17)***	(a)	Declines as production increases
(2)	AFC	(b)	Accounting cost
(3)	Opportunity cost ***(Oct. 18)***	(c)	Envelope curve
(4)	Learning curve ***(BIM, Oct. 18)***	(d)	Next best alternative use
(5)	Long run average cost curve ***(BIM, Oct 18)***	(e)	Arrow
		(f)	Prime Cost
(6)	Variable Cost	(g)	Additional cost to produce an additional unit
(7)	Marginal Cost		
(8)	MC = AC	(h)	One level of production
(9)	Economics of scale	(i)	Lowest AC

*[**Ans.**: (1 – b); (2 – a); (3 – d); (4 – e); (5 – c); (6 – f); (7 - g); (8 - i); (9 - h)]*

(2) **Distinguish between:**
  (a) Fixed and variable cost.
  (b) Historical cost and replacement cost.
  (c) Private cost and social cost.
  (d) Explicit cost and Implicit cost.
  (e) Average cost and Marginal cost
(3) Explain the various cost concepts.
(4) Write a note on long run average cost curve.
(5) Discuss the various short run concepts with suitable diagram.
(6) Explain the concept of long run average cost. Also explain the relationship between AC and MC. ***(Oct. 16)***
(7) "The LAC envelopes a number of short run average cost curves". Discuss. ***(March 17)***
(8) Explain why LAC is U shaped.
(9) Define cost of production, Discuss following costs in detail. ***(March 18)***
  (i) Money cost.
  (ii) Opportunity cost.
(10) Explain in detail derivation of Long Run Average Cost Curve (LAC) with the help of Short Run Average Cost Curves (SACs). ***(March 18)***
(11) Explain the various concepts of costs. ***(BIM, March 19)***
(12) Explain the short run cost i.e. AFC, AVC, ATC and MC.
(13) Long run average cost curves are made of various short run average cost curves. Explain.

(14) **Write short notes on:**
- (a) Optimum firm.
- (b) Learning curve.
- (c) Relationship between AC and MC.
- (d) Opportunity cost. ***(Oct. 16; BIM, March 19)***
- (e) Explicit cost and implicit cost. ***(March 19)***
- (f) Incremental cost.
- (g) Economic Cost.
- (h) Implicit cost.
- (i) Explicit cost.
- (j) LAC.
- (k) Replacement cost.

(15) Find total variable cost and marginal cost if total fixed cost is Rs. 60.

Units of output	1	2	3	4	5	6
Total cost	85	100	125	160	210	280

(16) If the fixed cost is Rs. 30, calculate total variable cost and marginal cost from the following data:

Output	1	2	3	4	5	6
Total cost	52	68	78	91	109	132

(17) From the following information calculate total cost and total variable cost. The total fixed cost is given as Rs. 300.

Output	1	2	3	4	5	6
Marginal cost	300	100	50	50	100	120

(18) Calculate average cost and marginal cost from the following:

Units of output	1	2	3	4	5	6
Total cost	25	36	44	51	59	69

(19) The total fixed cost is Rs. 40. Calculate the total cost, AVC, AFC and MC from the following table:

Units of Output	0	1	2	3	4	5	6	7	8
TVC (Rs)	0	15	30	60	100	150	210	270	350

(20) From the following data calculate TVC, MC, AC and AFC.

Units of output	0	1	2	3	4	5	6	7	8
Total cost	50	120	170	180	210	260	340	440	580

(21) A firm incurs an average total cost of Rs. 100 and average variable cost of Rs. 60, when its output is 50 units. Calculate the total fixed cost of the firm.

(22) From the following table calculate variable cost, average variable cost and marginal cost.

Output	0	1	2	3	4	5
Total cost (Rs.)	40	60	78	100	130	170

(23) From the following table calculate total cost and average cost. The total fixed cost is given as Rs. 100.

Units of Output	1	2	3	4	5
Price	120	110	100	90	80
Marginal Cost	70	75	80	85	90

(24) The total fixed cost of a firm is Rs. 90. Calculate total variable cost, average cost and marginal cost from the following table:

Quantity	1	2	3	4	5
Price	180	160	140	120	100
Total Cost	175	200	220	250	300

9

Break-even Analysis

GRAPHIC METHOD
- LINEAR FUNCTION
- NON-LINEAR FUNCTION

ALGEBRAIC METHOD
ASSUMPTIONS
CRITICISMS

Break-even analysis occupies an important place in economic theory. It analyses the relationship between cost of production, revenue and profit. It is very useful to business firms in decision making related to investment policies, production planning etc. and also to the government in formulating its various policies. Break-even point is that point at a particular level of output at which total revenue is equal to total cost. It implies a no-profit-no-loss zone. At this point the firm neither makes profit nor loss. Here total revenue is exactly equal to total cost. This analysis can be explained through a graphic method and an algebraic method.

GRAPHIC METHOD:

This method explains the relationship between revenue, cost and profit at various levels of output. This method considers both linear function and non-linear function.

LINEAR FUNCTION AND BREAK-EVEN ANALYSIS:

Linear function implies that the price remains constant and the total revenue and total cost curves are straight lines. When the price remains the same, every increase in production and sales

will lead to increase in total revenue in a constant proportion. The total revenue curve starts from the origin indicating that it varies with the level of output. The total cost curve is also a straight line starting at a point on the y axis above the origin. This indicates that there is an element of fixed cost in the total cost of production. The point at which total revenue is equal to total cost is said to be the break-even point. The break-even point in the case of linear cost and revenue curves can be shown as follows:

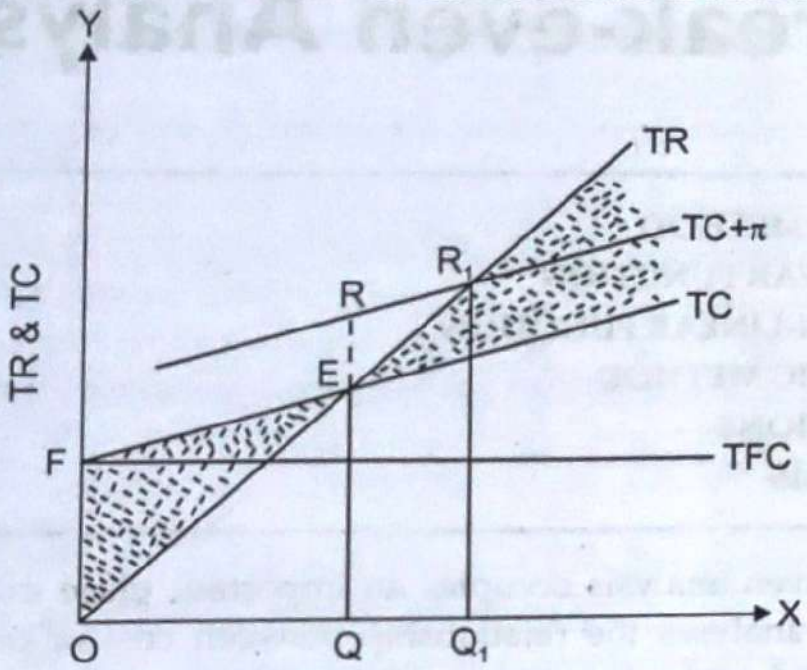


Fig. 9.1

In the above diagram TR represents the total revenue curve. TC refers to the total cost curve while TFC stands for total fixed cost. TR curve starts from the origin and it is a linear curve indicating that TR increases in a constant proportion. TFC is a straight line indicating that it remains the same whatever be the level of output. The vertical distance between TC and TFC represents total variable cost. TVC increases with the increase in output. The total revenue curve and the total cost curve intersect each other at point E and this point is the break-even point. At this point total revenue is equal to total cost. The firm neither makes profit nor loss at this point. Before the break-even point total revenue is less than total cost, whereas after the break-even point total revenue is more than the total cost. Break-even point shows the minimum level of output required to be produced and sold by the firm to break-even. Any rational firm would like to produce the quantity

of output which is more than the output at the break-even point or at least, the quantity of output at the break-even point. No firm would like to produce the output which is less than the break-even output as it clearly indicates loss. If the firm aims at attaining a fixed amount profit in its operation then break-even point indicates the required level of output to be produced. For e.g. in the figure, let us suppose the firm aims at a profit of π then the new cost curve TC + π intersects the TR curve at point R_1 while the break-even output is OQ, the output required to achieve the targeted profit is OQ_1.

NON-LINEAR FUNCTION AND BREAK-EVEN ANALYSIS:

While linear total revenue and total cost functions exists in perfect competition, in reality the market structure is monopoly, monopolistic competition or oligopoly. In such a case the cost and revenue functions are non-linear. The determination of break-even point in this case can be explained with the help of the following diagram:

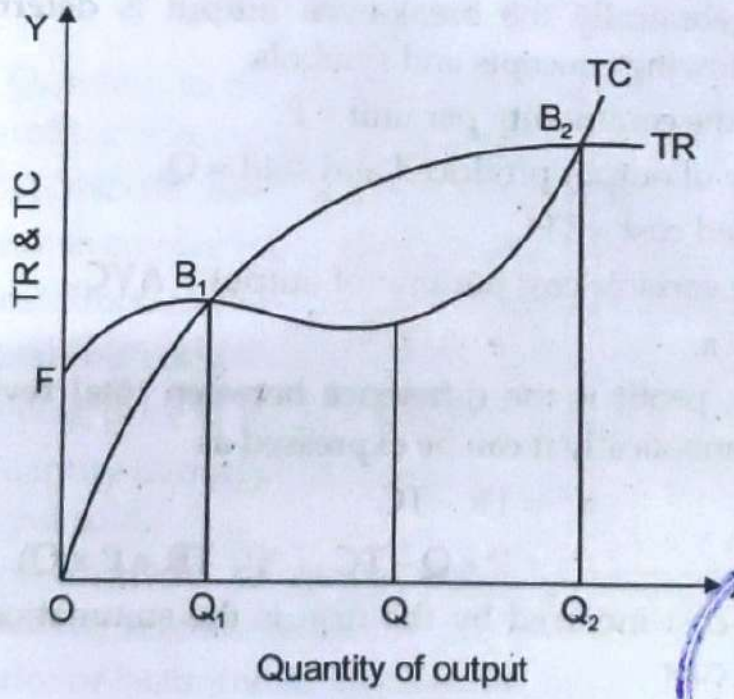


Fig. 9.2

In the above diagram the TR curve slopes upwards upto a particular point and then it starts declining. TR increases at a diminishing rate when more output is sold. The total cost curve starts from point F on the y axis indicating the fixed cost component. Initially it increases at a diminishing rate and then it

rises at an increasing rate. The vertical distance between TR and TC represents the total profits earned by the firm. The TR and TC curves intersect each other at point B_1 and B_2. At B_1 the total revenue is equal to total cost and the corresponding level of output is OQ_1. B_1 is the break-even output. After this point TR curve lies above the TC curve. When the firm produces OQ level of output the distance between TR and TC is the maximum. Beyond this point the distance between TR and TC starts narrowing down and again at point B_2 the total revenue curve intersects the total cost curve. While B_1 is called the lower break-even point, B_2 is called the upper break-even point. B_2 lies beyond the profit maximising level of output of the firm and hence it does not have much relevance. B_1 or the lower break-even point is more relevant to a business firm as it indicates how much output has to be produced and sold to break-even and maximise profits.

ALGEBRAIC METHOD AND BREAK-EVEN ANALYSIS:

This method is very useful to business firms in decision making. Algebraically the break-even output is determined by using the following concepts and symbols:

(1) Price of the commodity per unit = P.

(2) Quantity of output produced and sold = Q.

(3) Total fixed cost = TFC.

(4) Average variable cost per unit of output = AVC.

(5) Profits = π.

Generally, profit is the difference between total revenue and total cost. Symbolically it can be expressed as

$$\pi = TR - TC$$
$$= P \times Q - TC \quad (\because TR = P \times Q) \quad \ldots (1)$$

The total cost incurred by the firm is the summation of fixed and variable cost.

$$\therefore \quad TC = TFC + TVC$$
$$TC = TFC + AVC \times Q \quad \ldots (2)$$

At the break-even point TR = TC. Let us assume the break-even point level of output = Q_B.

At the break-even point

$$TR = TC$$

$$P \times Q_B = TFC + AVC \times Q_B$$

$$P \times Q_B - AVC \times Q_B = TFC$$

$$Q_B (P - AVC) = TFC$$

$$\therefore \quad Q_B = \frac{TFC}{P - AVC}$$

This equation implies that the break-even quantity depends upon total fixed cost, price of the commodity and total variable cost. Break-even quantity will change when there is a change in any one of these variables. The denominator P – AVC is known as contribution ratio i.e. the profit contribution per unit. The formula quoted above can be modified to determine a particular level of output to achieve the targeted profit. The formula to be used is as follows:

$$Q_r = \frac{TFC - \pi}{P - AVC}$$

where Q_r refers to the output to be produced to achieve the targeted profit. π refers to the target profit.

ASSUMPTIONS OF BREAK-EVEN ANALYSIS:

The break-even analysis is based on the following assumptions:

(1) The cost function and the revenue function are linear.

(2) The total cost consists of fixed cost and variable cost.

(3) The selling price of the commodity is constant.

(4) The quantity of output produced is equal to the total quantity of output sold.

(5) The productivity of factors, both average and marginal productivity remain the same.

(6) The price of factors of production is constant.

(7) If the firm produces a number of goods the product mix remains the same.

CRITICISMS/LIMITATIONS OF BREAK-EVEN ANALYSIS:

This analysis has been criticised by many economists on a number of grounds. They are:

(1) The assumptions of the theory are unrealistic. Constancy of productivity of factors, constancy of prices of factors of production are difficult to realise.

(2) Modern economies are dynamic economies. This analysis is not suitable as it is a static one.

(3) This analysis assumes a linear function. It is not possible to have this in practice as linear function exists in perfect competition which is not a realistic market structure.

(4) According to this analysis, profit is a function of output produced but in reality it depends upon the state of technology used, managerial efficiency and productivity of factors of production.

(5) Under monopolistic competition and oligopoly, a huge expenditure is incurred on advertisement, sales promotion, etc. This type of expenditure known as selling cost exerts a greater influence on sales, production, etc. This aspect has not been analysed by the break-even analysis. Hence it is an incomplete theory.

(6) The effect of taxation on prices, cost of production and sales are not analysed by break-even analysis.

Despite all the criticisms, this analysis is widely used by business firms. It gives them an idea about the profit structure and helps them to control the cost function. It is also useful to decide about future expansion, modernisation and diversification. The significance or applications of this principle in business can be highlighted as follows:

Significance or Business Applications of Break even analysis:

(1) **Resource mobilisation:** Once a firm achieves the break even point, resource mobilisation becomes easier as the lenders will be optimistic about the future of the firm and will be willing to provide credit. Thus flow of capital will become better for future operations.

(2) **Cost management:** Both fixed and variable costs are recovered at the break even point. Hence this analysis helps them to manage the cost function effectively.

(3) **Demand and profit forecasts:** Break even analysis helps the business firms to analyse the demand for their products in

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(2) **Cost management:** Both fixed and variable costs are recovered at the break even point. Hence this analysis helps them to manage the cost function effectively.

(3) **Demand and profit forecasts:** Break even analysis helps the business firms to analyse the demand for their products in

future and also in setting the target for profits. This analysis also helps the firms to determine a particular level of output to achieve the targeted profit.

(4) **Strategic planning:** A firm's planning regarding marketing sales, introduction of new technology or innovations is very much influenced by break even analysis. If the firm makes loss after the break even point, new strategies have to be worked out to change the situation. If profits are generated after the break even point, the firm has to take necessary steps to sustain and increase it. In both the cases this analysis is very useful.

(5) **Return on investments:** One of the main objectives of a firm is to maximize profits for its own benefit as well as to satisfy the interests of the shareholders. Break even analysis helps the firms to estimate the time period to earn returns on the capital invested. It is essential to estimate this as capital expenditure is huge in size and involves a long gestation period to yield returns. Break even analysis is useful in estimating this time period.

Thus break even analysis is very useful to firms in making various decisions.

NUMERICALS

Ex. 1:

Calculate Break Even Point when,

- Selling Price p/u = Rs. 250
- Variable Cost p/u = Rs. 150
- Total Fixed Cost = Rs. 35,000

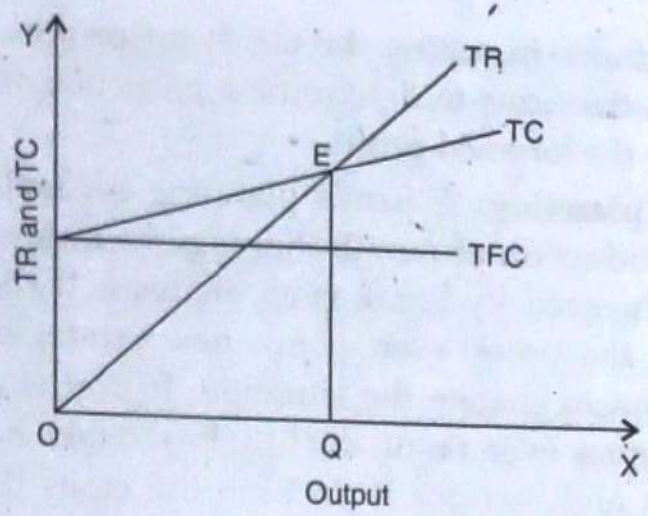
And draw the diagram

Solution:

$$\text{Break even point output} = \frac{\text{TFC}}{\text{P} - \text{AVC}}$$

$$= \frac{35000}{250 - 150}$$

$$= 350 \text{ Units}$$



QUESTIONS FOR REVIEW

(1) Define the following:

(a) Total revenue.
(b) Total cost.
(c) Break even point.

State whether the following statements are true or false:

(a) Break even point refers to the no-profit no loss zone.
(b) In a non-linear function TR and TC curves are straight lines.
(c) At the break even point, the firm's total revenue is maximum. ***(Oct. 16)***
(d) An increase in price will decrease the break even point. ***(March 17)***
(e) An increase in variable cost will increase the Break-Even sales. ***(BIM, March 19)***
(f) When TR and TC are non-linear there are two break–even points.
(g) Break even analysis has no limitations.

***[Ans.:** (a) True; (b) False; (c) False; (d) True; (e) True; (f) True; (g) False]*

Match the following:

(A)		(B)	
(1)	Break-even point	(a)	Linear and non-linear function
(2)	Graphic method	(b)	No profit no loss

***[Ans.:** (1 – b); (2 – a)]*

(2) Define break-even point.
(3) Give the diagrammatic representation for break-even point both in the linear and non-linear functions.
(4) Determine the break-even output with the help of the algebraic method.
(5) Explain in detail the break-even analysis.
(6) Critically examine the break-even analysis.
(7) What are the uses of break-even analysis? What are its assumptions and short comings?
(8) Diagrammatically explain the concept of break-even point analysis. ***(Oct. 16)***
(9) What is breakeven point? Explain the limitations of break even analysis. ***(March 17)***
(10) What is Breakeven point? Explain the business application of Breakeven analysis. ***(Oct. 17)***
(11) What in details break-even analysis. ***(BIM, Oct. 17)***
(12) Explain with the help of diagram the concept of break-even analysis. ***(Oct. 18)***
(13) Explain with the help of suitable diagram linear break-even analysis and discuss the uses of break-even analysis. ***(BIM, Oct. 18)***.

(14) What is break-even analysis? Discuss in detail the business application of break-even analysis. ***(March 19)***

(15) Explain the concept of break-even point with the help of diagram. ***(BIM, March 19)***

(16) Describe breakeven point and its limitations in detail.

(17) Explain the effect of changes in the following variables of break-even point
(a) Price of the product (b) Fixed cost

(18) Calculate the break-even output with the help of the following information. The total fixed cost of printing a book is Rs. 80,000. The price per unit is Rs. 60. The average variable cost is Rs. 20. Find out the output level at which the firm can break-even. If the price rises to Rs. 120 and if AVC increases to Rs. 40, what is the new break-even output?

