Managerial Economics

MBA First Year
Paper No. 2

School of Distance Education
Bharathiar University, Coimbatore - 641 046

CONTENTS

MANAGERIAL ECONOMICS

Number of Credit Hours : 3

Subject Description: This course presents the principles of economics, demand analysis, market structure and macro environment and its application in the decision making.

Goals: To enable the students to learn the basic principles of economics and its application in the decision making in the business.

Objectives: On successful completion of the course the students should have:

1.   understood the principles economics.

2.   learnt the demand analysis and various cost aspects in the business.

3.   learnt the market structure and the decision making process for various markets.

4.   learnt the profit, profit policies, cost volumes relationship.

5.   learnt the macro environment of the business.

UNIT I

Managerial Economics - meaning, nature and scope - Managerial Economics and business decision making - Role of Managerial Economist - Fundamental concepts of Managerial Economics- Demand Analysis - meaning, determinants and types of demand - Elasticity of demand.

UNIT II

Supply meaning and determinants - production decisions - production functions - Isoquants, Expansion path - Cobb-Douglas function.

Cost concepts - cost - output relationship - Economies and diseconomies of scale - cost functions.

UNIT III

Market structure - characteristics - Pricing and output decisions - methods of pricing - differential pricing - Government intervention and pricing.

UNIT IV

Profit - Meaning and nature - Profit policies - Profit planning and forecasting - Cost volume profit analysis - Investment analysis.

UNIT V

National Income - Business cycle - inflation and deflation - balance of payments - Monetary and Fiscal Policies.

UNIT-I

LESSON

1

MANAGERIAL ECONOMICS: DEFINITION, NATURE, SCOPE

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1.0 AIMS AND OBJECTIVES

The main objectives of this lesson is to give basic introduction of managerial economics. Here, we will also discuss role of economics in managerial decision-making. After study this lesson you will be able to:

(i) understand the meaning and nature of managerial economics

(ii) understand the role of economic theory and quantitative techniques in managerial economics

(iii) discuss the role of economics in managerial decision-making

(iv) describe interrelationship between scarcity and decision-making

(v) know the subject-matter of managerial economics.

1.1 INTRODUCTION

Managerial economics draws on economic analysis for such concepts as cost, demand, profit and competition. A close interrelationship between management and economics had led to the development of managerial economics. Viewed in this

way, managerial economics may be considered as economics applied to "problems of choice" or alternatives and allocation of scarce resources by the firms.

1.2 MEANING OF MANAGERIAL ECONOMICS

Managerial Economics is a discipline that combines economic theory with managerial practice. It tries to bridge the gap between the problems of logic that intrigue economic theorists and the problems of policy that plague practical managers.[1] The subject offers powerful tools and techniques for managerial policy making. An integration of economic theory and tools of decision sciences works successfully in optimal decision making, in face of constraints. A study of managerial economics enriches the analytical skills, helps in the logical structuring of problems, and provides adequate solution to the economic problems. To quote Mansfield,[2] "Managerial Economics is concerned with the application of economic concepts and economic analysis to the problems of formulating rational managerial decisions." Spencer and Siegelman[3] have defined the subject as "the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management."

1.3 NATURE OF MANAGERIAL ECONOMICS

1.3.1 Contribution of Economic Theory to Managerial Economics

Baumol[4] believes that economic theory is helpful to managers for three reasons. Firsts, it helps in recognising managerial problems, eliminating minor details which might obstruct decision-making and in concentrating on the main issue. A manager is able to ascertain the relevant variables and specify relevant data. Second, it offers them a set of analytical methods to solve problems. Economic concepts like consumer demand, production function, economies of scale and marginalism help in analysis of a problem. Third, it helps in clarity of concepts used in business analysis, which avoids conceptual pitfalls by logical structuring of big issues. Understanding of interrelationships between economic variables and events provides consistency in business analysis and decisions. For example, profit margins may be reduced despite an increase in sales due to an increase in marginal cost greater than the increase in marginal revenue.