(19) A business firm incurs a total fixed cost of Rs. 80,000 in producing a commodity X. Its price is Rs. 100 per unit and the average variable cost is Rs. 50 per unit. If the firm wants to make a profit of Rs. 20,000, calculate the output to be produced. Identify the breakeven output.

(20) **Write short notes:**
(a) Beak-even Analysis.

(21) (a) Find out the break even quantity if the total fixed cost is Rs. 2 lakhs, price per unit is Rs. 100 and the average variable cost is Rs. 60.
(b) If the firm wants to make a profit of Rs. 20,000, calculate the quantity of output to be produced.

MODULE - IV: MARKET STRUCTURE

10

Perfect Competition

FEATURES OF PERFECT COMPETITION
DETERMINATION OF EQUILIBRIUM PRICE AND OUTPUT
MARGINAL REVENUE AND MARGINAL COST APPROACH
TOTAL REVENUE – TOTAL COST APPROACH
SHORT RUN EQUILIBRIUM OF THE FIRM AND INDUSTRY
LONG RUN EQUILIBRIUM OF THE FIRM AND INDUSTRY

The term market refers to the link between the buyer and the seller. The link can be established through a number of ways like through telephones, fax, e-mail, etc. It is not necessary for the buyer and the seller to meet directly in many cases. Markets are classified as product markets and factor markets. The product market is a market where goods and services are bought and sold. The product market is classified on the basis of the commodity sold i.e. whether they are homogeneous or heterogeneous or on the basis of the number of buyers and sellers. Market is also classified on the basis of time and place. The broad classification of market is as follows:

(1) On the basis of place it is classified as local, national and international.

(2) On the basis of time it is classified as very short period, short period, long period and very long period.

(3) On the basis of the nature of the product, number of sellers and degree of competition markets are classified into perfect competition and imperfect competition.

The various types of markets based on number of firms, degree of competition can be tabulated as follows:

Type of market structure	No. of buyers and sellers	Degree of competition
(1) Monopoly	Single seller and many buyers	Nil
(2) Oligopoly	Few sellers and many buyers	Severe
(3) Monopolistic competition	Many sellers and many buyers	Intense
(4) Perfect competition	Larger number of buyers and sellers	Intense

PERFECT COMPETITION:

Perfect competition is an ideal market structure which ensures rational utilisation of resources. Perfect competition avoids exploitation of labourers and consumers. A perfectly competitive market exhibits the following features:

(1) There are large number of sellers. Each seller sells a small fraction of the output. He cannot influence the price of the commodity by changing his supply. He has to accept the prevailing price and sell as much as possible at the existing price. Hence a firm under perfect competition is said to be a price taker.

(2) There are large number of buyers. Each buyer buys a small fraction of the output. Hence he cannot influence the price through his purchases.

(3) All the units of a commodity produced and sold by all the firms are homogeneous in nature. Hence they are perfect substitutes for each other.

(4) A single price prevails in the market.

(5) There is free entry and exit. Any firm can join the industry and any firm can leave the industry. There are no restrictions on entry and exit.

(6) There is no government intervention. Market mechanism is allowed to play its role in the determination of equilibrium price and output.

(7) The transport cost is assumed to be nil. It is assumed that either all the firms are close to the market or are equally far away from the market. Hence the transport cost is assumed to be nil.

(8) Factors of production are said to be perfectly mobile. This ensures equal factor cost for all the firms.

(9) Both the sellers and the buyers have perfect knowledge about the market. If any seller tries to sell at a higher price, the consumers will shift to some other seller. Similarly no seller would like to sell at a lower price as all the sellers know about the market price.

DETERMINATION OF EQUILIBRIUM PRICE AND OUTPUT:

The term equilibrium refers to a position of rest. A firm is said to be in equilibrium when it has no tendency to change the level of output. This happens when the firm maximises its profits. One of the aims of any business firm is to maximise its profits and is considered as rational. Profit is the difference between total revenue and total cost. Total revenue is the revenue earned by sale of output. It is obtained by multiplying the price per unit by the quantity of output sold. Total cost consists of rent, wages, interest and normal profit. Normal profit refers to the remuneration, the entrepreneur should get for management and coordination. It is the minimum income that should be earned by the entrepreneur to stay in business. The difference between total revenue and total cost refers to pure or economic profits. Economic profits are also known as super normal profits. A firm will be in equilibrium when it produces that level of output at which its profits are maximised. There are two approaches to explain this namely **(1)** Total revenue – Total cost approach and **(2)** Marginal revenue – Marginal cost approach.

TOTAL REVENUE – TOTAL COST APPROACH:

Under this approach the firm is said to be in equilibrium when the difference between total revenue and total cost is maximum. Under perfect competition there is a single price and all additional units are sold at the same price. The total revenue therefore will increase at the same rate. Equilibrium of the firm can be explained with the help of the table and diagram.

Quantity of output	Total Revenue (Rs.)	Total Cost (Rs.)	Economic Profit (Rs.) (TR – TC)
(1)	10	14	– 4
(2)	20	15	5
(3)	30	17	13
(4)	40	20	20
(5)	50	26	24
(6)	60	35	25
(7)	70	50	20
(8)	80	70	10

In the above table when the firm produces the first unit TC is more than TR. When more units are produced, the firm starts earning profits. Profits start increasing. It earns maximum profits when the 6th unit is produced. Hence the firm will be inequilibrium when it produces 6 units of the output.

The above table can be translated in the form of the diagram given below:

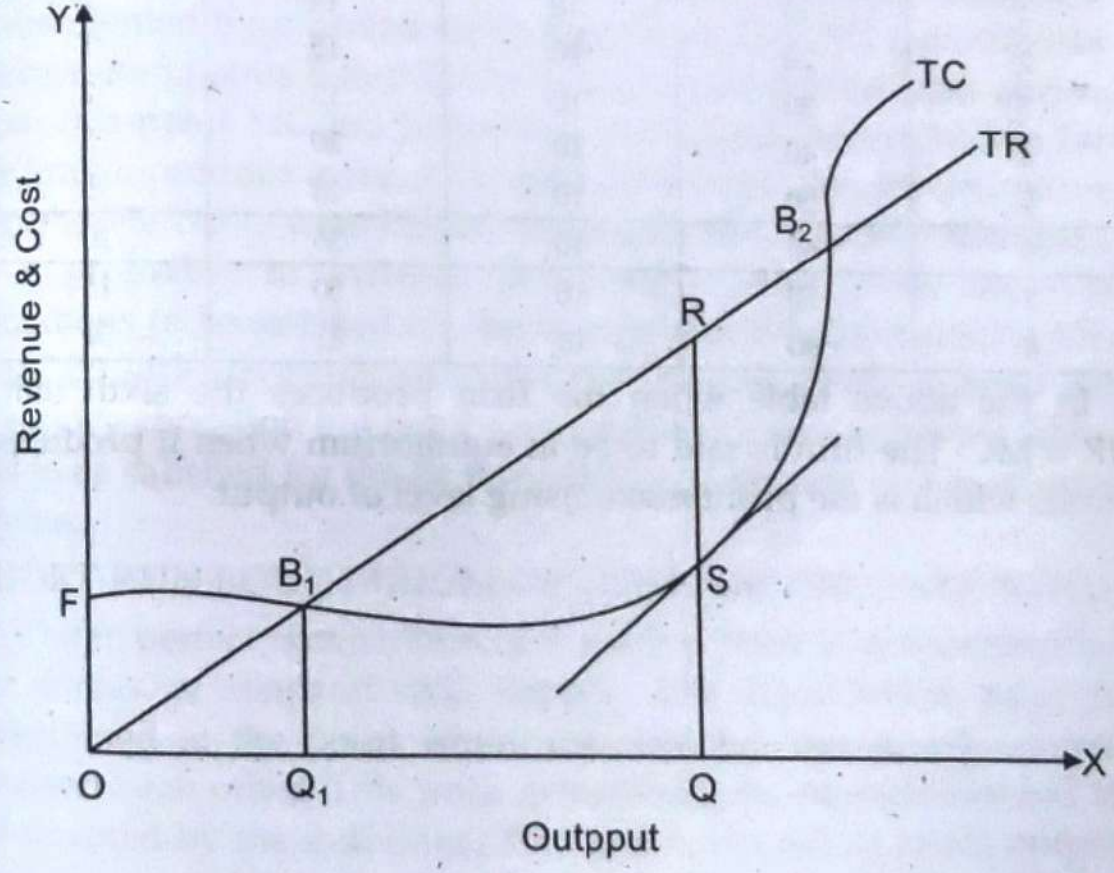


Fig. 10.1

In the above diagram TR curve is a linear curve indicating that TR increases at a constant rate. The TC curve starts from point F

on the Y axis indicating fixed cost. At point B_1, total revenue is equal to total cost. After this break even point, the firm starts earning profits. The difference between TR and TC is maximum when the firm produces OQ level of output. This is said to be the equilibrium level of output. After this point, if the firm produces more, profits starts declining. At point B_2, TR = TC and after this point total cost is more than total revenue. Hence a rational firm would like to produce OQ level of output and maximise its profits.

MARGINAL REVENUE – MARGINAL COST APPROACH:

An alternative namely MR – MC approach has been developed to determine equilibrium of the firm. The firm is said to be in equilibrium when MR = MC. This can be explained with the help of the following table and diagram.

Units of Output	Total Revenue	Marginal Revenue	Total Cost	Marginal Cost
0	0	0	12	–
1	10	10	14	2
2	20	10	15	1
3	30	10	17	2
4	40	10	20	3
5	50	10	25	5
6	60	10	35	10
7	70	10	50	15
8	80	10	81	31

In the above table when the firm produces the sixth unit, MR = MC. The firm is said to be in equilibrium when it produces 6 units which is the profit maximising level of output.

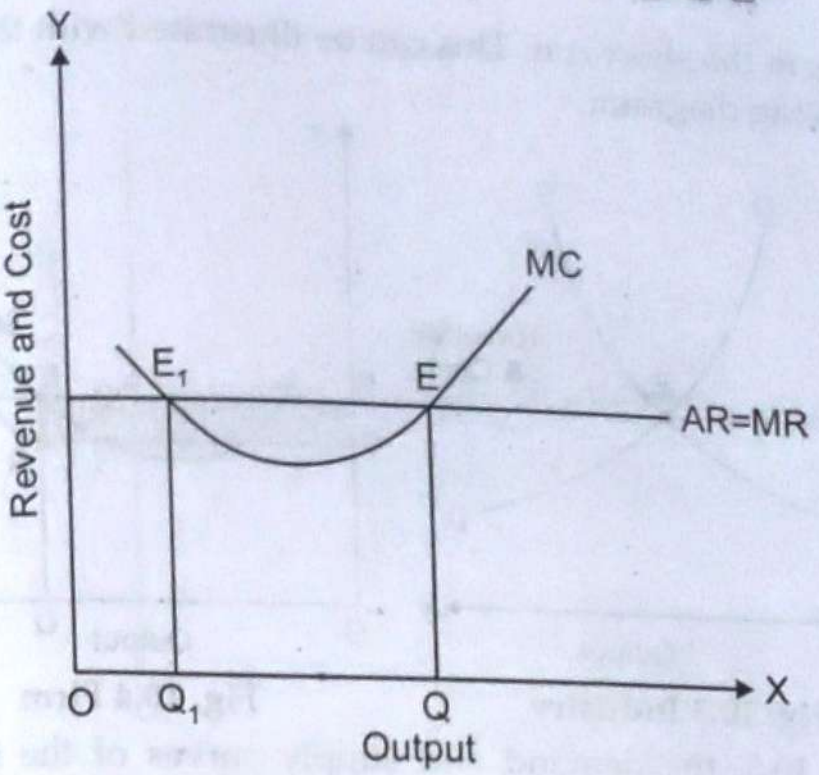


Fig. 10.2

In the above diagram AR and MR coincide with each other and is represented by a horizontal straight line. The MC cuts the MR curve at two points E and E_1. At E_1 MC is cutting MR from above. After this point MC lies below MR curve and it is profitable for the firm to produce more. At point E, MR = MC and the MC curve cuts the MR curve from below. As long as MR is greater than MC, it is profitable to increase production. Thus there are two conditions to be satisfied for the firm to attain equilibrium **(1)** MR = MC **(2)** MC curve cuts MR curve from below. The first one is the necessary condition but not a sufficient one. The second condition has to be satisfied for the firm to attain equilibrium and maximise profits.

SHORT RUN EQUILIBRIUM OF THE FIRM AND INDUSTRY:

Under perfect competition, the market price is determined by the forces of demand and supply. The equilibrium price is determined at the point where the demand and supply curves intersect each other. This price determined by the industry has to be accepted by the individual firm and it can sell as much output as it wants at that price. The firm will attain equilibrium at that point where MR = MC and the MC curve cuts the MR curve from below. The individual firms may earn super normal profits or

incur loss in the short run. This can be illustrated with the help of the following diagram:

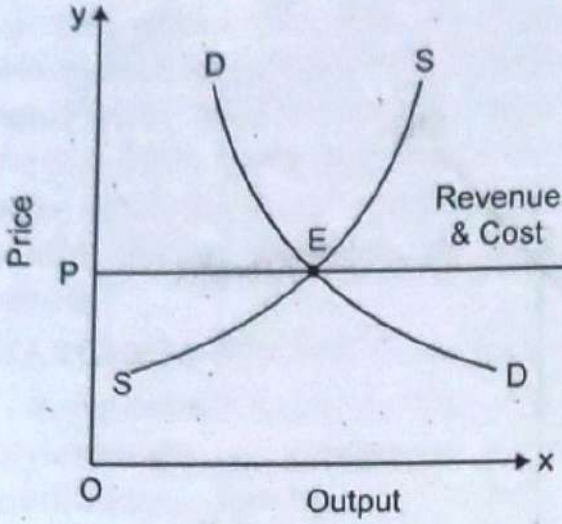


Fig. 10.3 Industry

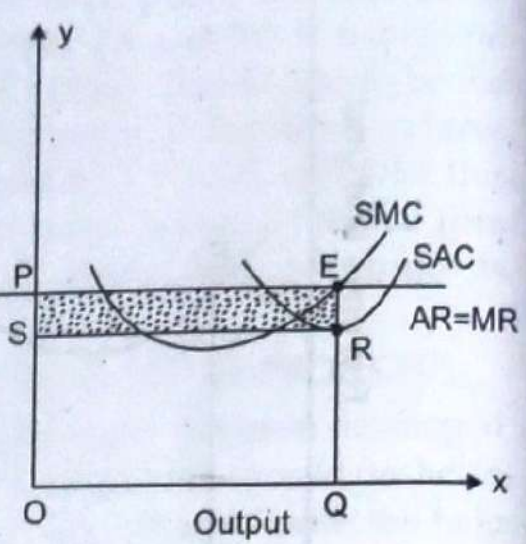


Fig. 10.4 Firm

In Fig. 10.3, the demand and supply curves of the industry intersect each other at point E. The equilibrium price is OP. This price is accepted by the individual firm and it can sell as much output as possible at this price.

In Fig. 10.4 the individual firm's short run marginal cost curve cuts the MR curve from below at point E. At this point MR = MC and the MC curve cuts MR from below. Therefore E is the equilibrium point. The firm's total revenue is OQEP. The total cost incurred by the firm is OSRQ. Therefore the difference between the two i.e. PERS is the super normal profits earned by the firm. In the short run, the firm can incur losses also. It can be represented below:

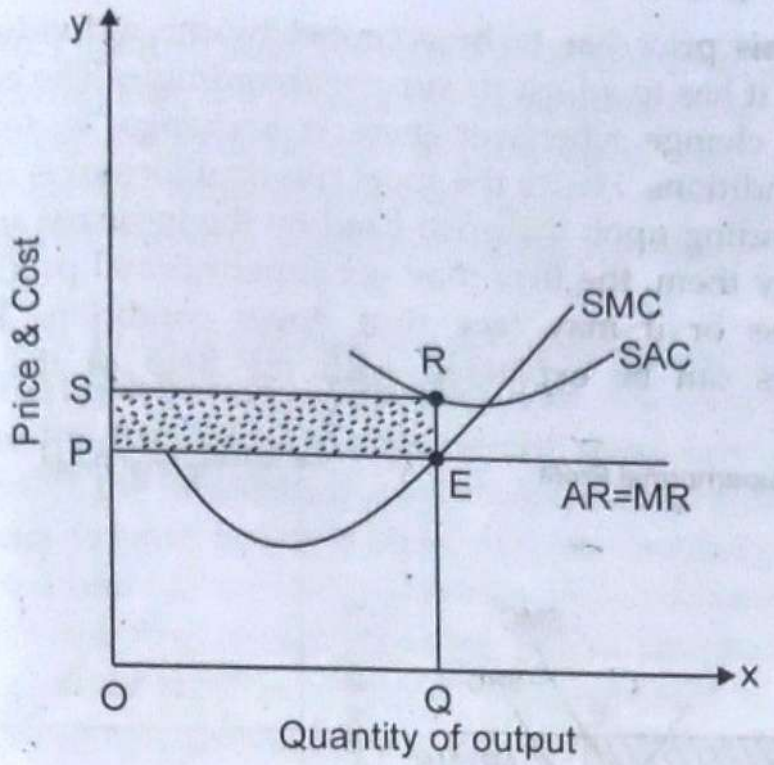


Fig. 10.5

In this diagram E is the point of equilibrium. AC curve lies above AR curve indicating that average cost is more than average revenue. Here the total cost is OQRS, total revenue is OQEP and the different between the two represents the loss incurred by the firm. Therefore loss is equal to PERS, the shaded portion in the diagram.

In the short run under perfect competition, business firms may incur loss or they may get super normal profits. If they earn super normal profits, more firms will be attracted to the industry. This is possible due to free entry. Due to the increase in the number of firms, supply will increase and this will reduce the price and in the long run super normal profits will become normal profits. On the other hand if some firms incur loss, they will leave the industry. Supply will become less, price will rise and this will help the firm to wipe out the losses. Hence in the long run all the firms will be in equilibrium and hence the industry will also be in equilibrium. In the short run the firms may be in equilibrium but the industry may not be in equilibrium.

Profit, Loss and Shutdown Point:

In the short run under perfect competition the equilibrium price is determined by the industry according to demand and

supply. This price has to be accepted by the individual firm as given and it has to adjust its supply accordingly. The equilibrium price will change whenever there is a change in demand and supply conditions. Hence the short run equilibrium is not a stable one. Depending upon the price fixed by the industry and the cost incurred by them, the firm may get super normal profits, normal profits, loss or it may face shut down condition. These four possibilities can be explained with the help of the following diagram:

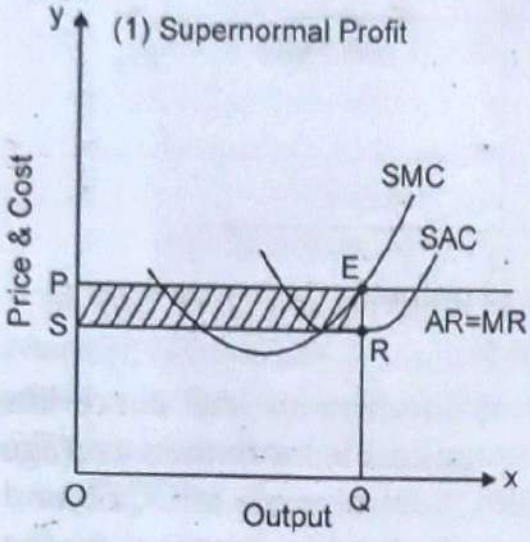


Fig. 10.6

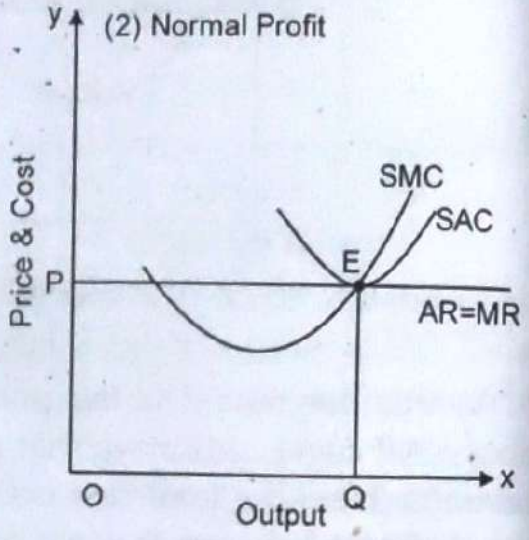


Fig. 10.7

In Fig. 10.6, the firm earns super normal profits. It is indicated by the shaded portion PERS.