Ragnar Frisch divided economics in two broad categories – macro and micro. Macroeconomics is the study of economy as a whole. It deals with questions relating to national income, unemployment, inflation, fiscal policies and monetary policies. Microeconomics is concerned with the study of individuals like a consumer, a commodity, a market and a producer. Managerial Economics is micro-economics in nature because it deals with the study of a firm, which is an individual entity. It analyses the supply and demand in a market, the pricing of specific input, the cost structure of individual goods and services and the like. The macroeconomic conditions of the economy definitely influence working of the firm, for instance, a recession has an unfavourable impact on the sales of companies sensitive to business cycles, while expansion would be beneficial. But Managerial Economics encompasses variables, concepts and models that constitute micro-economic theory, as both the manager and the firm where he works are individual units.

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1. Dean, J; Managerial Economics, Englewood Cliffs.

2. Mansfield, E (ed); Managerial Economics and Operations Research, Norton & Co. Inc., New York, 1966, p. 11.

3. Spencer, M H and Siegelman, L; Managerial Economics, Irwin, Illinois, 1969, p. 1.

4. Baumol, W J; 'What can Economic Theory Contribute to Managerial Economics'; American Economic Review, Volume 51, No. 2, May 1961.

1.3.2 Contribution of Quantitative Techniques to Managerial Economics

Mathematical Economics and Econometrics are utilised to construct and estimate decision models useful in determining the optimal behaviour of a firm. The former helps to express economic theory in the form of equations while the latter applies statistical techniques and real world data to economic problems. Like, regression is applied for forecasting and probability theory is used in risk analysis. In addition to this, economists use various optimisation techniques, such as linear programming, in the study of behaviour of a firm. They have also found it most efficient to express their models of behaviour of firms and consumers in terms of the symbols and logic of calculus.

Thus, Managerial Economics deals with the economic principles and concepts, which constitute 'Theory of the Firm'. The subject is a synthesis of economic theory and quantitative techniques to solve managerial decision problems. It is micro-economic in character. Further, it is normative since it makes value judgements, that is, it states what goals a firm should pursue. Fig. 1.1 summarises our discussion of the principal ways in which Economics relates to managerial decision-making.
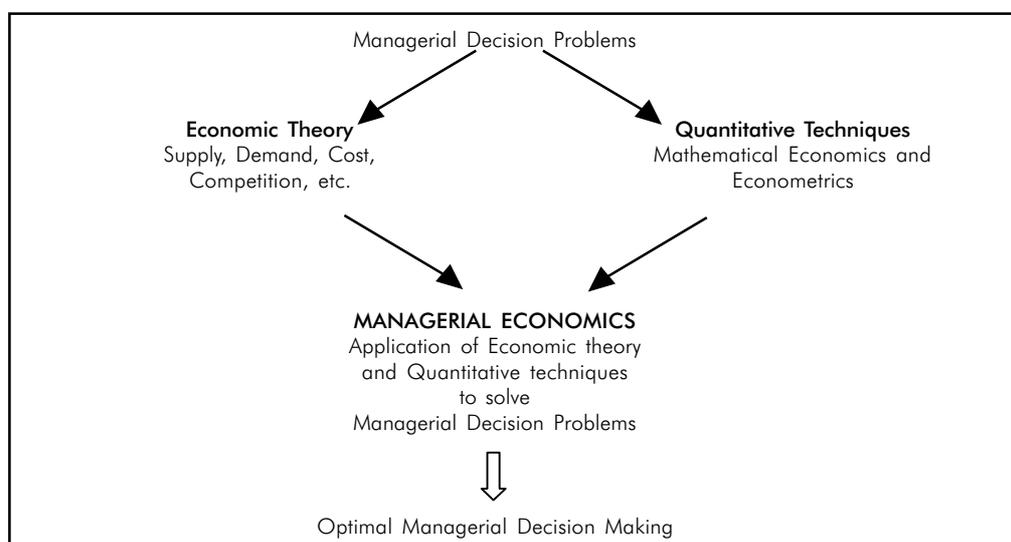
Figure 1.1: Managerial Economics and Related Disciplines

Managerial Economics plays an equally important role in the management of non-business organisations such as government agencies, hospitals and educational institutions. Regardless of whether one manages the ABC hospital, Eastman Kodak or College of Fine Arts, logical managerial decisions can be taken by a mind trained in economic logic.