In Fig. 10.7 the firm is in equilibrium at point E where MR = MC, MC curve cuts MR from below and AR = AC. Therefore the firm earns normal profits.

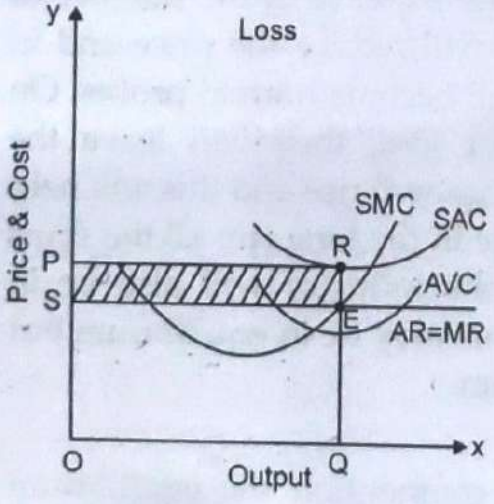


Fig. 10.8

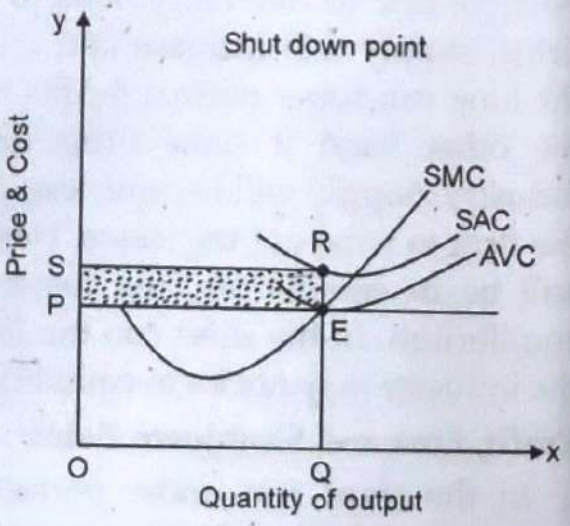


Fig. 10.9

In Fig. 10.8 the firm's AC curve is above AR curve. Though the firm is incurring loss, it will continue its production as long as it is able to recover the variable cost of production. Here the firm is able to recover the variable cost and a part of the fixed cost. The loss incurred by the firm is equal to PRES, the shaded portion in the diagram.

In Fig. 10.9, price is OP and it is equal to the average variable cost. The fixed cost per unit is RE (QR – QE). The total fixed cost is PERS. Here the firm's loss is equal to the fixed cost. If the price falls below OP, the loss will be more than the fixed cost. The point E where price is equal to the average variable cost is known as the shut down point. If price falls below this minimum average variable cost, the firm will close down. Thus a firm has to recover variable cost in the short run to continue production.

LONG RUN EQUILIBRIUM OF THE FIRM AND INDUSTRY:

Long run is a time period which enables the firms and industry to change the scale of production. All factors are variable in the long run. The industry will be in equilibrium when all the firms make normal profits. When the firms earn normal profits, there is no tendency on the part of the firms to enter or leave the industry. The long run equilibrium can be explained with the help of the following diagram:

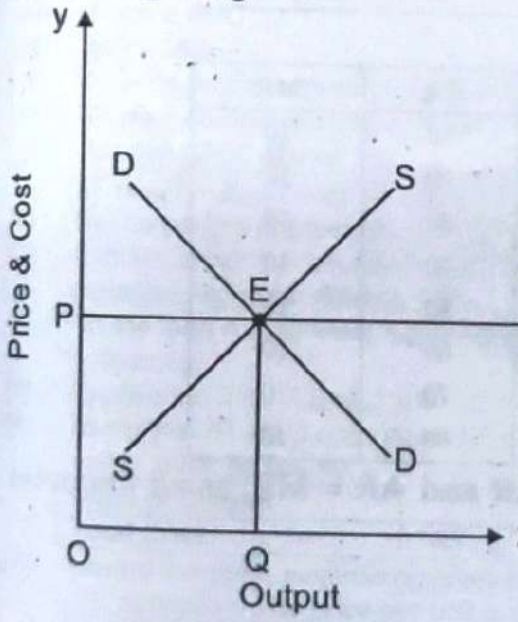


Fig. 10.10

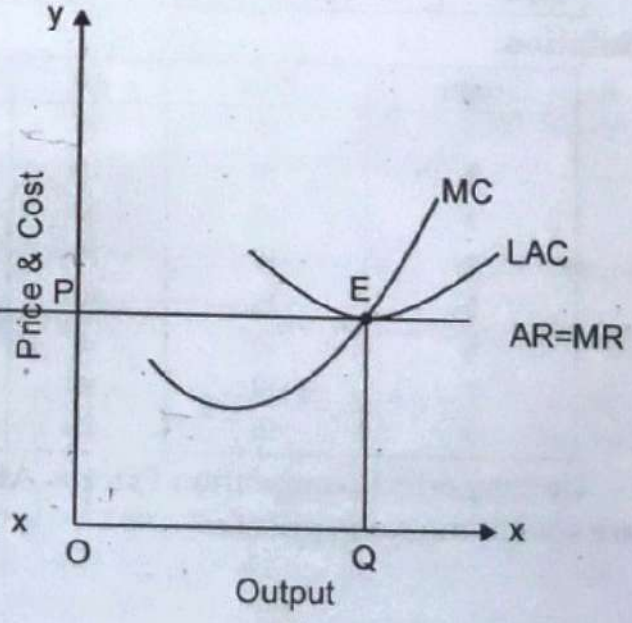


Fig. 10.11

In Fig. 10.10, the demand and supply curves of the industry intersect each other at point E, OP is the equilibrium price and OQ is the equilibrium quantity demanded and supplied.

In Fig. 10.11, the two conditions for equilibrium is satisfied at point E. The firm accepts the price given by the industry as given and sells OQ amount of output. At point E, AR = AC, MR = MC and the MC curve cuts MR from below. The firm earns only normal profits. When all the firms earn normal profits, the industry is said to be in equilibrium.

Of all the market structures perfect competition is said to be the ideal market structure. It ensures optimum utilisation of resources. The output produced is more, the price charged is nominal and it avoids exploitation of labour. In reality however it does not exist. To some extent it can be seen in agriculture. Though it is not found in reality, in economic theory, perfect competition occupies an important place.

NUMERICALS FROM UNIVERSITY EXAMS

Ex. 1:

Construct a revenue structure of a firm under perfect competition on the basis of following data:

Units	1	2	3	3	5	6	7	8
Price	10	10	10	10	10	10	10	10

Solution:

Units	Price	AR	TR	MR
1	10	10	10	10
2	10	10	20	10
3	10	10	30	10
4	10	10	40	10
5	10	10	50	10
6	10	10	60	10
7	10	10	70	10
8	10	10	80	10

Under perfect competition Price = AR and AR = MR, as all the units are sold at the same price.

QUESTIONS FOR REVIEW

(1) **Define the following:**
- (a) Market.
- (b) Perfect Competition.
- (c) Economic Profits.
- (d) Nominal Profit.
- (e) Shut Down Point.

State whether the following statement are true or false:
- (a) Perfectly competitive firm is a price taker. ***(Oct. 16)***
- (b) A firm under perfect competition incurs a huge promotional expenditure.
- (c) All firms under perfect competition earn normal profits in the long run.
- (d) Shut down point occurs at the point where price is equal to AVC.
- (e) Perfect competition is a realistic market structure.
- (f) Under perfect competition AR is always equal to MR.
- (g) A firm under perfect competition incurs heavy selling cost. ***(Oct. 18)***
- (h) Advertisements expenditure are huge for a perfectly competitive firm. ***(BIM, Oct. 18)***
- (i) Selling cost does not exist under perfect competition.
- (j) In the short run, a firm should recover the fixed cost to continue production.

***[Ans.:** (a) True; (b) False; (c) True; (d) True; (e) False; (f) True; (g) False; (h) False; (i) True; (j) False]*

Fill in the Blanks:
- (a) _____ market is theoretical concept.
- (b) Under perfect competition, the products are _____.

***[Ans.:** (a) Perfect; (b) Homogeneous]*

Match the following:

(A)	(B)
(1) Industry	(a) Long run
(2) Super normal profits in perfect competition	(b) Shut down point
(3) Price < AVC	(c) Equilibrium
(4) MR = MC	(d) Short run
(5) Normal profits in perfect competition	(e) Price maker
(6) Perfect competition ***(March 19)***	(f) Place for buying and selling of goods
(7) Market ***(BIM, March 19)***	(g) Large number of buyers and sellers/ horizontal demand curve

***[Ans.:** (1 – e); (2 – d); (3 – b); (4 – c); (5 – a); (6 – g); (7 – f)]*

(2) Define perfect competition. Explain its features.

(3) Explain short run equilibrium of the firm under perfect competition with the help of suitable diagrams. ***(March 17)***

(4) "In the long run all firms make normal profits and hence the industry is in equilibrium" – Discuss.

(5) Explain the TR – TC and MR – MC approaches regarding the equilibrium of the firm.

(6) Using the TR – TC approach calculate the profit maximising level of output. Price per unit is given as Rs. 40.

Units of Output	1	2	3	4	5	6	7
Total Cost	25	28	35	44	65	95	140

(7) Locate the profit maximising level of output from the following information. Use MR – MC approach. The price per unit is given as Rs. 20.

Quantity	0	1	2	3	4	5	6	7
Total Cost	24	28	30	34	40	50	70	95

(8) Comment on the following statements:
- (a) Homogeneous price prevails in the perfectly competitive market.
- (b) An individual firm under perfect competition can influence the price in the market.
- (c) Under perfect competition AR = MR = Price both in the short run and long run.
- (d) Supernormal profits are always earned by firms under perfect competition.
- (e) Perfectly competitive firms incur huge advertisement expenditure due to severe competition.

(9) Explain how equilibrium price is determined under perfect competition.

(10) Give diagrammatic representation of the following:
- (a) Short run equilibrium of the firm.
- (b) Long run equilibrium of the firm.

(11) Explain the concept of long run equilibrium of a firm in perfect competition, with the features of perfect competition market structure. ***(Oct. 16)***

(12) Distinguish between perfect competition and monopoly. ***(BIM, Oct. 17)***

(13) What is perfect competition and what are its features? ***(Oct. 17)***

(14) Explain the long-run equilibrium of price and output of the industry under perfect competition. ***(Oct. 18)***

(15) How does the industry attain equilibrium of price and output under perfect competition in long-run? ***(BIM, Oct. 18)***

(16) How does a firm attain equilibrium in long run under perfect competition?

(17) What is market? Examine the various types of market. ***(BIM, March 19)***

(18) What are the characteristics of perfect competition? ***(BIM, March 19)***

(19) Explain the concept of long run equilibrium of a firm in perfect competition with the help of diagram.

(20) Discuss long run equilibrium of a firm under perfect competition.

(21) **Write short notes:**
- (a) Perfect Competition.

(22) Find out the profit maximizing level of output from the following data. Price per unit is Rs. 5.

Quantity of output	0	20	40	60	80	100	120	140	160	180
Total Cost (Rs.)	100	220	260	320	400	420	480	560	650	900

- (a) Find out breakeven point output both lower and upper.
- (b) Identify the level of output at which total loss is maximum.

11

Monopoly

FEATURES

EQUILIBRIUM OF THE MONOPOLY FIRM IN THE SHORT RUN AND LONG RUN

DISTINCTION BETWEEN PERFECT COMPETITION AND MONOPOLY

FEATURES:

Monopoly is a market structure characterised by the existence of a single seller. It exhibits the following features:

(1) A single seller has complete control over the supply of the commodity.

(2) There are no close substitutes for the product.

(3) There is no free entry and exit. There are many restrictions on entry and exit.

(4) It is a complete negation of competition.

(5) A monopoly firm has complete control over the price policy. The firm is a price maker under monopoly.

(6) Since there is a single firm, the firm and industry are one and the same.

(7) The industry faces a downward sloping demand curve. This implies that he can sell more by reducing the price. Though he is a price maker he does not have unlimited power. He cannot fix the price and the quantity to be sold. He has to fix either the price or the quantity and leave the other to the

market. The monopolist has to consider the elasticity of demand for his product while fixing the price.

(8) There are no immediate rivals for the firm.

Monopoly is also defined in terms of absolute monopoly and limited monopoly. Absolute monopoly implies that a single seller has complete control over the market. There are no substitutes and no competition. In reality it is not possible to have absolute monopoly. In practice limited or simple monopoly exists. In limited or simple monopoly, the product will have some remote substitutes.

EQUILIBRIUM OF THE MONOPOLY FIRM IN THE SHORT RUN AND LONG RUN:

Short Run Equilibrium: The monopoly firm will be in equilibrium when the firm gets maximum profits. The demand curve faced by a monopolist is a downward sloping curve. It implies that the monopolist can sell more only when he reduces the price. Though the firm has no competition, it cannot control both price and quantity. If one is determined the other is implied. The downward sloping demand curve is the average revenue curve. The marginal revenue curve lies below it. The monopolist will be in equilibrium when two conditions are satisfied i.e. MR = MC and the MC curve cuts the MR curve from below. The first one is a necessary condition and the second one is a sufficient condition. The monopoly firm may get supernormal profits in the short run or it may incur loss. As long as the price is above average variable cost, the firm will continue to produce in the short run. If the price is below average variable cost the firm has to shut down. The equilibrium of the monopoly firm can be explained with the help of the following diagrams:

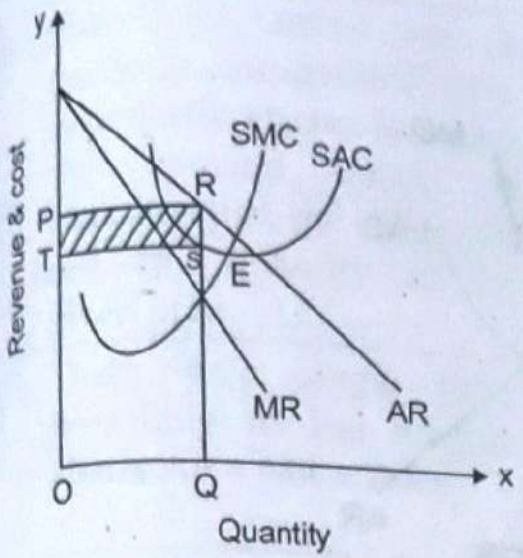


Fig. 11.1

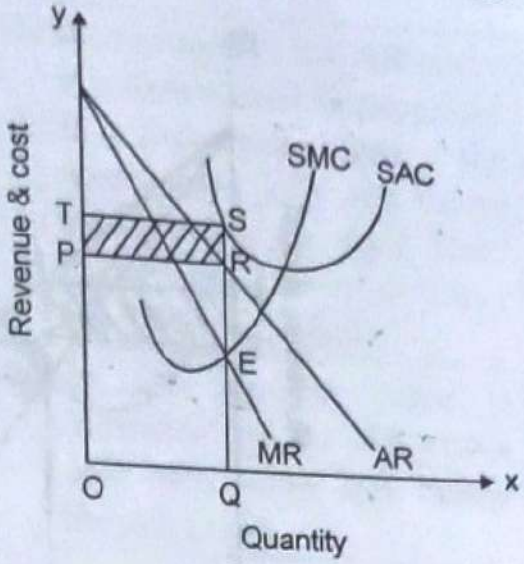


Fig. 11.2

In Fig. 11.1, the monopoly firm attains equilibrium at point E where MR = MC and the MC curve cuts the MR curve from below. The equilibrium quantity of output is OQ and the price is OP. Average revenue is QR while average cost is SQ. Therefore profit per unit is RS. The total profit earned is equal to PRST i.e. the shaded portion in the diagram. In Fig. 11.2, the firm incurs loss as average cost is more than average revenue. The loss incurred by the firm is equal to PRST, the shaded area in the diagram.

The monopoly firm stops production even before the optimum level is reached i.e. when average cost is falling, the firm stops production. The firm does not produce till the minimum average cost is attained. In other words the firm does not produce the optimum level of output. The firm can either set the price or the quantity of output to be sold but not both. The monopoly power depends upon cost conditions and elasticity of demand.

Long Run Equilibrium of the Monopoly Firm: In the long run all factors are variable. The monopoly firm can change the size of the plant, hire new technology and expand the scale of operation. The firm will be in equilibrium when MR = MC and the MC curve cuts MR curve from below. The monopoly firm generally earns super normal profits due to the absence of rivals.

Long run equilibrium of the firm can be explained with the help of the following diagram.

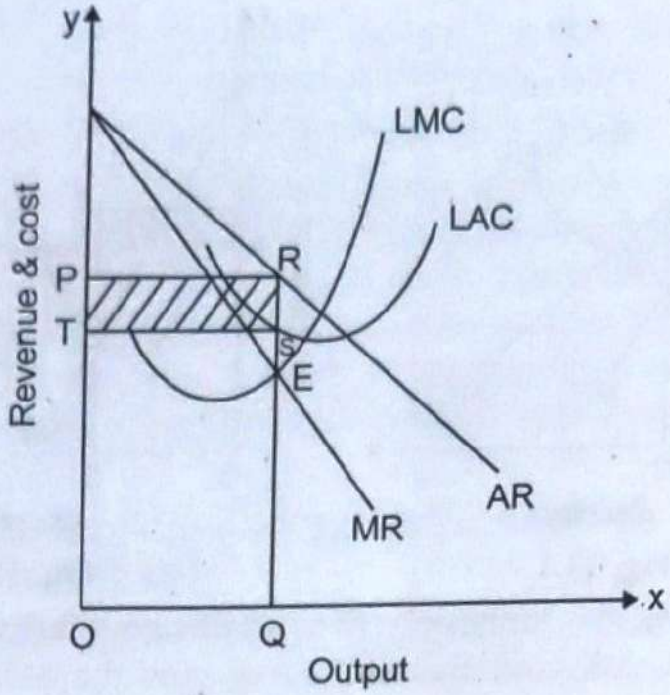


Fig. 11.3

The firm attains equilibrium at point E. The firm makes supernormal profits equivalent to PRST. Entry barriers and absence of rivals ensure supernormal profits for the monopoly firm both in the short run and long run.

DISTINCTION BETWEEN PERFECT COMPETITION AND MONOPOLY:

Perfect Competition	Monopoly
(1) It is a market structure where there are large number of sellers and buyers.	(1) It is a market structure where there is a single seller.
(2) Here firm and industry are different.	(2) Here firm and industry are one and the same.
(3) The goods are close substitutes for each other.	(3) Goods here do not have close substitutes.
(4) There is free entry and exit.	(4) There is no free entry and exit.
(5) The firm is a price taker.	(5) The firm is a price maker.