1.4 ECONOMICS AND MANAGERIAL DECISION MAKING

The best way to become acquainted with Managerial Economics is to come face to face with real world decision problems. Many companies have applied established principles of Managerial Economics to improve their profitability. In the past decade, a number of known companies have experienced successful changes in the economics of their business by using economic tools and techniques. Some cases have been discussed here.

Example 1: Reliance Industries has maintained top position in polymers by building a world-scale plant and upgrading technology. This has resulted in low operating costs due to economies of scale. Reliance Petroleum Ltd. registered a net profit of Rs. 726 crores on sales of Rs. 14,308 crores for the six months ended September

30, 2000. Of these, exports amounted to Rs 2,138 crores, which make RPL India's largest manufacturer and exporter.

The overall economies of scale are in favour of expansion. This expansion will further consolidate the position of RPL in the sector and help in warding off rivals.[5]

Example 2: Leading multinational players like Samsung, LG, Sony and Panasonic cornered a large part of Indian consumer durables market in the late 1990s. This was possible because of global manufacturing facilities and investment in technologies. To maintain their market share, they resorted to product differentiation. These companies introduced technologically advanced models with specific product features and product styling.[6]

Example 3: For P&G[7], the 1990s was a decade of 'value-oriented' consumer. The company formulated policies in view of emergence of India as 'value for money' product market. This means that consumers are willing to pay premium price only for quality goods. Customers are "becoming more price-sensitive and quality conscious…more focussed on self satisfaction…"[7] It can, therefore, be said that consumer preferences and tastes have come to play a vital role in the survival of companies.

Example 4: In late 1990s, HLL earned supernormal profits by selling low-priced branded products in the rural areas. This was a result of market segmentation policy adopted by the company. The company considers the rural market as a separate market. It is now developing packages for the rural market with products, packaging, and pricing tailor made for the rural consumers.[8]

To ward off rivals and to make it a better competitor the company resorted to mergers and acquisitions. Merger of BBIL with HLL in 1996 made it the largest conglomerate in the consumer goods market in India. Over the years HLL has acquired Kissan and Dipys from UB group; Dollops from Cadburys in 1993; and International Bestfoods in 2000, to achieve economies of scope.

Example 5: Apple, the company that began the PC revolution, had always managed to maintain its market share and profitability by differentiating its products from the IBM PC compatibles. However, the introduction of Microsoft's Windows operating system gave the IBM and IBM compatible PCs the look feel, and ease of use of the Apple Macintosh. This change in the competitive environment forced Apple to lower its prices to levels much closer to IBM compatibles. The result has been an erosion of profit margins. For example, between 1991 and 1993, Apple's net profit margins fell from 5 to 1 per cent.

In all the above examples, decision making has primarily been economic in nature as it involves an act of choice. The decision of Reliance Industries to build a plant of international scale and to further expand capacity was made on the basis of the law of returns to scale and economies of scale. Similarly, the MNCs in the consumer durables market in India emphasised on global manufacturing facilities coupled with product differentiation to capture and maintain a major portion of market share. It should be noted that scale economies are sufficient for RPL as it operates under homogenous oligopoly (refer Chapter 7). But consumer durables market falls under differentiated oligopoly market structure, so it requires emphasis on differentiation as well. Likewise, Apple had always managed to maintain market share due to product differentiation.

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5. *The Economic Times*, 12 Jan 2001.

6. *The Economic Times*, 24 July 2000.

7. *The Economic Times*, Brand Equity, 11-17 August, 1999.

8. *The Economic Times*, 30 August, 2000.

Fast moving consumer goods (FMCG) companies, P&G and HLL took concepts of consumer demand analysis, namely, consumer preferences and market segmentation respectively, to maintain their dominant position in various product categories. Selection of product portfolio of P & G is an expression of consumer choice for quality products. HLL strategy to earn supernormal profits by catering to rural areas is an economic decision based on selection of an expanding market segment. The objective of HLL of being the largest firm in the industry was achieved by economies of scope acquired through mergers and acquisitions.

1.5 SCARCITY AND DECISION MAKING

Robbins has defined Economics as "the science that studies human behaviour as a relationship between ends and scarce means which have alternative uses". Human wants are virtually unlimited and non-satiable, but the means to satisfy them are limited.

Managerial Economics hence has evolved as a discipline of choice making. But why does scarcity arise? A resource is scarce if demand for it exceeds its supply. Scarcity is, therefore, a relative term. Anything that commands a price is a scarce item, called economic good, and the rest are free goods. Any item which is a free good today in a particular society may become an economic good tomorrow. Thus, scarcity can be defined as a condition in which resources are not available in adequate amounts to satisfy all the needs and wants of a specified group of people. The problem of scarcity, and thereby, choice would not have arisen if resources of production had been in abundance. A choice has to be made between ends (unlimited wants) and means (limited resources). Due to scarcity of resources, we have to constantly match the ends and means. Fig. 1.2 explains the problem of choice making.
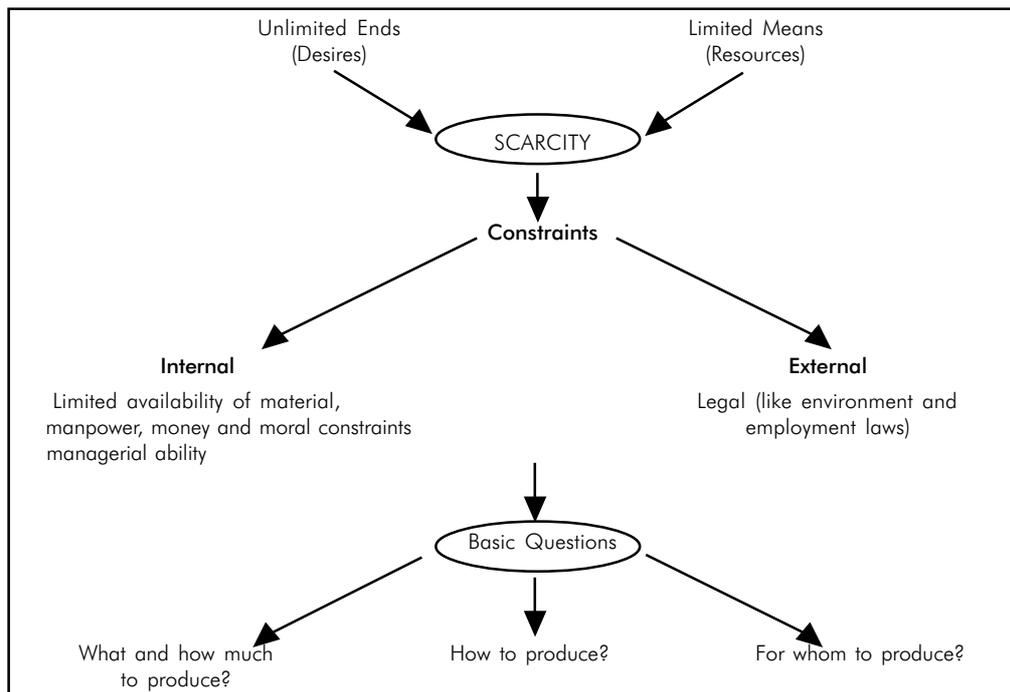
Figure 1.2: Scarcity and Basic Choice Problem

A firm has to allocate the available resources among various activities of the unit. Resource constraints can be in form of limited supply of men, materials, machines, money and managerial ability. Following examples illustrate this point:

1. Production manager of Asian Paints may face a choice making decision of producing paints for domestic or industrial use, due to scarcity of titanium dioxide.