(6) The AR curve for a perfectly competitive firm is perfectly elastic. It is also the demand curve. It indicates that the seller can sell any quantity at the given price.	(6) In monopoly, the AR curve is a downward sloping one. It indicates that the monopolist can sell more by reducing the price. Here the average revenue curve is relatively inelastic.
(7) There is a single price prevailing in the market. Hence AR = MR = Price.	(7) In this market price is indicated by the AR curve and MR curve lies below the AR curve.
(8) Under perfect competition Price = MC.	(8) Under monopoly price is greater than marginal cost.
(9) Perfectly competitive firms always aim at optimum output. In the long run especially the MC curve cuts the AC curve at its minimum point.	(9) In monopoly the firm does not produce the optimum output. It stops production before the minimum point on the AC is attained.
(10) While the price is generally low in perfect competition the output is more.	(10) Here the price is high and output is less.
(11) In the long run, only normal profits are earned by a perfectly competitive term.	(11) The firm can earn supernormal profits both in the short run and long run.
(12) The firm under perfect competition attains equilibrium only when two conditions are satisfied. Both the conditions are important.	(12) Under monopoly the two conditions are required. However a monopoly firm can attain equilibrium even if the second condition is not satisfied. A monopoly firm may operate under different cost conditions like increasing, decreasing and constant cost conditions.

(13) The monopoly power is zero because demand is perfectly elastic.	(13) The monopoly power varies between zero and one as demand is relatively inelastic.
(14) Price discrimination is not possible in perfect competition as consumers have complete knowledge about the market.	(14) In monopoly price discrimination is very much possible.

QUESTIONS FOR REVIEW

(1) Comment on the following statements:

(a) A monopoly firm is a price maker.
(b) A monopolist has complete control over the market.
(c) Monopoly and perfect competition are mutually exclusive to each other.
(d) A monopoly firm always makes supernormal profits.
(e) A monopoly firm can control both output and price at the same time.
(f) A monopolist can sell more output at a higher price.

Fill in the blanks:

(a) Monopoly is a complete negation of _____.
(b) The demand curve faced by a monopoly firm is _____.
(c) A monopoly firm is a _____.
(d) Indian Railways is an example of _____ monopoly.
(e) In pure monopoly cross elasticity of demand is _____.

[Ans.: (a) competition; (b) downward sloping; (c) price maker; (d) public; (e) zero]

Match the Following:

Group A	Group B
(1) Price maker	(a) Sources of monopoly
(2) Legal protection	(b) Monopolist

[Ans.: (1 – b); (2 – a)]

State whether the following statements are True or False:

(a) Demand curve of monopolist is sloping upward from left to right. ***(Oct. 17)***
(b) A monopolist is a price taker. ***(March 18)***
(c) A monopoly firm and industry are identical. ***(Oct. 18)***
(d) In monopoly price is determined by market demand and market supply. ***(BIM, March 19)***
(e) There is no entry for a new firm to a monopoly market.
(f) A monopoly firm always enjoys supernormal profit in short run production function.
(g) In a monopoly market firm and industry are the same.

[Ans.: (a) False; (b) False; (c) True; (d) False; (e) True; (f) False; (g) True]

(2) Define monopoly. What are its features?
(3) What is monopoly? What are its features? ***(March 17)***
(4) Explain the features of monopoly.
(5) Distinguish between perfect competition and monopoly.
(6) Explain the equilibrium of a monopoly firm both in the short run and long run.
(7) Explain the short run equilibrium of a firm under monopoly. ***(March 18)***
(8) Explain short run equilibrium of a monopoly firm.

(9) Explain the equilibrium of a monopoly firm in the short period.

(10) Discuss the short-run equilibrium of price and output under the monopolist firm. ***(BIM, Oct. 18)***

(11) How perfect competition form of market structure is different from monopoly market? ***(March 19)***

(12) Explain the long run equilibrium of a firm under monopoly. ***(March 19)***

(13) **Write short notes on:**

(a) Features of monopoly.

(b) Types of monopoly.

(c) Distinction between monopoly and perfect competition.

(d) Equilibrium of the firm in the short run and long run.

(14) Find the profit maximising level of output using TR – TC approach from the following data:

Quantity	1	2	3	4	5	6
Price	200	180	160	140	120	100
Total Cost	100	130	170	185	210	250

(15) Find the equilibrium price and quantity for the monopoly firm from the following information:

Quantity	1	2	3	4	5
Price	120	110	100	90	80
Marginal Cost	70	75	80	85	90

12

Monopolistic Competition

FEATURES
EQUILIBRIUM OF A FIRM UNDER MONOPOLISTIC COMPETITION
PERFECT COMPETITION AND MONOPOLISTIC COMPETITION
PRODUCTION COST AND SELLING COST

FEATURES:

Monopolistic competition is a combination of monopoly and competition. Pure monopoly and perfect competition do not exist in reality. In the real word, markets have both the elements of monopoly and competition and hence the markets are imperfect. The concept of monopolistic competition was developed by Prof. Chamberlin, a famous American economist.

The main features of monopolistic competition are as follows:

(1) **Large number of sellers:** There are large number of sellers sharing a small share of the market demand for a product. They produce differentiated products which are close substitutes for each other. Due to this, the competition is very severe under monopolistic competition. Presence of large number of sellers also indicates that the size of firms will be relatively small.

(2) **Product differentiation:** Though the products produced by them are identical, they are differentiated in some form or the other. In other words the products produced by the firms are not the same but similar. The price of the products cannot be very much different from each other as their products are similar. This feature also indicates the tough competition prevailing among the firms.

(3) **Influence over the price:** Firms under monopolistic competition have some amount of control over the price. Its products have close substitutes in the market. If the price of a product is reduced demand will go up and vice versa. Hence the demand for the substitutes will also vary. The firm faces a downward sloping demand curve which is the AR curve and the MR curve lies below it. The firm is not a price taker and it has to decide about the price – output combination to maximise its profits.

(4) **Selling cost:** This is a unique feature of monopolistic competition. Selling cost refers to the cost incurred on advertisement, sales promotion, etc. In perfect competition and monopoly, there is no need for selling cost. Under monopolistic competition firms compete with each other through advertisement. This is known as non-price competition. Through selling cost, the preferences of the customers are influenced and firms aim at attracting more customers.

(5) **Large number of buyers:** This market structure like perfect competition has a large number of buyers. Buyers have ample choice in selecting the goods as close substitutes are available. Buyers also develop a preference for a particular brand and have a tendency to stick to the brand.

(6) **Free entry and exit:** There are no barriers to entry under monopolistic competition. Exit is also equally easier. Though there is free entry and exit, it is not like perfect competition where a new firm can produce the same commodity produced by others and can compete in the market. Here the new firm has to develop a differentiated product and compete with the already existing ones.

(7) **Concept of group:** While developing the theory of imperfect competition, Prof. Chamberlin introduced the concept of group to replace the concept of industry. An industry refers to a cluster of firms producing the same commodity. Here the firms are producing differentiated products which are close substitutes for each other. Hence the term industry cannot be applied here. A more relevant concept 'group' was introduced. It implies a collection of firms producing differentiated products which are close substitutes for each other.

(8) **Price and non-price competition:** Firms in this market compete both through price as well as through non-price competition. Non-price competition implies competition through advertisement, sales promotion, etc.

Thus monopolistic competition combines the features of perfect competition and monopoly. Some of the examples for monopolistic competition are:

(1) Different brands of tooth pastes, soaps, shampoos.

(2) Large number of provision stores, medical stores.

(3) Variety of newspapers and magazines.

(4) Food plazas, beauty parlours, etc.

The firms specialising in selling the above goods and services compete on the basis of location, brand name etc. In all these cases, it is possible to enter and exit easily. Each brand has its own loyal customers. Monopolistic competition provides lot of choice to the consumers.

EQUILIBRIUM OF A FIRM UNDER MONOPOLISTIC COMPETITION:

Equilibrium of a firm under monopolistic competition depends upon the price of the product, the nature of the product and its advertisement expenditure.

A firm under monopolistic competition has monopoly over its product due to product differentiation. At the same time it faces competition from its rivals who produce close substitutes. Hence the demand curve (AR curve) is a downward sloping one and it is also more elastic. The firm can sell more by reducing the price.

Demand curve is more elastic due to the availability of close substitutes. For the sake of simplicity it is assumed that except the price of the product of the firm all other factors namely nature of the product, selling cost of the firm and its rivals are constant. Under such conditions a firm under monopolistic competition will attain equilibrium at the point where MR = MC and MC cuts MR from below. This can be explained with the help of the following diagram:

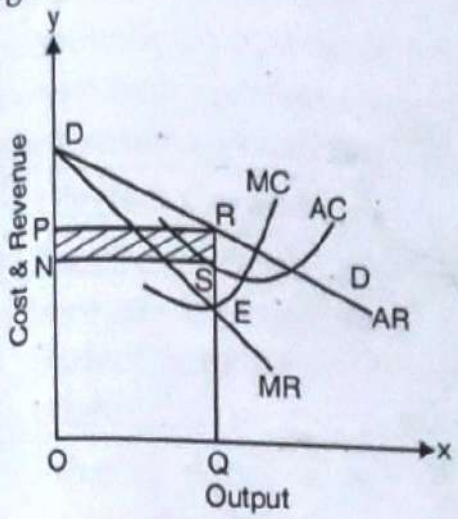


Fig. 12.1

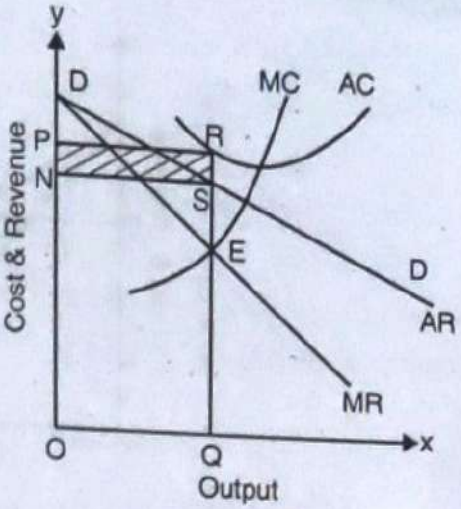


Fig. 12.2

In figure 12.1, the DD curve is the AR curve. It slopes downwards from left to right indicating more output can be sold at a lesser price and vice versa. The average cost curve slopes downwards due to economies of scale, reaches a minimum point and then slopes upwards due to diseconomies of scale.

The equilibrium point is attained at the point where MR = MC and MC curve cuts MR from below. In the above figure 'E' is the equilibrium point. OQ is the equilibrium level of output. Average revenue is equal to QR or OP and average cost is equal to QS. Profit per unit is RS. The total profit earned by the firm is PRSN. Thus here the firm is earning supernormal profits. In the short run, the firm may make supernormal profits or losses.

In figure 12.2, the demand curve or AR curve lies below the AC curve, while the price is ON, AC is OP. At the equilibrium level of output OQ, the firm is incurring losses to the extent of PRSN. The shaded portion, in both the figures represents supernormal profits or losses.

When the firms make supernormal profits in the short run, other firms producing close substitutes will enter the market. Due to this the demand curve or AR curve will keep shifting to the left till it becomes tangent to the AC curve at one point. At this point AR = AC and the supernormal profits will disappear. The firm will earn only normal profits in the long run. The long run equilibrium can be explained with the help of the following diagram:

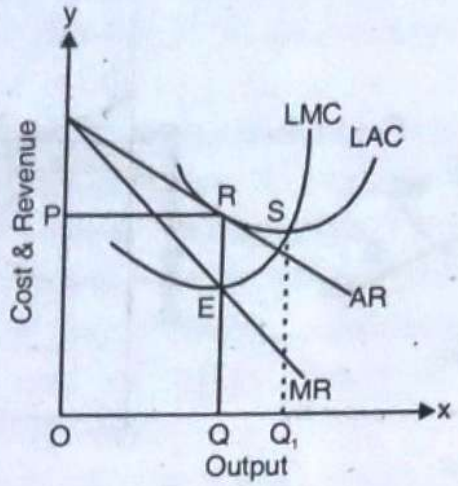


Fig. 12.3

In the above figure, equilibrium is attained at point 'E' where MR = MC and MC cuts MR from below and AR = AC= OP = QR. Here the firm earns only normal profits. When all the firms in the 'Group' earn normal profits, there will be group equilibrium provided the cost and revenue curves are alike. When normal profits are earned, other firms will not find it attractive to enter the market. Thus, in the long run firms under monopolistic competition enjoy normal profits.

Firms under perfect competition and monopolistic competition earn normal profits in the long run. However there are vital differences between the two. A perfectly competitive firm produces the optimum output. It produces the optimum output at the minimum average cost. Its output is larger and price is lower. In the case of a firm under monopolistic competition, price is high and output is not optimum. This is evident from the above figure. The AR curve is tangent to the falling portion of the AC curve at point R. It is not at the minimum average cost i.e. point S. The firm can produce upto OQ_1. However it stops at OQ. Therefore QQ_1 amount of output is not produced. Though the firm has the

capacity to produce, it is not producing. This is called Excess Capacity. Firms under monopolistic competition thus earn normal profits in the long run though they have monopoly power over their product due to product differentiation.

DISTINCTION BETWEEN PERFECT COMPETITION AND MONOPOLISTIC COMPETITION:

Firms under monopolistic competition face a number of complexities compared to perfectly competitive firms. While monopolistic competition has certain features of competition, it is different from perfect competition in various aspects. These two market structures can be distinguished as follows:

Perfect Competition	Monopolistic Competition
(1) The products produced here are homogeneous and perfect substitutes for each other.	(1) Here the products are differentiated and are close substitutes for each other.
(2) Price is equal to marginal cost under this market.	(2) Price is greater than marginal cost here.
(3) Optimum output is produced here.	(3) The output produced here is less than the optimum.
(4) There is no excess capacity and no wastage of resources.	(4) Excess capacity exists and there is wastage of resources.
(5) There is no scope for product differentiation.	(5) Product differentiation is one of the important features.
(6) Selling cost is irrelevant here.	(6) Selling cost plays a crucial role here.
(7) Equilibrium of the firm and industry exists here.	(7) Group equilibrium exists here.
(8) Perfect competition is ideal market structure.	(8) Monopolistic competition is a realistic market structure.

There is often a debate whether monopolistic competition promotes or reduces the welfare of the society. On the one hand it promotes the welfare of the consumers by offering a variety of

goods, on the other hand it has a number of limitations which reduces social welfare. Some of them are

(1) Firms under monopolistic competition suffer from excess capacity. They attain equilibrium not at the lowest point of the average cost curve but before that.

(2) The output produced here is less compared to a perfectly competitive firm.

(3) The prices are higher than that prevails in a competitive market.

(4) As the resources are not utilised efficiently, the problem of unemployment gets aggravated.

(5) Firms spend a huge amount on advertising. While constructive advertising is good, combative advertising leads to wastage of resources. While the former one creates awareness and educates the consumers, the latter aims at eliminating competition which is a wasteful expenditure.

Inspite of the limitations, monopolistic competition is a realistic market structure. Some economists do not attach much importance to wastes of monopolistic competition. According to them product differentiation offers a wide choice to people and less output and a high price are the price to be paid for the variety of products. Though perfect competition is the ideal market structure, in reality the market structure is monopolistic competition.

SELLING COST AND PRODUCTION COST:

Economists often make a distinction between production cost and selling cost. The major points of differences are:

Production Cost	Selling Cost
(1) It refers to the cost incurred in producing a commodity to satisfy the demand of the consumers.	(1) It refers to the cost incurred on advertisement sales promotion, etc. to induce demand for the product.
(2) This results in the creation of utilities.	(2) It leads to shift in demand.

(3) They are incurred to adapt the product to the demand. i.e. this is incurred to satisfy the demand of the consumers.	(3) They are incurred to adapt the demand to the product. i.e. This is incurred to influence the demand of the consumers.
(4) Increase in this cost leads to an increase in production. i.e. supply.	(4) Increase in this cost leads to increase in demand.

In spite of these differences, sometimes it is difficult to divide cost of production into production and selling cost. For example if additional cost is incurred in packing a product, it is not clear whether it is production or selling cost. However expenditure incurred on advertising sales promotion etc. constitute selling cost. Business firms consider both production and selling cost while determining the price of the product.

DEBATE OVER ROLE OF ADVERTISING:

Advertising expenditure is an important component of selling cost under monopolistic competition. Selling cost includes advertisement expenditure, salaries of salesmen, display expenses other promotional expenses etc. Firms under monopolistic competition produce differentiated products which are close substitutes for each other. Hence it is necessary for them to attract customers through advertisements. They highlight the special features of the product to increase the demand for their product at the expense of others. This can be seen in various products like soaps, shampoos, toothpastes etc. When the consumers are influenced by the advertisements, demand for the product will rise. The demand curve will shift to the right indicating increase in demand at the same price.

Advertisement outlay enables the firm to reap increasing returns in the beginning due to economies of scale. Initially when advertisement outlay increases, more customers are attracted to the product due to the influence of repeated advertisements. However after sometime increase in outlay will lead to diminishing returns as the existing buyers will not buy more and new buyers will not be influenced by the advertisement. The

effect of advertising depends on the elasticity of demand and average cost of production.

The role of advertising in influencing demand conditions is often a matter of debate. It is a mixed bag as it has both merits and demerits. **The main merits are:**

(1) Advertising provides information about the product enabling the customer to make the right choice. Informative role is a very positive one.

(2) Firms can widen their markets through advertisement. New areas can be penetrated with the help of advertisement in print and electronic media.

(3) Through advertisement, competition gets a boost. Entry of new firms prevents monopoly firms' dominance in the market.

(4) Advertising outlay is an essential component of selling cost. When firms use advertising to promote their products, other components of selling cost like expenditure on sales force can be reduced.

The demerits of advertising are:

(1) Advertisement can be misleading by giving false information. This will result in consumers making wrong choices.

(2) If advertisement outlays are increased by firms at the cost of research and development, innovations etc, the firm will suffer in the long run and lose out in the competition.

(3) If advertisement expenditure is incurred by firms for artificial product differentiation, then it is said to be unjustified.

(4) Large firms have the resources to allot a huge outlay for advertisement. The small firms find it difficult to have substantial allocation for advertisement. This condition eventually results in monopoly or oligopoly.

Though there are limitations, advertisement has become a part and parcel of business today. As long as it is informative and educative it is said to be productive and fully justified. If it is misleading and predatory then it is totally unjustified. The business firms have to consciously adopt advertising for promoting their product but not at the cost of the competitors.

QUESTIONS FOR REVIEW

(1) **Define the following:**
- (a) Monopolistic competition.
- (b) Group.
- (c) Selling price.
- (d) Product differentiation.
- (e) Excess capacity.

Match the following:

	(A)		(B)
(1)	Selling cost and product differentiation ***(BIM, Oct. 18)***	(a)	Prof. Chamberlin
(2)	Concept of Group ***(BIM, Oct. 18)***	(b)	Monopolistic Competition
(3)	Selling cost ***(BIM, March 19)***	(c)	Monopolistic Competition
(4)	Selling cost may increase	(d)	Demand
(5)	Monopolistic competition	(e)	Selling cost

[Ans.: (1 – c); (2 – a); (3 – b); (4 – d); (5 – e)]

State whether the following statements are true or false.
- (a) Monopolistic competition is a combination of perfect competition and monopoly.
- (b) Under monopolistic competition firms produce identical products which are close substitutes.
- (c) Selling cost is a unique feature of monopolistic competition. ***(Oct. 16)***
- (d) Optimum output is produced by firms under monopolistic competition.
- (e) Monopolistic competition is the most ideal market structure.
- (f) Product sold in monopolistic competition is differentiated. ***(March 17)***
- (g) In a monopolistic market a product has no close substitute. ***(BIM, Oct. 17)***
- (h) Product sold in monopolistic competition is differentiated. ***(March 19)***
- (i) Demand curve under monopolistic competition is more elastic.

[Ans.: (a) True; (b) True; (c) True; (d) False; (e) False; (f) True; (g) False; (h) True; (i) True]

Fill in the blanks:
- (a) Selling cost is the cost incurred on _____.
- (b) The concept of 'group' was introduced by _____.
- (c) There is price and _____ competition in monopolistic competition.
- (d) In the long run firms under monopolistic competition make _____ profits.
- (e) Excess capacity leads to reduction in _____.
- (f) Soft drinks are example of _____ market structure. (perfect competition, monopoly, monopolistic competition)

[Ans.: (a) advertisement and promotions; (b) Prof. Chamberlin; (c) non-price; (d) normal; (e) social welfare; (f) Monopolistic competition]

(2) What is/Define monopolistic competition? What are/Explain its features?
(3) Discuss the features of monopolistic competition.
(4) Explain the features of monopolistic competition. ***(Oct. 16)***
(5) **Distinguish between:**
- (a) Perfect competition and monopolistic competition.
- (b) Production cost and selling cost.

(6) Define monopolistic competition. Explain its characteristics with suitable examples.
(7) Explain the wastes of monopolistic competition.
(8) Explain the effect of selling cost.
(9) Differentiate between monopoly and monopolistic competition.
(10) Comment on the following statements:

(a) Monopolistic competition is a realistic market structure.
(b) Selling cost is one of the essential features of monopolistic competition.
(c) Firms under monopolistic competition produce less than the optimum output.
(d) Limitations (wastes) of monopolistic competition affect social welfare.

(11) Explain how a firm under monopolistic competition attains equilibrium.
(12) Examine the role of advertising under monopolistic competition. ***(March 17)***
(13) Explain the importance of advertisement in monopolistic competition. ***(BIM, Oct. 17)***
(14) What are the merits and demerits of advertising?
(15) Explain long run equilibrium of a firm under the monopolistic competitive market. ***(Oct. 17)***
(16) Explain the short run equilibrium of a firm under monopolistic competition. ***(BIM, Oct. 17)***
(17) Discuss the characteristics of monopolistic competition. ***(March 18)***
(18) "Advertisement as an important instrument to promote the goods and services". Comment. ***(March 18)***
(19) Discuss the equilibrium of a firm under monopolistic competition in short-run. ***(Oct. 18)***
(20) Explain the short run equilibrium of a firm under monopolistic competition form of market structure. ***(March 19)***
(21) Explain with the help of diagram how does a monopolistic competitive firms earns super normal profit, normal profit and loss in the short run. ***(BIM, March 19)***
(22) Explain super normal profit in monopolistic competition.
(23) **Write short notes on:**
(a) Role of advertising under monopolistic competition. ***(March 19)***
(b) Arguments against advertising. ***(BIM, March 19)***
(c) Features of Monopolistic competition.
(d) Monopolistic Competition.

13

Oligopoly

FEATURES
OLIGOPOLY MODELS
- KINKED DEMAND CURVE MODEL
- CARTEL FORMATION
- PRICE LEADERSHIP

FEATURES:

Oligopoly is a market structure in which there are few sellers selling homogeneous or differentiated products. When the firms sell homogeneous products, they are called pure oligopoly firms while those selling differentiated products are called differentiated oligopoly. It is the most realistic market structure. It exhibits the following characteristics:

(1) There are few sellers in the market. Oligopoly is defined as the market where there is competition among the few.

(2) The sellers may sell homogeneous or heterogeneous products.

(3) There is a high degree of interdependence amongst the firms in matters related to price and output. The action of each firm affects the other firms in the market. For e.g. if Jet Airways reduces the price, Indian Airlines also attempts to do the same. Otherwise demand for its services may decline. This feature is due to the existence of few firms.

(4) There is constant rivalry amongst the firms. They try to compete with each other on the basis of price, product differentiation, advertising, etc.

(5) All the firms incur huge advertisement expenditure in this market. They prefer to compete through product differentiation and advertising rather than price war as it is ruinous. When one firm increases the advertisement expenditure others also follow the same. Hence non-price competition is very severe here.

(6) There is lack of homogenity in the market. It implies that the firms are of different sizes.

(7) There is lack of certainty in this market. The business firms aim at maximum profit and they want to be independent in decision making. At the same time they fear about the actions of rivals. They act and react continuously according to the decision of the rivals. Hence there is no certainty in this market.

(8) The degree of cross elasticity is very high in this market as the products are close substitutes for each other.

(9) Price rigidity is one of the features of the oligopoly market. If one of the oligopolists increases the price, others will not follow suit. This will affect the demand for the products of the former. On the other hand, if he reduces the price, others will also reduce their price. Hence it does not lead to increase in demand. Hence the sellers generally try to maintain the same price.

(10) Oligopoly market structure prevails when few firms enjoy economies of scale for a long period of time, when the government gives protection, when investment involved is huge which only few firms can afford and when the firms have exclusive patenting rights. Low pricing by the existing firms will act as a barrier for the entry of new firms and this prevents further competition.

Oligopoly market structure in reality is represented by industries like automobiles, cigarette manufacturers, washing machines, refrigerators, etc. Each one of them have their own brand name, price and features.

OLIGOPOLY MODELS:

There are various types of oligopoly models based on the nature of competition. However no single model can give a precise explanation of price-output equilibrium. This is because the demand curve of a firm is indeterminate. The different models are broadly classified as Collusive and Non-collusive model. A collusive oligopoly is one in which the firms co-operate with each other and avoid competition. Firms aim at maximum profits by charging the same price. A collusive oligopoly takes the form of a cartel. The best example for cartel is the OPEC (Organisation of Petroleum Exporting Countries). A non-collusive oligopoly is one where the oligopoly firms compete with each other and do not enter into any agreement. Price rigidity exists and the firms aim at maximising their own profit. The best example for a non collusive oligopoly model is the Kinked Demand Curve Model. The various models help to understand the problem of equilibrium in the oligopoly market. The following three forms of price-output determination are noteworthy:

(1) **The Kinked Demand Curve Model (Non-collusive Model):** This model was given by the famous economist Paul Sweezy in 1939. It tries to explain the problem of price rigidity in this market. It also indicates that oligopoly firms would like to have a non-price competition rather than a price competition. This is because if one of the firms increases the price, other firms will not follow suit. Hence the firm will lose its customers to the rivals. On the other hand if it lowers the price, others will also lower the price. Hence the firm will not get any additional benefit by reducing the price. Thus oligopoly firms would like to retain the same price and compete on the basis of other factors like advertising, quality, after sales service, etc.

This model can be explained with the help of the following diagram:

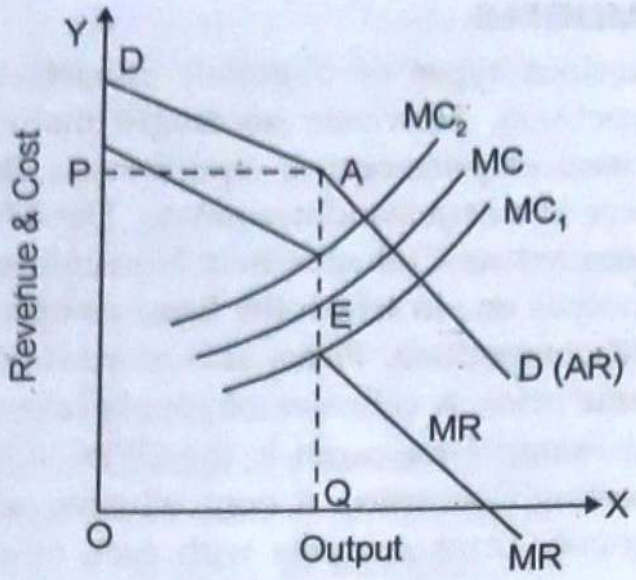


Fig. 13.1

In the above diagram DD is the demand curve. It has a kink at point A. Before the kink, the demand curve is more elastic than after the kink. It implies that, if the firm rises the price, other competitors will not increase the price but they will react quickly to price cuts. MR is the marginal revenue curve. It is discontinuous due to the kink in the demand curve. The equilibrium level of output and price is determined at the point where the MC curve cuts the vertical portion of the MR curve. In the above diagram the equilibrium output is OQ and the price is OP. There will not be any change in price and output even if there is a shift in MC either upwards or downwards. Like firms in other market structures, the oligopoly firm can earn profits or incur loss in the short run. It will continue to produce as long as price is more than average variable cost.

The kinky demand curve thus explains the nature of price and output in the market. The oligopoly firms always consider the rivals' reaction and find it worthwhile to retain the same price.

(2) **Cartel Formation (Collusive Model):** Severe competition prevails among the few firms under oligopoly. It is both price as well as non-price. The firms by and large prefer non-price

competition. Sometimes to avoid the ill-effects of competition they prefer to form a cartel. A cartel is an organisation of few firms, which enter into an agreement regarding price and output. Here the members jointly decide about the output to be produced and the price to be charged. Cartels are of 2 types namely:

(a) Market sharing cartel, and

(b) Centralised cartel.

In the former each member has an exclusive right to sell the commodity in a particular geographical location. In the second case, the member countries agree on the quota of output to be produced by each member, the price to be charged and sharing of profits.

When firms under oligopoly operate in a cooperative manner and minimise competition, it is also termed as collusive oligopoly. When the few firms agree to charge the same price and not undercut each other, the rewards are significant. They will be producing the monopoly output and their profits will be monopoly profits. Let us suppose there are three firms which join together to maximise their profits taking into account their high degree of interdependence. Since all of them decide to charge the same price, the demand curve of each firm will have the same elasticity as the demand curve of the industry. The price determination here will be identical to that of the monopoly firm. The price determination and profit maximisation can be shown as follows:

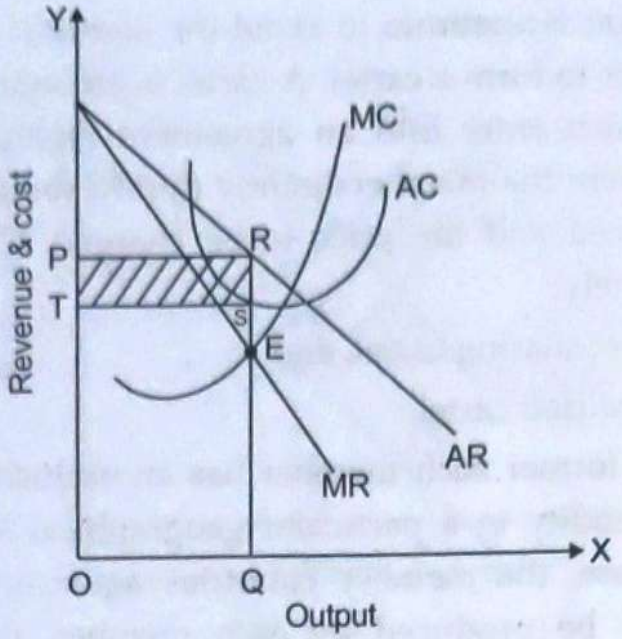


Fig. 13.2

In the above diagram equilibrium is attained at point E. The price is OP and profits are indicated by the shaded portion PRST.

Price-output determination under cartel can be explained with the help of the following diagram also:

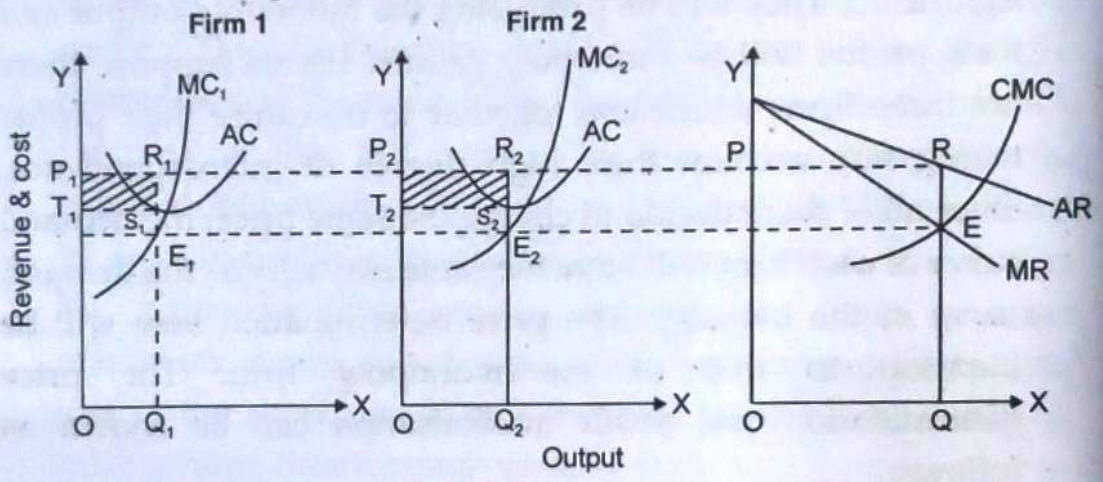


Fig. 13.3 **Fig. 13.4** **Fig. 13.5**

In the above diagram, the demand curve for the entire industry is downward sloping. It is indicated in Fig. 13.5. The industry, let us assume consists of two firms. They form a cartel to maximise their profits. The industry attains equilibrium at point E. The price is determined as OP. CMC is the combined marginal cost curve. The equilibrium output OQ has to be distributed between the two firms. The two

firms are in equilibrium at points E_1 and E_2 where their MC curve cuts the MR curve. The MR curve is drawn from the equilibrium point E. The price determined by the cartel is accepted by both the firms and the output is shared by both the firms. While firm 1 sells OQ_1 output and firm 2 sells OQ_2 output. The profits earned by them is represented by the shaded portion. Under the given conditions this is the maximum profit that can be earned by the firms.

Though firms would like to form a collusive model, it is very difficult in reality as there are many practical problems. The major ones are:

(a) In many countries collusion is not allowed. For e.g. in USA it is illegal.

(b) By undercutting prices, firms may cheat each other. For e.g. for some customers they may sell at a cheaper rate to enhance their market share.

(c) Due to expansion of international trade, competition is becoming intensive.

(d) Within a cartel, if there is a conflict among some members, then it is very difficult to retain the cartel.

The best example given for cartel is the Organisation of Petroleum Exporting Countries (OPEC). Production quotas and prices are set by OPEC. OPEC has twelve nations as members. Though they agree to the provisions of the cartel, in reality they are not able to adhere to it. Often price competition exists among them. Often squabbles among them had resulted in fluctuations in supply and price. Critics have pointed out that OPEC actually behaves like a collusive monopoly to maximise the profits of its members. Another similar example of oligopoly is the airline industry. Here also there are few firms. They also try to form cartels. The practical problems make it difficult and they end up having relentless price wars.

(3) **Price Leadership:** In this model one of the firms emerge as a leader and price policy of this firm is followed by others. The leader is generally the dominant firm or the largest firm. Sometimes a firm may be a small one. But it may be able to

understand the changes required in the industry. This firm when it makes changes in its price policy, it is followed by others. While the former one is called as the dominant price leadership, the latter is called as the barometric price leadership. In the case of dominant price leadership, the firm allows all other firms to sell the quantity they want at the prevailing price. Then it enters into the market as the residual seller. The following diagram explains the case of dominant price leadership.

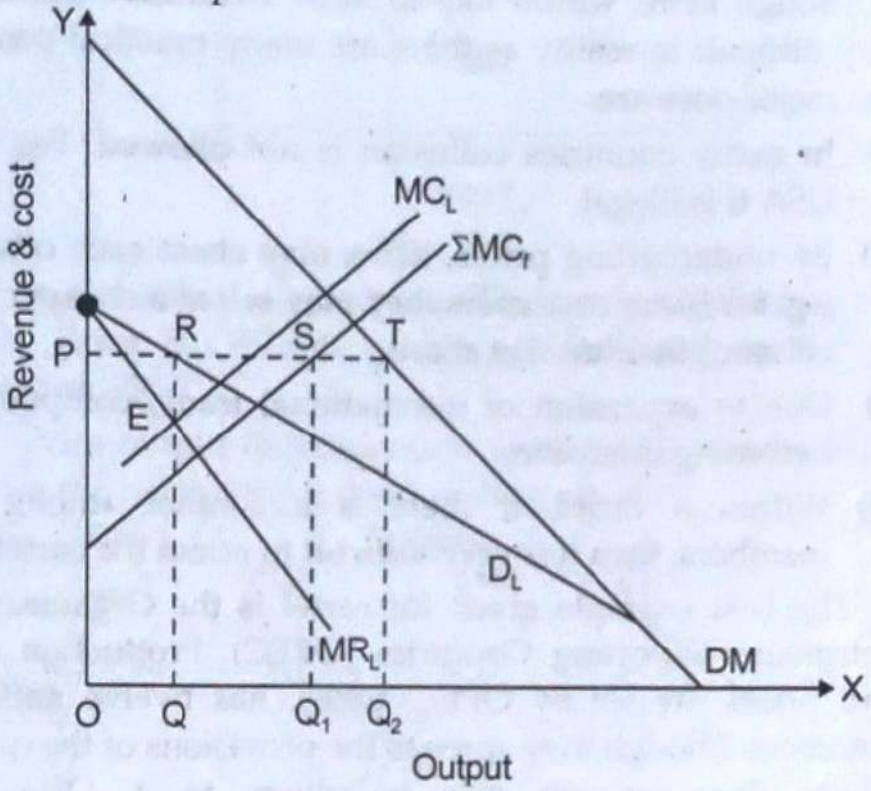


Fig. 13.6

In this diagram D_M is the market demand curve for the product. MC_L is the marginal cost curve of the leader while ΣMC_f is the summation of marginal cost curves of the follower firms. The follower firms behave like perfectly competitive firms. They produce at the point where price = ΣMC_f. The dominant firm attains equilibrium at point E where MC_L cuts MR_L curve from below and $MC_L = MR_L$. The price set by this firm is OP. At this price the followers will supply OQ_1 amount of the product and the leader will supply Q_1Q_2 of the output. Thus the dominant firm sells its output as a residual seller.

Price leadership depends on a variety of factors like market share of the dominant firm, innovative techniques used in production and sales and business reputation. The role of the price leader is not permanent. It can shift from one firm to another over a period of time.

In the short run oligopoly firms may incur loss or may get supernormal profits or they may just break even. However, in the long run, if it cannot make profit it will leave the industry. Due to the high degree of interdependence and uncertainty, price-output determination cannot be determined clearly in this market structure.

Some economists have pointed out the harmful effects of this market structure. They are:

(a) Price under oligopoly is always higher than the long run average cost to ensure higher profits.

(b) Oligopoly firms do not produce the optimum output.

(c) Price is greater than the long run marginal cost indicating under allocation of resources to the firms.

(d) Firms incur a huge advertisement expenditure as they prefer a non-price competition to a price competition.

While these limitations are true to some extent, some economists argue in favour of oligopoly market structure. Some of their arguments are:

(a) Many oligopoly firms invest a substantial amount on research and development. This accelerates technological development in the economy.

(b) Certain products like steel, automobiles and services like airlines cannot be produced by large number of sellers. Only few firms would be in a position to manage it efficiently.

(c) It is not right to say that all types of advertisement expenditure is wasteful. As long as it is informative, it helps both the firm and the customers. Similarly product differentiation helps to satisfy the consumers who want variety.

Thus oligopoly market has its own distinct merits and demerits. Like monopolistic competition, it is also widely prevalent in all modern economies.

QUESTIONS FOR REVIEW

(1) Define the following:

(a) Oligopoly.
(b) Price leadership.
(c) Cartel.

Fill in the blanks:

(a) Under oligopoly the number of firms are _____.
(b) The degree of cross elasticity is very _____ in the oligopoly market.
(c) The kinky demand curve model was given by _____.
(d) Competition among the few firms under oligopoly is _____.
(e) Under _____, one of the firms emerge as the leader.
(f) Kinked demand curve is found in _____ market structure. (Perfect competition, Oligopoly, Monopoly)
(g) Price rigidity is a feature of _____.

*[**Ans.:** (a) few; (b) high; (c) Prof. Paul Sweezy; (d) Severe; (e) price leadership; (f) Oligopoly; (g) Oligopoly]*

State whether the following statements are true or false:

(a) The firms under oligopoly are homogeneous.
(b) Oligopoly firms produce only homogeneous products.
(c) Price rigidity is one of the important features of oligopoly.
(d) Cartel formation helps the oligopoly firms to avoid competition. ***(Oct. 16)***
(e) Under price leadership, all the firms become leaders in rotation.
(f) OPEC is an example of collusive oligopoly.
(g) Kinky demand curve model is an example of non-collusive oligopoly.
(h) A Kinked demand curve indicates price rigidity in non-collusive oligopoly. ***(March 17)***
(i) Price is very flexible in oligopoly. ***(Oct. 17)***
(j) Oligopoly produce homogenous product. ***(BIM, Oct. 18)***
(k) Price rigidity in oligopoly leads kinked demand curve. ***(March 19)***
(l) OPEC is not an example of an explicit collusive oligopoly. ***(BIM, March 19)***
(m) Non-price competition is absent in oligopoly.
(n) Demand curve under oligopoly market is kinked.

*[**Ans.:** (a) False; (b) False; (c) True; (d) True; (e) False; (f) True; (g) True; (h) True; (i) False; (j) True; (k) True; (l) False; (m) True; (n) True]*

Match the following:

(A)	(B)
(1) Oligopoly ***(BIM, Oct. 17)***	(a) Prof. Paul Sweezy /Oligopoly
(2) Kinked demand curve ***(Oct. 17)***	(b) High barriers to entry
(3) Oligopoly ***(Oct. 18)***	(c) OPEC
(4) Cartel ***(Oct. 18)***	(d) Few sellers/ Rigid price
(5) Non-collusive oligopoly ***(March 19)***	(e) Oligopoly
(6) Cartels ***(BIM, March 19)***	(f) Firms compete with each other

*[**Ans.:** (1 – b); (2 – a); (3 – d); (4 – c); (5 – f); (6 – e)]*

(2) Define oligopoly. What are its features?
(3) Explain the various models of oligopoly.
(4) Analyse the role of OPEC as a cartel.

(5) Analyse the pricing strategy of airlines industry and mobile service providers in India. Explain whether the pricing strategies benefit the customers or not.
(6) Explain the concept of kinky demand curve. ***(Oct. 16)***
(7) Explain the kinked demand curve hypothesis in an oligopoly market. ***(March 17)***
(8) What is price leadership? Explain the types of price leadership. ***(Oct. 17)***
(9) Explain the equilibrium of price and output under oligopoly market. ***(March 18)***
(10) Explain in detail kinked demand curve situation in oligopoly. ***(BIM, Oct. 17)***
(11) Discuss the various types of price leadership. ***(Oct. 18)***
(12) What is price rigidity? Discuss it with the help of suitable diagram. ***(Oct. 18)***
(13) Explain the concept of price rigidity with the help of suitable diagram. ***(BIM, Oct. 18)***
(14) "Cartel aims at joint profit maximization". Explain. ***(BIM, Oct. 18)***
(15) Explain different types of price leadership in oligopolist market situation. ***(March 19)***
(16) Describe characteristics of Oligopoly market.
(17) What is collusive oligopoly?
(18) Explain price determination in collusive oligopoly.
(19) Discuss the kinked demand curve concept with the help of suitable diagram. ***(BIM, March 19)***
(20) **Comment on the following statements:**
  (a) Price rigidity exists in oligopoly.
  (b) Oligopoly market has its own merits and demerits.
  (c) Collusive oligopoly has many practical problems.
(21) **Write short notes on:**
  (a) Features of Oligopoly. ***(March 17, 18)***
  (b) Cartel formation. ***(Oct. 17)***
  (c) Kinky demand curve. ***(Oct. 18)***
  (d) Price leadership. ***(BIM, Oct. 18)***
  (e) OPEC.

MODULE - V: PRICING PRACTICES

14

Pricing Methods

OBJECTIVES
PRICING PRACTICES
- MARGINAL COST PRICING
- FULL COST PRICING
- DISCRIMINATORY PRICING
- PRICING FOR MULTI PRODUCTS
- TRANSFER PRICING

OTHER PRICING METHODS

OBJECTIVES:

Pricing policy is one of the important policies to be decided by any business firm. It is a difficult task as it involves a number of practical considerations. Various factors like nature of the market, objectives of the firms, the ability of the firm to adapt itself to the market conditions etc. determine the price policy of a firm. If a firm operates under perfect competition, it is a price taker. If it is a monopoly firm, it is said to be a price maker. In monopolistic competition and oligopoly, product differentiation, advertisement, etc. influence the pricing policy of the firms.

Pricing policy is an important means for a firm to achieve a number of objectives. Often it is believed that profit maximisation is the only objective of a firm. But in reality it is not so. Other

objectives like optimum utilisation of resources, sales promotion, welfare motive, etc. are equally important. Pricing policy helps the firm to achieve a number of objectives and these are also considered as the objectives of price policy. Some of them are:

(1) Pricing policy aims at ensuring the survival of the business firm.

(2) The firm may fix the price in such a way to avoid competition and ensure its position in the market.

(3) Sales maximisation, optimum utilisation of resources and diversification also figure in the aims of the price policy.

(4) Some firms are welfare oriented. They may fix the price in such a way that the welfare of the people is maximised.

(5) Price policy also aims at profit maximisation and reasonable rate of return on investment.

(6) Growth of the firm and increasing its market share are also important objectives of price policy.

While fixing the price of a commodity certain factors are taken into account. They are:

(1) Cost of production is the basis of pricing a product.

(2) Elasticity of demand is a very influential factor. If demand is relatively elastic, then price cannot be fixed at a high level and if demand is relatively inelastic it is possible for the firm to fix a higher price.

(3) Market structure decides what price can be set by the firm. If the market is a perfectly competitive one, the individual firm has no control over price. If it is monopoly or oligopoly the firm can formulate its price policy.

(4) The objective of profit maximisation also influences the pricing policy of a firm.

(5) Government's control also has a decisive influence on price. Sometimes firms will not be fixing the price but the government will be fixing the price. Such prices fixed by the government are called administered prices.

Thus pricing policy of a firm is not an easy task. The firm has to take into account all the above factors and objectives while formulating their pricing policy.

PRICING PRACTICES:

There are various ways of formulating the pricing policy. The common methods are:

(1) Marginal cost pricing,
(2) Full cost pricing,
(3) Discriminatory pricing,
(4) Multi product pricing,
(5) Transfer pricing.

They can be explained as follows:

(1) MARGINAL COST PRICING:

Under this system price is determined according to the marginal cost of production. Marginal cost is the cost incurred in producing an additional unit of the commodity. Under perfect competition, the marginal cost curve cuts the marginal revenue curve from below and at the point of equilibrium MR = MC and MR = AR. Therefore MC = AR. Therefore price is charged according to marginal cost of production. Under imperfect competition, equilibrium is attained at the point where MR = MC and the MC curve cuts MR from below. Here the price charged is more than MC. To adopt this method firms need correct information about MC and MR which is difficult to obtain.

(2) FULL COST PRICING:

Two famous economists of Oxford University Hall and Hitch developed this concept of pricing. It is also called as mark-up pricing or cost plus pricing. Under this method the firm will first estimate the average variable cost of producing a normal or standard level of output. (Normally it is 70 – 80% of the capacity). To this average variable cost, overhead cost per unit and also a margin of normal profits are added. The formula for calculating the mark up pricing is

$$m = \frac{P - C}{C}$$

where m is the mark up on cost, P is the price of the product and C is the average cost of the product. Here P – C is termed as the profit margin. The profit margin can be obtained by rearranging the equation as follows:

$$P = C(1 + m)$$

Economists Hall and Hitch analysed the behaviour of nearly 38 firms regarding their pricing policy. They arrived at the conclusion that firms do not follow the principle of equating marginal revenue with marginal cost. The firms, in their opinion do not try to fix the price according to marginal revenue and marginal cost. Instead they adopt cost plus pricing. This method can be explained with the help of an example.

Let us suppose that a firm has a capacity to produce 1000 units. It uses 75% of its capacity and is considered as the standard output. The total variable cost incurred is Rs. 1500 and the overhead cost is Rs. 750. The mark up decided by the firm is 25% (0.25). The above information can be substituted in the formula and the price can be estimated.

Standard output	= 750 units
Total variable cost	= Rs. 1500.
∴ Average variable cost	= 1500/750 = Rs. 2.
Total overhead cost	= Rs. 750.
Average fixed cost	$= \frac{750}{750}$ = Rs. 1
∴ Average cost	= 2 + 1 = Rs. 3.

The formula to find out pricing is

$$P = C(1 + m)$$
$$P = 3(1 + 0.25)$$
$$= \text{Rs. } 3.75$$

∴ Price per unit under cost plus pricing will be Rs. 3.75 per unit.

Many major industries like automobiles, electrical appliances etc. prefer a 25% markup.

This method has a number of advantages.

(1) It is a very simple method. It requires less data and it is less time consuming.

(2) It is easy to apply.

(3) This method ensures stability in prices when cost of production remains stable.

(4) It is easier to increase the price in response to changes in cost of production under this method.

Cost plus pricing method suffers from some limitations. Some of them are:

(1) It is not possible to estimate precisely the variable cost and overhead cost and distribute it among the various products produced by the firm.

(2) It has ignored opportunity cost and replacement cost. This is considered as a serious omission.

(3) Some economists are of the opinion that pricing should be based on marginal cost pricing rather than average cost pricing.

(4) This method has not considered the demand side.

Despite all the criticisms, in reality many firms follow this method. A number of reasons were given by economists as to why firms fix their price at full cost. Some of them are:

(1) If the price is above the average cost, firms would make supernormal profits and this will attract the competitors to enter the market.

(2) Firms find it difficult to get correct information about MR and MC and hence they are not able to follow marginal cost pricing.

(3) Many entrepreneurs think that full cost price is the right price to be charged and they do not want to change it often. Moral conviction of the firms also influences them to follow this policy.

This method is commonly used by business firms in the oligopoly market.

(3) PRICE DISCRIMINATION:

Concept and Types:

Price discrimination exists in a monopoly market. It implies the practice of selling the same product at different prices to different buyers. Price discrimination is also defined in another way. To practice price discrimination, the monopolist may make some slight differences in the product and sells it to different customers at different prices. Prof. Stigler defines this type of price

discrimination as "The sale of technically similar products at prices which are not proportional to marginal costs". This statement implies that differences in prices are not proportionate to the differences in cost of production. For the sake of simplicity, the former definition of price discrimination is often used.

Price discrimination is of various types. Some of them are as follows:

(1) **Personal price discrimination:** When different prices are charged from different buyers, it is called personal discrimination. For e.g. professionals like doctors, lawyers, teachers, etc. charge a lower amount from the poor people and a higher amount from the rich people.

(2) **Local discrimination:** It refers to charging different prices from people according to the locality. For e.g. in a posh locality, a beauty parlour may be charging more while charging less price for the same service in a common locality.

(3) **Age discrimination:** Here different prices are charged according to the age group. For instance railways charge less for children and senior citizens and more for others for the same service.

(4) **Sex discrimination:** In some cases women may be offered goods and services at a lesser rate compared to men. In many states in India there is no fees for girls in schools and colleges while boys have to pay the full fees.

(5) **Size discrimination:** When a commodity is sold in a larger quantity like tooth paste, washing powder, etc. the price is quoted on the lower side and vice-versa.

(6) **Quality wise price discrimination:** Different prices are charged when there is a difference in the quality of the product. For e.g. deluxe edition of a book is expensive than that of an ordinary edition.

(7) **Use discrimination:** Prices differ according to the use to which the commodity is utilised. For instance electricity is supplied to agriculture freely in many states in India, while industries have to pay reasonable charges and the households have to pay more charges.

(8) **Discrimination based on the nature of product:** Certain goods are bulky while certain goods are light weight. When railways carry light goods like coal, the charges are less whereas when they transport heavy goods like iron, the charges are more.

(9) **Time discrimination:** Different rates may be charged for a service depending upon the time of service. Advertising will be less expensive in the non-prime time compared to the prime time in the electronic media. Similar is the case with telephone services, cinema halls, etc.

Degrees of Price Discrimination:

Prof. Pigou developed the three degrees of price discrimination namely:

(1) First degree price discrimination,

(2) Second degree price discrimination, and

(3) Third degree price discrimination.

(1) **Price discrimination of the first degree:** This is also known as perfect price discrimination. Here the seller takes maximum advantage of his position in the market and sells each unit of the commodity at a different price to the customers. The price charged by him indicates the marginal utility that will be obtained by the consumer by consuming the commodity. In other words, the monopolist will charge from every consumer what he is willing to pay. It implies that there is no consumer's surplus in first degree price discrimination. Consumer's surplus is the difference between what the consumer is willing to pay and what he actually pays. If the price he pays is less than what he is willing to pay, then he gets surplus satisfaction which is called consumer's surplus. The entire consumer's surplus is converted into producer's surplus in the case of first degree price discrimination. This type of discrimination is possible only when the following conditions prevail.

(a) There are few buyers in the market.

(b) The monopolist knows them individually and able to estimate what price they are willing to pay.

(c) There is no possibility of resale.

These conditions are very difficult to realise in practice. Hence price discrimination of the first degree is very rare in reality.

However, in practice it is a rare phenomenon e.g.

Price	Quantity Demanded	Total Revenue
Rs. 10	1	Rs. 10
Rs. 9	2	Rs. 18
Rs. 8	3	Rs. 24
Rs. 7	4	Rs. 28

In simple monopoly he will sell 1 unit at Rs. 10, 2 units at Rs. 9 each, 3 units at Rs. 8 each, 4 units at Rs. 7 each and so on.

But under price discrimination he will sell as follows:

Price	Quantity Demanded	Total Revenue
Rs. 10	1st unit	Rs. 10
Rs. 9	2nd unit	Rs. 9
Rs. 8	3rd unit	Rs. 8
Rs. 7	4th unit	Rs. 7
∴ TR by selling 4 units = Rs. 34		

He sells each unit at a different price. TR by selling 4 units of the same commodity = Rs. 34 & so on. Fig. 14.1 explains this.

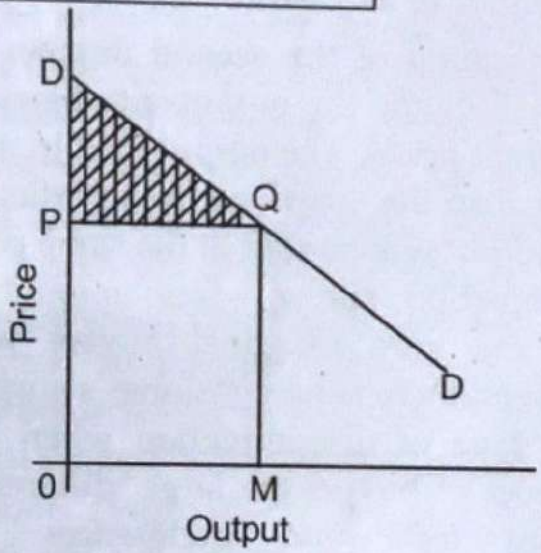


Fig. 14.1 First Degree Price Discrimination

The shaded area represents the consumer's surplus which is lost for the buyer. The seller charges different prices for each unit of the commodity which he sells to different buyers. He will charge each buyer the maximum price he/she is willing to pay for the commodity rather than go without it. In the process the monopolist takes away the entire consumers'

surplus which is converted into monopoly profits. According to Mrs. Joan Robinson, this is perfect price discrimination.

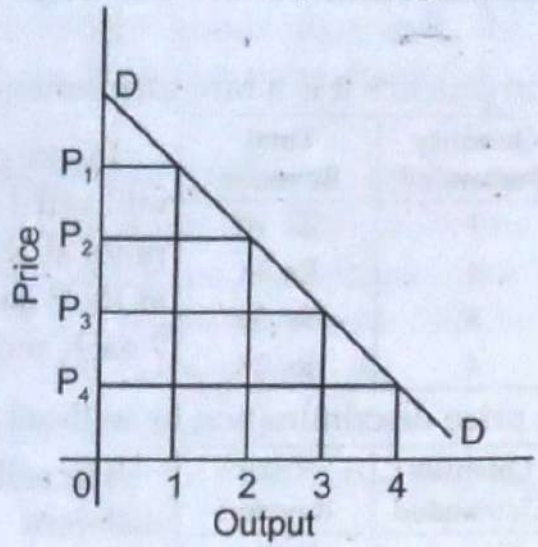


Fig. 14.2

The seller will charge OP_1 from first buyer who is willing to pay that high a price for the commodity rather than go without it. Likewise he will charge OP_2 from second buyer OP_3 from third buyer and so on.

(2) **Price discrimination of the second degree:** In this type the monopolist will divide the output into blocks of output and sell it at different prices. The output sold in one block may be priced higher than the other one. In a particular block all the units of the output will be sold at the same price. This type of price discrimination allows some amount of consumer's surplus for the intra marginal buyers whereas for the marginal buyers, there is no consumer's surplus. It is easy to practice this type of discrimination when there is a wide market, number of buyers are large, different income levels and different taste and preferences. This type of discrimination is generally found in telephone services, transport services and supply of electricity.

The seller charges different prices OP_1, OP_2, OP_3 etc. for different lots of output viz. OM_1, M_1M_2, M_2M_3 and so on.

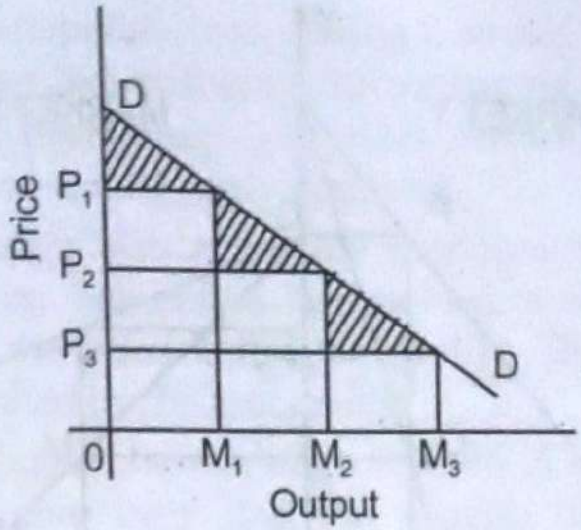


Fig. 14.3

(3) **Third degree price discrimination:** This is the most common type of discrimination. Here the monopolist divides his output among the various submarkets. How much output he will divide among the markets and what price he will charge depends upon elasticity of demand. If demand is relatively inelastic he will charge a higher price and if it is elastic he will charge a lower price. To distribute the output, the monopolist will follow the principle of equimarginal revenue i.e. he will distribute the output in such a way that the marginal revenue from each market will be the same. When marginal revenue is equalised, profits will be maximum.

Here there are 2 submarkets namely market 1 and market 2. In market 1 demand curve D_1 is relatively inelastic and in market 2 the demand curve D_2 is relatively elastic. The total output produced by the monopolist is equal to AB. This he has to divide between the two markets. He will distribute the output in such a way that marginal revenue from each market will be the same. Therefore, he will sell OA output in market 1 at OC price and OB output in market 2 at OP_2 price. It is clear here he charges a higher price in market 1 where demand is relatively inelastic and a lesser price in market 2 where demand is relatively elastic. This kind of price discrimination is often followed by monopolists.

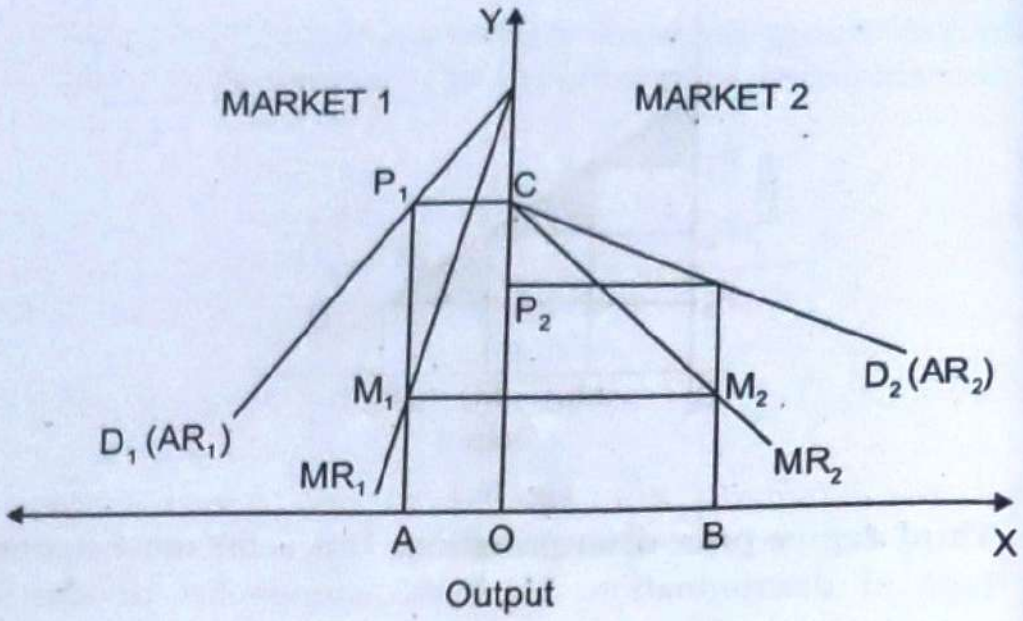


Fig. 14.4

Price Discrimination – When is it Possible?

Price discrimination is possible under the following conditions:

(1) Monopoly market structure should prevail for the practice of price discrimination. In perfect competition it is not possible to follow price discrimination as all the units are homogeneous, the buyers and sellers have perfect knowledge about the market and there is a single price prevailing in the market. In monopolistic competition and oligopoly close substitutes are available. Hence there is no scope for price discrimination. Monopoly market provides considerable scope for price discrimination.

(2) There is no possibility of resale. That is it should not be possible for the buyers in the dearer market to go and buy the commodity from the cheaper market. For e.g. government gives subsidised foodgrains to the poor people. If the rich people pretend to be poor and buy the subsidised foodgrains, then the price discrimination will break down. Thus to practice price discrimination neither the unit of the commodity nor the consumer can be transferred from one market to the other. Thus a monopolist can easily practice price discrimination if he can keep the markets quite separate.

(3) It should be possible to divide the markets into various submarkets.

(4) If the monopolist can bring about some product differentiation like changing the packaging style, improving the quality, promoting after sales service, etc. then price discrimination can be easily practiced.

(5) Buyers' illusion also helps the monopolist to adopt price discrimination. Sometimes buyers have a wrong conception that higher the price, better the quality. This misconception can be exploited by the monopolist.

(6) Sometimes buyers have a let go attitude. A slight rise in price does not bother them and this enables the monopolist to indulge in price discrimination.

(7) Legal sanction provided by the government helps the monopolist to adopt price discrimination. As per the legal provisions the consumers can be segregated into different groups and each group can be charged different prices.

(8) Sometimes consumers are not aware of the policy of price discrimination followed by the monopolist. This ignorance of the consumers helps the monopolist to charge different prices.

(9) Certain services are non-transferable. e.g. services of a doctor, teacher, professionals like C.A. etc. are non transferable. They generally practice price discrimination. They charge a lower price from the poor people and a higher price from the richer class. A poor person cannot avail of the services provided to a richer section. This non transferability helps the monopolist to charge different prices.

(10) When the markets are separated by long distances and when there are tariff barriers, it is possible to adopt price discrimination. In the case of foreign trade it is possible to have price discrimination. When the monopolist charges a lower price in the foreign market and a higher price in the domestic market, there is said to be price discrimination and this type is known as dumping.

Price Discrimination – When is it Profitable?

Price discrimination may be possible when the above conditions are satisfied but it may not be profitable always. For

price discrimination to be profitable two conditions are to be satisfied.

(1) The elasticity of demand should be different in different markets.

(2) The cost differentials in supplying the output in the different markets should not be large in relation to price differentials based on elasticity of demand.

Of these two conditions, the first condition is very important. If elasticity of demand is the same in both the markets, there is no point in practising price discrimination. This is because the monopolist will not be able to maximise his profits by adopting price discrimination. The monopolist will aim at equating the marginal revenue from the various markets. If the price is the same and elasticity of demand is the same, then profitability will not be there by transferring certain quantity of output from one market to another. Thus price discrimination to be profitable elasticity of demand should be different.

Equilibrium under Dumping:

It is a special type of price discrimination. It refers to the practice of selling a commodity in the domestic market at a higher price and selling the same commodity at a lower price in the international market. This type of discrimination is easier to follow as the markets are separated from each other due to geographical distance. To practice dumping the following conditions should be satisfied:

(1) The firm should be a monopolist in the domestic market. He should have a certain amount of monopoly power.

(2) The markets should be widely separated. In international trade, markets are separated by different customs, languages, currency, etc.

(3) There should not be any possibility of resale. The consumers should not buy in the cheaper market and sell it in the dearer market. Distance and cost of transport prevents resale in international trade.

(4) Elasticity of demand should be different in different markets.

Dumping is nothing but international price discrimination. This can be explained with the help of the following diagram:

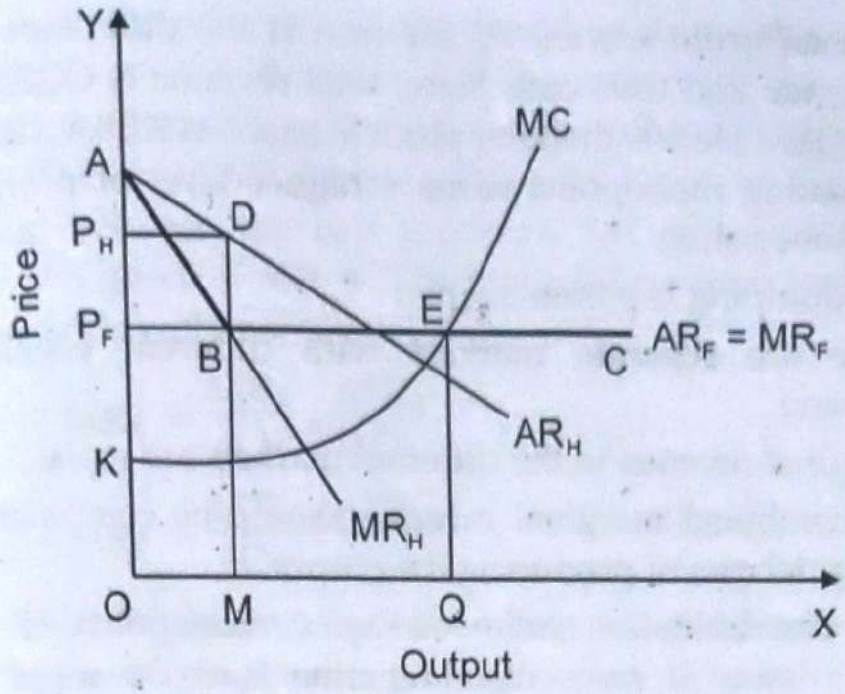


Fig. 14.5

In the above diagram AR_F and MR_F refer to the average and marginal revenue curves of the firm in the foreign market. AR_H and MR_H refer to the revenue curves in the home market. The nature of the curve indicates that the firm is a monopolist in the home market whereas it is a perfectly competitive firm in the foreign market. The monopoly firm resorts to price discrimination to maximise its profits. The firm will be in equilibrium at that point where the combined MR = MC and the MC curve cuts the MR curve from below. The combined MR curve can be obtained by superimposing the MR_H curve over the MR_F curve. In the figure ABC represents the combined MR curve. The MC curve cuts the MR curve from below at point E. The equilibrium output is equivalent to OQ. This equilibrium output has to be divided between the home market and the foreign market. The firm will divide the output in such a way that the MR in the two markets are equal. In the above figure at point B, the marginal revenue in the domestic market is equivalent to BM. In the foreign market at point E marginal revenue is equal to EQ. It is obvious from the figure BM = EQ. Therefore the monopolist will sell OM quantity of output in the domestic market and the price charged by him will be OP_H. The balance output MQ will be sold in the foreign market at the price OP_F.

The total profit earned by the firm is the difference between total revenue and total cost. Here, total revenue is OQEBA. Total cost is OQEK. Hence, the total profit is equal to KEBA. Generally a discriminating monopolist earns a higher level of profit than a simple monopolist.

Thus dumping is possible when

(1) there are separate markets with different elasticities of demand.

(2) marginal revenue in the different markets are equal.

(3) the combined marginal revenue should be equivalent to the marginal cost of producing the output.

Price discrimination followed by a monopolist is often a debatable issue. If price discrimination leads to more output, increases consumer satisfaction, helps the poor to enjoy goods and services and results in better utilisation of resources it is said to be beneficial. On the other hand if it leads to only maximisation of monopoly profits, benefits the richer section and elimination of competition, then it is not desirable. Price discrimination on the whole is desirable if it leads to more output, extension of market and greater social welfare.

Dumping which is a special type of price discrimination is also known as persistent dumping. If dumping is practised to eliminate the competitors, then it is called predatory dumping. Sometimes monopoly firms have excess stock. To dispose it, they sell in the foreign market at a price lower than the domestic price. This is termed as sporadic dumping. Dumping enables the monopolist to maximise his profits.

(4) MULTIPLE–PRODUCT PRICING:

Many firms at present produce a variety of products. They do not confine themselves to one good as it is very risky. The goods sold by them may be substitutes or complementary goods. Firms which are producing cars, refrigerators, washing machines, etc. have to decide the pricing of their products after taking into account a number of factors. For e.g. Maruti Ltd. manufactures variety of cars each one having its own market segment. Certain products like air conditioners, music system power windows etc. are used by all types of cars manufactured by Maruti Ltd. While

deciding about the price of one, the firm should consider the effect of this price on the demand for the other. In the case of multiproducts, demand interrelationship influences the pricing decisions. The marginal revenue function helps to explain the relationship between the two products. Let us suppose a firm produces two goods X and Y. The marginal revenue function for these two goods will be

$$MR_X = \frac{\Delta TR_X}{\Delta Q_X} + \frac{\Delta TR_Y}{\Delta Q_X} \quad \ldots (1)$$

$$MR_Y = \frac{\Delta TR_Y}{\Delta Q_Y} + \frac{\Delta TR_X}{\Delta Q_Y} \quad \ldots (2)$$

Here X and Y refer to the two goods. Marginal revenue of a product has two components namely change in its total revenue due to change in the sale of the product and change in its revenue due to change in the sale of the other product. The second term in the right hand side of the equation measures the change in the total revenue of one product due to change in the sale of the other product. For e.g. in equation 1, the expression $\Delta TR_Y/\Delta Q_X$ refers to the change in the total revenue of the firm from product Y due to the sale of an additional unit of X. If the second term on the right hand side of the equation is positive, then it implies that the goods are complementary to each other. In this case increased sale of one good will lead to increased sale of the other also. In case the second term in the equation is negative it implies that the goods are substitutes for each other. The increased sale of one will lead to a reduction in the demand for the other.

Multiproduct pricing can be explained with the help of the following diagram. Let us assume that there are three products X, Y and Z. The profits of the firm will be maximum when $MR_X = MR_Y = MR_Z = MC$. The respective average revenue curves are AR_X, AR_Y and AR_Z and CMC is the combined marginal cost curve.

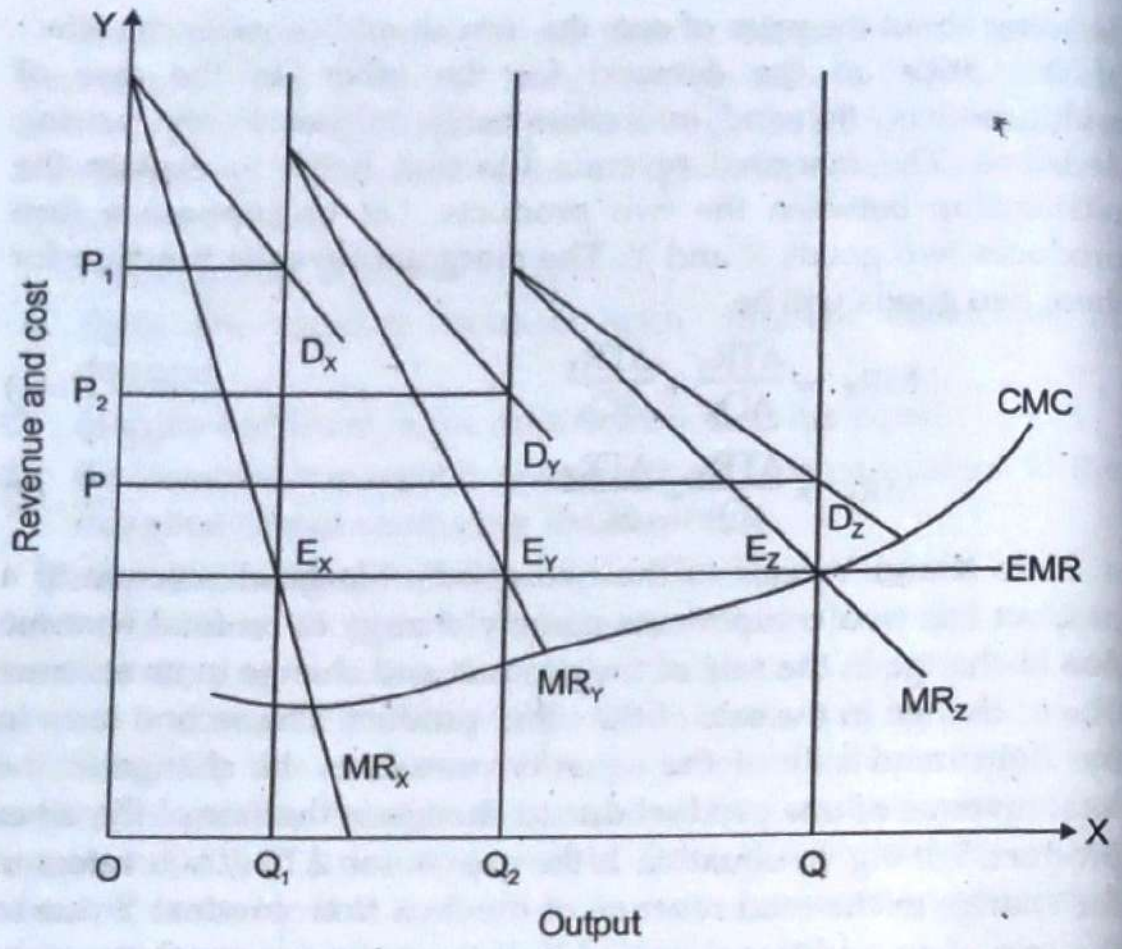


Fig. 14.6

In the above diagram D_X, D_Y and D_Z are the three demand curves or the average revenue curves. MR_X, MR_Y and MR_Z are the corresponding marginal revenue curves. The firm is in equilibrium when profits are maximum. The equilibrium is attained at that point where $MR_X = MR_Y = MR_Z = MC$. This is indicated at points E_X, E_Y and E_Z where the equal marginal revenue curve crosses the MR_X, MR_Y and MR_Z curves. The firm would produce OQ_1 of quantity X and sell it at OP_1 price. It will produce Q_1Q_2 of Y and the price would be OP_2 while the quantity of Z will be Q_2Q at OP price. It is clear from the figure that the successive demand curves are more elastic and the price becomes lower and lower while marginal cost is higher. For each of the product, the price is fixed in such a way that the total profit of the firm is maximised.

(5) TRANSFER PRICING:

The rapid growth of large scale industries gives rise to transfer pricing. Large scale industries and multinational companies

establish semiautonomous profit centres to produce intermediary products. The price at which the intermediary products are sold by the organisation to the parent body is called transfer pricing. For e.g. if an automobile company has a steel unit then the firm has to decide how much steel, the automobile firm must buy from the steel company and at what price. The steel company should also decide how much it should supply to the automobile firm and how much it should sell outside. Transfer pricing is nothing but the rate at which this transaction takes place. The price has to be fixed properly as the final price of the product depends on the price of intermediary products. Profitability of the two firms also depends upon proper pricing. The intermediary firm may sell the entire output to the parent company or it may sell a part of the output to the parent company and the remaining in the external market. These two situations can be analysed as follows:

Transfer Pricing with No External Market:

Let us suppose that there is a parent company and a subsidiary. The intermediate product produced by the subsidiary is fully purchased by the parent firm. It is also assumed that one unit of the intermediary product is required to produce one unit of the final product. This also implies that the output produced by the intermediary firm and parent firm is the same. The determination of transfer pricing in this case can be explained with the help of the following diagram:

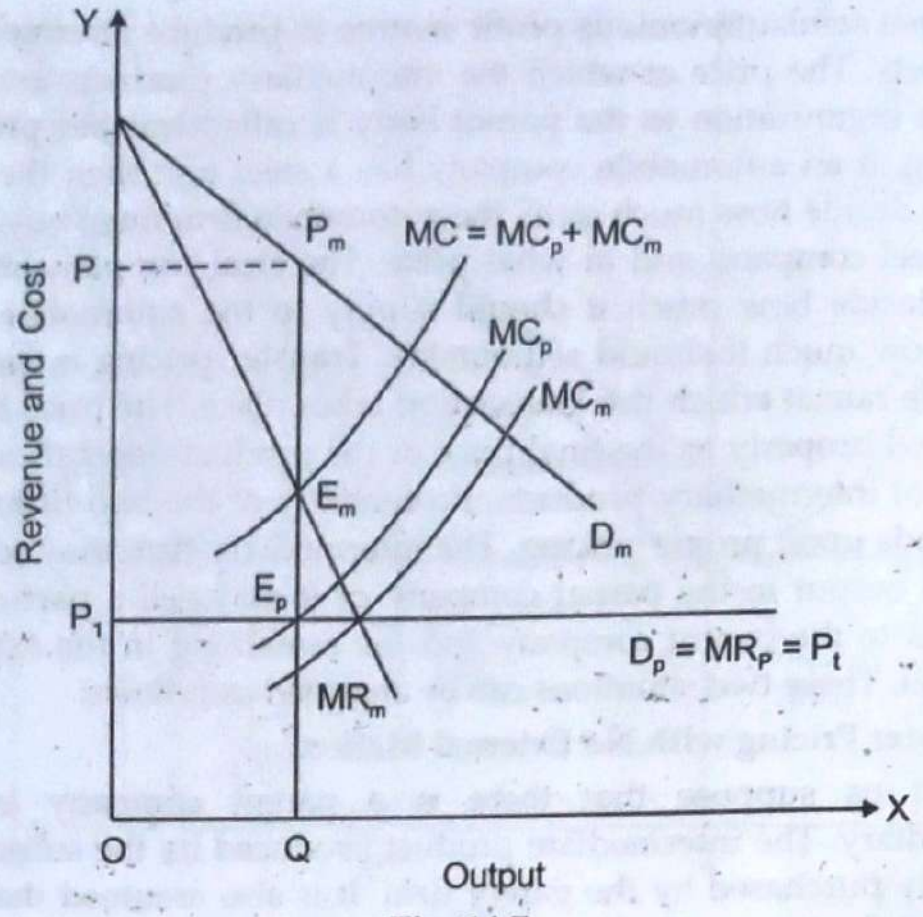


Fig. 14.7

Let us suppose the intermediary firm is represented as the production unit and the output is sold to the marketing unit of the parent firm. In the above diagram MC is the combined marginal cost curve of the production and marketing units. D_m is the market demand curve of the marketing unit while MR_m is its marginal revenue curve. The firm attains equilibrium at point E_m where MR = MC and the MC curve cuts MR from below. Here the equilibrium price is OP and the best output for the marketing unit is OQ. Each unit of the final product consists of the intermediary product. Its price is determined at the point where $MC_p = MR_p$. In the above diagram at point E_p, $MR_p = MC_p$. Hence the price for the intermediary product is OP_1. This is the transfer price at which the intermediary product is sold to the parent firm. Here it is assumed that each unit of the final product requires one unit of the intermediary product. Hence the total output of both will be the same. It is clear from the figure that at point E_p, $D_p = MR_p = P_t = MC_p$. (Here P_t is the transfer price). When there is no external

market for the product, the transfer price is equal to marginal cost of production.

Transfer Pricing when there is External Market and Perfect Competition:

The intermediary product produced by the semiautonomous firm may be sold to the parent firm and also to the external market. Similarly if the parent company needs more of the intermediary product then it can buy from external sources also. The fixation of transfer pricing in this case can be explained with the help of the following diagram:

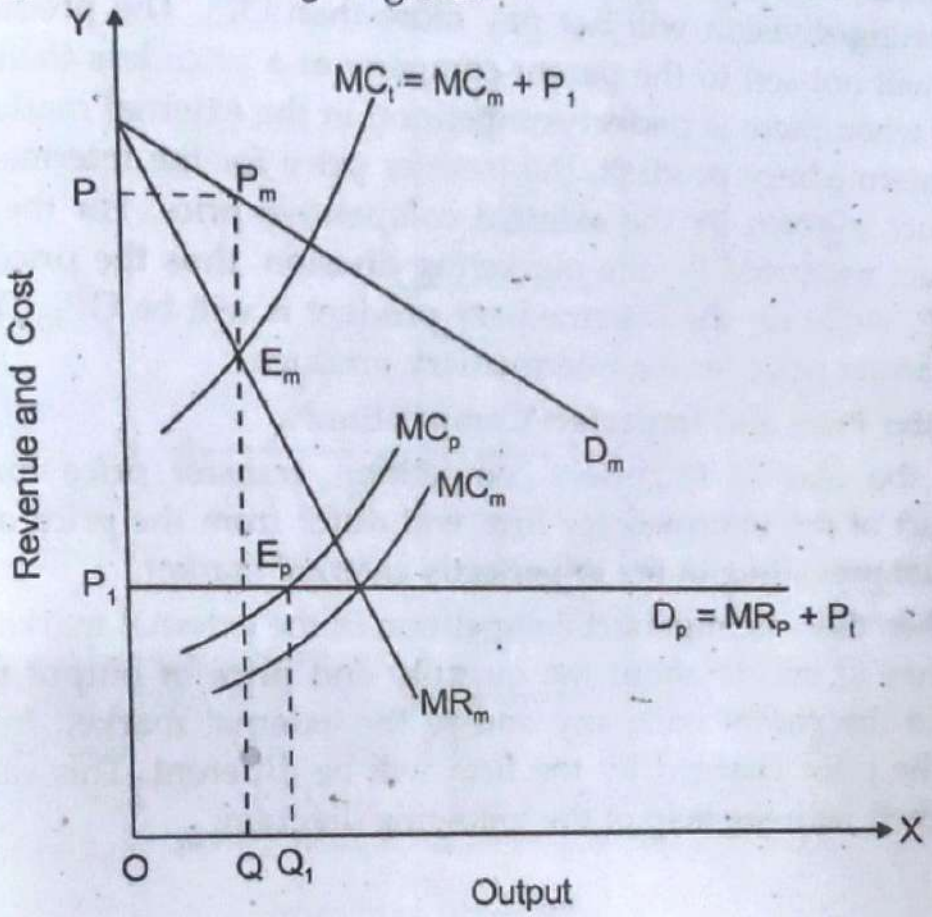


Fig. 14.8

In this diagram the production division produces more than what is required by the marketing division. It sells the excess output in the perfectly competitive market. The production unit is at equilibrium when $MR_p = MC_p$. In the diagram at point E_p, the production unit is in equilibrium. It produces OQ_1 output and the price is OP_1. The marketing division can buy from the production division as well as from the external market. MC_p represents the marginal cost of the production unit while MC_m is the marginal

cost of the marketing unit. These two are combined together and the total marginal cost is represented as MC_t. MR_m is the marginal revenue curve of the marketing division. The total MC curve, MC_t cuts MR_m at point E_m. The best output for this division is OQ and the price is OP.

The production unit produces OQ_1 level of output while the marketing unit needs only OQ level of output. The difference QQ_1 is sold in the external market at OP_1 price. The marketing unit has a choice to buy from the production unit of the subsidiary or it can buy from the external market. Since the external price is OP_1, the marketing division will not pay more than OP_1. The production unit will not sell to the parent company at a price less than OP_1. Thus when there is perfect competition in the external market for the intermediary product, the transfer price for the intermediary product is given by the external competitive price. For the final product produced by the marketing division, thus the price will be OP, while for the intermediary product it will be OP_1. This is the transfer price for the intermediary product.

Transfer Price and Imperfect Competition:

In the case of imperfect competition, transfer price for the product of the intermediary firm will differ from the price of the product prevailing in the imperfectly external market.

When there is imperfect competition in the external market the firm has to decide about the quantity and price of output to be sold to the parent company and to the external market. In this case the price charged by the firm will be different. This can be explained with the help of the following diagram:

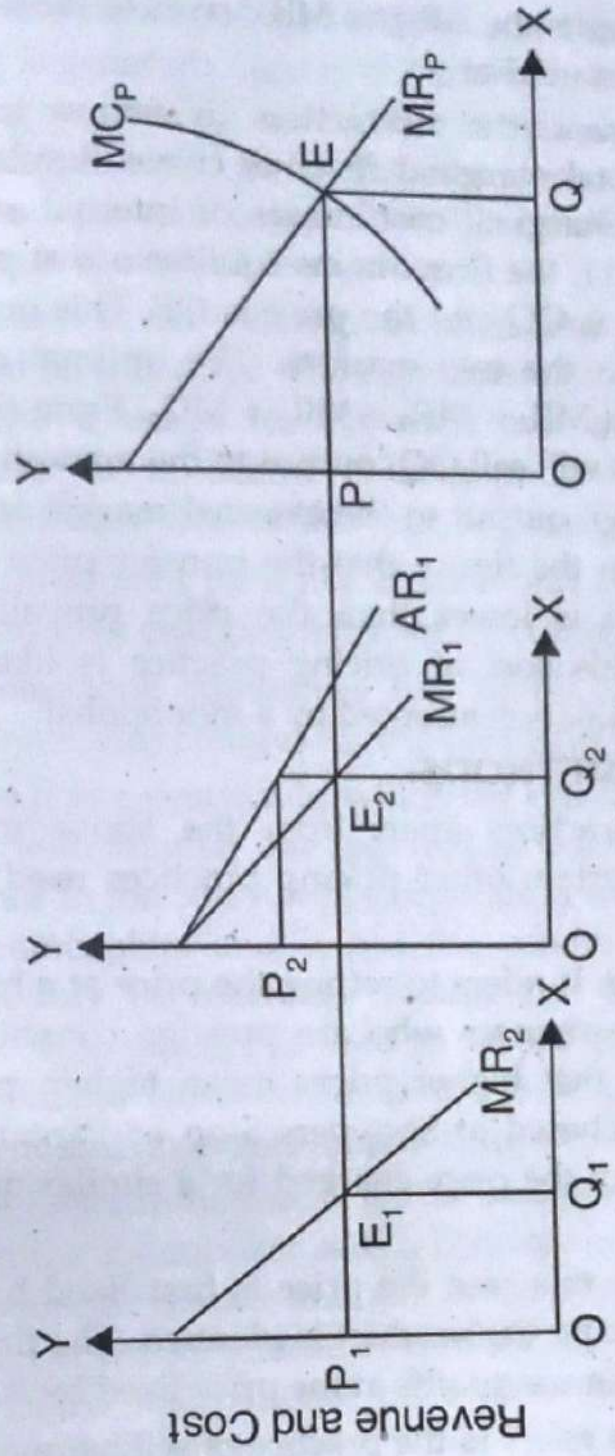


Fig. 14.11

Fig. 14.10

Fig. 14.9

The above figure represents the total output produced by the intermediary firm and the distribution of the output between the parent company and the external market. Fig. 14.9 represents the internal or marketing division of the parent company, Fig. 14.10 is for the external market and Fig. 14.11 symbolises the intermediary firm.

In Fig. 14.9, MR_2 represents the marginal revenue curve of the marketing division of the parent company.

Fig. 14.10 represents the AR and MR curves of the intermediary firm in the imperfect market.

Fig. 14.11 represents the production division or intermediary firm. MR_p is the total marginal revenue curve. Similarly MC_p is the summation of marginal cost curves of internal and external markets. In Fig. 14.11, the firm attains equilibrium at point E. The equilibrium output is OQ and the price is OP. This output has to be divided between the two markets. The optimal distribution will be one at which $MR_2 = MR_1 = MR_p = MC_p$. From the figure, it is clear that the firm will sell OQ_1 output to the marketing division at OP_1 price and OQ_2 output to the external market at OP_2 price. Thus it is clear from the figure that the transfer price charged to the internal market is lower than the price prevailing in the external market. This sort of pricing practice is like the third degree price discrimination adopted by a monopolist.

OTHER PRICING METHODS:

Other pricing practices apart from the above methods of pricing, there are certain other pricing practices used in reality. They are:

(1) **Prestige Pricing:** It refers to setting the price at a higher level to attract the customers who are prestige conscious. Many consumers feel that higher prices mean higher quality. For e.g. a shirt purchased at Shoppers Stop or Pantaloon has a higher price than the price charged for a similar quality in a small shop.

(2) **Price Lining:** In this case the price is first fixed by the firm and then producing the product is planned. The firm aims at making the maximum profits at the price fixed by it.

(3) **Value Pricing:** It refers to the practice of selling quality goods at a lower price than what it was sold earlier. It is nothing but offering more for a less price. This is generally seen in the case of beverages like Pepsi or Coca-Cola. This strategy tries to satisfy the consumers who are bargain conscious.

(4) **Skimming Pricing:** It refers to the practice of setting a high price initially and then lowering it later on. When a product is produced for the first time, it is difficult to have precise demand forecasting. Hence the firm sets a high price and sells

it to consumers who are ready to pay the price. This kind of pricing is generally seen in the case of consumer durables like washing machines, air conditioners, computers, etc. When demand is likely to go up, the firm lowers the price to expand sales and prevent competition. Depending on the demand, the firm will expand its capacity.

(5) **Two Part Tariff Pricing:** In this case the consumers are charged an initial fee while purchasing the product or service and also a usage fee for each unit of the product they purchase. It is found in oligopolistic and monopolistic markets. Examples for this type of pricing are:

(a) Amusement park like Essel World charging an entry fee and then charging extra for certain rides.

(b) Telephone companies like MTNL charging a monthly rental plus charges for the calls made by the customers.

(6) **Tying:** It is a practice in which the consumer buys a product along with another one required to use the first product. For instance in the 50's Xerox Corporation was the only producer of photocopiers and it put the condition that those firms which buy its machines should also buy the paper from Xerox. This practice is used to ensure quality and to prevent competition. However, in reality judiciary often interferes to prevent such attempts against competition.

(7) **Price Discrimination:** This is practiced by a monopolist. When the monopolist sells a commodity at a higher price in the domestic market and at a lower price in the international market at the same time, it is called price discrimination. It is also called international price discrimination. This type of pricing is possible only when there is monopoly in the domestic market, the markets are separate and the elasticity of demand is different in the two markets. This type is adopted by the monopolist to maximise its profits.

(8) **Administered Pricing:** When the prices of certain goods are determined by the government, then it is called as administered pricing. It is used by the government to correct market imperfections, to check inflation, to provide goods at a reasonable rate to people etc. Sometimes the government

resorts to dual pricing i.e. a part of the output will be sold at the price fixed by the government and the balance will be sold according to the market price.

(9) **Peak Load Pricing:** Demand for certain goods like electricity, telephone, etc. are demanded differently at different points of time. During the day time, the demand for such goods is at its peak, while during the night time it is less. Firms supplying such goods cannot charge a uniform price for their product throughout the day. Hence they adopt dual pricing. During the peak period they charge a high price called peak load price and during the off-peak period, they charge a lower price.

Thus pricing in practice is a complex one. The firm has to consider all the factors which influence the price of the product and should adopt a rational pricing policy. The survival, expansion and diversification of the firm depends upon its pricing policy. Hence this policy is very significant for any business firm.

QUESTIONS FOR REVIEW

(1) Define the following:

(a) Marginal cost pricing.
(b) Multiproduct pricing.
(c) Cost plus pricing.
(d) Administered pricing.
(e) Skimming pricing.
(f) Transfer pricing.
(g) Prestige pricing.
(h) Peak load pricing.
(i) Discriminatory pricing.

Fill in the blanks:

(a) There is no consumer's surplus in _____ price discrimination.
(b) _____ of demand should be different in different markets to practice price discrimination.
(c) _____ is known as international price discrimination.
(d) _____ is the cost incurred on producing an additional unit of a commodity.
(e) _____ pricing refers to prices of certain goods fixed by the government.
(f) Price discrimination is profitable when _____. (a commodity is not transferable, when customers do not meet each other, when customers are ignorant about price differentials, all the above.)
(g) Dumping takes place when a monopolist-_____. (has monopoly in the world market as well as home market, has monopoly in the world market, has monopoly in the home market as well as a competitive world market, all the above)
(h) Under marginal cost pricing, _____ costs are ignored.
(i) Cost Plus pricing is also known as _____.

*[**Ans.:** (a) first degree; (b) elasticity; (c) Dumping; (d) Marginal Cost; (e) Administered; (f) all the above; **(g) has monopoly in the home market as well as a competitive world market;** (h) Fixed; (i) Mark up pricing]*

State whether the following statements are true or false:

(a) Price discrimination exists only in a monopoly market. ***(Oct. 16)***
(b) Price discrimination is always possible and profitable. ***(March 18)***
(c) Administered pricing helps to supply goods at reasonable rate to the people.
(d) Price discrimination is desirable if it leads to more output and greater social welfare.
(e) In dumping, a monopolist is a price taker in the world market.
(f) Cost plus pricing is also called as mark up pricing. ***(Oct. 16)***
(g) Price discrimination is not profitable if elasticity of demand is the same in different markets. ***(March 17)***
(h) Dumping is known as international price discrimination. ***(Oct. 17)***
(i) Full cost pricing method has certain limitation. **(Oct. 17)**
(j) Pricing of product should cover cost alone. ***(BIM, Oct. 17, March 18)***
(k) Public enterprises may charge a price equal to their MC. ***(BIM, Oct. 17)***
(l) Under marginal cost pricing, prices are determined on the basis of fixed cost only. ***(Oct. 18)***
(m) Today firms produce a variety to products rather than a single product. ***(Oct. 18)***
(n) In case of multi-products, demand interrelationship influences the pricing decisions. ***(BIM, Oct. 18)***
(o) Price discrimination is profitable if elasticity of demand is same in different market. ***(March 19)***
(p) Full cot pricing has certain limitations. ***(BIM, March 19)***
(q) In dumping, a monopolist is a price taker in the world market.
(r) Dumping means selling a commodity in the foreign country at a higher price.

***[Ans.:** (a) True; (b) False; (c) True; (d) True; (e) True; (f) True; (g) True; (h) True; (i) True; (j) False; (k) True; (l) False; (m) True; (n) True; (o) False; (p) True; (q) True; (r) False]*

Match the following:

(A)	(B)
(1) Different price in different markets ***(BIM, Oct. 17)***	(a) MC = MR / Public goods.
(2) Administered Pricing ***(Oct. 17)***	(b) Third degree price discrimination
(3) Marginal cost pricing ***(Oct. 17)***	(c) Determined / Price fixed by government
(4) Discriminating pricing ***(Oct. 18)***	(d) Cost incurred in producing and additional units of output / MC = MR
(5) Marginal cost ***(Oct. 18)***	(e) Persistent Dumping
(6) Transfer pricing ***(BIM, Oct. 18)***	(f) Different prices in different markets
(7) Third degree price discrimination ***(March 19)***	(g) Arises due to growth of large scale industries
(8) International price discrimination ***(BIM, March 19)***	(h) Monopoly
(9) Pricing Policies	(i) Price Stability
(10) Banning Dumping	(j) Import Embargo
(11) Price Discrimination	(k) One seller different price
(12) First degree monopoly	(l) Marginal cost pricing
(13) Public goods	(m) Multi product pricing
(14) MNC	(n) Type of price discrimination

***[Ans.:** (1 – b); (2 – c); (3 – a); (4 – h); (5 – d); (6 – g); (7 – f); (8 – e); (9 – j); (10 – i); (11 – k); (12 – n); (13 – l); (14 – m)]*

(2) Define price discrimination. What are the various forms of price discrimination? ***(Oct. 17)***
(3) When is price discrimination possible and profitable?
(4) Explain with a suitable diagram the process of international price discrimination.
(5) Price discrimination is practiced in the following cases. Justify the case for discrimination:
  (a) Supply of food grains under public distribution at a subsidized rate.

(b) Concessional tickets given by Indian railways to senior citizens and children.
(c) Less fees charged for the education of girls and students belonging to reserved category in schools and colleges.
(d) Differential charges for the supply of electricity to farmers and industrial sector.

(6) Explain the various pricing strategies with suitable examples and diagrams.
(7) Distinguish between marginal cost pricing and full cost / total cost pricing. ***(March 17)***
(8) What is multiproduct pricing? How is it done? ***(Oct. 17)***
(9) Write a note on other pricing practices / methods.
(10) What is transfer pricing? How is transfer pricing determined when the market is imperfect?
(11) Define price discrimination. Explain conditions under which it is profitable.
(12) What is price discrimination? Explain the different degrees of price discrimination? ***(March 17)***
(13) Define price discrimination. Discuss its various degrees. ***(BIM, March 19)***
(14) Discuss the degrees of price discrimination.
(15) Explain the conditions for price discrimination. ***(March 19)***
(16) What is price discrimination and what are its various types?
(17) Explain Dumping.
(18) Explain Marginal cost pricing.
(19) Explain in detail marginal cost pricing. ***(BIM, March 19)***
(20) Discuss the advantages and disadvantages of marginal cost pricing method. ***(BIM, Oct. 18)***
(21) Explain the concept of multiple product pricing.
(22) Explain various ways of formulating pricing policy.
(23) How is full cost determined? Why is the full cost pricing method more popular than any other pricing method?
(24) Explain difference between multiple product pricing and transfer pricing. ***(March 18)***
(25) State and explain the meaning and conditions for price of discrimination. ***(March 18)***
(26) Explain the equilibrium of price of discriminating monopolist. ***(BIM, Oct. 17)***
(27) Define 'transfer pricing' and explain how it affects a firm's profits. ***(BIM, Oct. 17)***
(28) Discuss the merits and demerits of full cost pricing. ***(Oct. 18)***
(29) Explain the concept of transfer pricing.
(30) Explain the concept of transfer pricing without external market. ***(Oct. 18)***
(31) Explain how monopolists practices the different forms of price discrimination. ***(BIM, Oct. 18)***
(32) Define transfer pricing. What are the managerial strategies involved in transfer pricing? ***(March 19)***
(33) Define transfer pricing and explain how it affects a firms profit.
(34) What are the advantages and disadvantages of average cost pricing?
(35) **Write a note on:**
(a) Dumping. ***(Oct. 16; March 17, 19)***
(b) Degrees of price discrimination.
(c) Transfer pricing under perfect competition.
(d) Mark up pricing. ***(Oct. 16)***
(e) Price discrimination. ***(Oct. 16)***
(f) International price of discrimination. ***(March 18)***
(g) Price leadership. ***(BIM, Oct. 17)***
(h) Full cost pricing. ***(BIM, Oct. 17)***
(i) Types of price discrimination. ***(Oct. 18)***
(j) Transfer pricing. ***(BIM, Oct. 18)***
(k) Forms of price discrimination.
(l) Cost plus pricing. ***(BIM, March 19)***