2. Marketing manager of Maruti Udyog has to decide whether to push up sales of Alto or Wagon R or Gypsy in view of limited advertisement outlay.

3. Personnel manager of Titan Watches has to decide whether to employ skilled labour on a contract basis or to hire them on daily wages.

4. The finance manager of a hospital may face the problem of allocation of limited budget between paediatric, surgery and orthopaedics departments.

5. A management institute may strive to maximise the value of teaching and research outputs subject to an annual budget constraint.

6. The technological constraints may set the physical limits on the amount of output per unit of time that can be generated by a particular machine, or workers employed by production manager of Videocon Intl.

The objective in all the cases has been to maximise the attainment of ends given the means and the priorities. How to maximise the output level or to minimise the use of resources, thereby, the cost of production, is regarded as the optimal solution to economic problem.

Besides resource constraints, the firm faces legal constraints. They include an array of central, state and local laws. These take the form of minimum wage laws, health and safety standards, pollution emission standards, as well as regulations that prevent firms from employing unfair trade practices. Society may impose moral constraints on firms to modify their behaviour to function consistently with broad social welfare goals. For instance, a community in a particular region may ban the operations of a liquor factory.

From the above analysis, it can be concluded that the essence of economic science is determination of optimal behaviour which is subject to constraints arising basically due to scarcity of resources. Constraints are so pervasive and important that economists use the term "constrained optimisation" synonymous to maximisation. Thus, the primary role of managerial economics is in evaluating the implications of the alternative courses of action and choosing the best or optimal course of action among several alternatives. As a result, the decision making process involves the following steps:

Step 1: Establish the objectives - Identification of objective of the organisation is necessary to make a decision. Unless one knows what is to be achieved, there is no sensible way to make a decision.

Step 2: Define the problem – Specification of the problem is a crucial part of decision-making. The problem may arise due to firm's planning process or may be prompted by new opportunities.

Step 3: Identification of alternatives – Once the problem is defined, possible courses of action should be identified. After addressing the question, "What do we want?", it is natural to ask, "What are our options?" The decision-maker should identify the variables under his control and the constraints that limit his choice.

Step 4: Selection of best alternative – Having identified the set of alternative possible solutions, revenues and costs associated with each course of action should be stated. Then the best possible alternative should be selected, given the goals of the firm.

Step 5: Implement the decision – Once an alternative is chosen, it must be implemented in order to be effective. Even organisations as disciplined as armies, find it difficult to carry out orders effectively.

1.6 SCOPE OF MANAGERIAL ECONOMICS

An analysis of scarcity of resources and choice making poses three basic questions:

Q.1 What to produce and how much to produce?

Q.2   How to produce?

Q.3   For whom to produce?

A firm applies principles of economics to answer these questions. The first question relates to what goods and services should be produced and in what quantities. Demand theory guides the manager in the selection of goods and services for production. It analyses consumer behaviour with regard to:

- Type of goods and services they are likely to purchase in the current period and in the future,

- Goods and services which they may stop consuming,

- Factors influencing the consumption of a particular good or service, and

- The effect of a change in these factors on the demand of that particular good or service.

A detailed study of these aspects of consumer behaviour help the manager to make product decision. At some particular time, a firm may decide to launch new goods and services or stop providing a particular good or service. For example, in 1990s, Videocon group launched a new company of kitchen appliances. In 1961, Tatas started TCS, while in 1993, the company ceded TOMCO to HLL. Knowledge of demand elasticities helps in setting up of prices in context of revenue of a firm. Methods of demand forecasting help in deciding the quantity of a good or service to be produced.

How to produce the goods and services is the second basic question. It involves selection of inputs and techniques of production. Decisions are made with regard to the purchase of items ranging from raw materials to capital equipment. Production and cost analysis guides a manager in personnel practices such as hiring and staffing and procurement of inputs. For example, the decision to automate clerical activities using PC network results in a more capital-intensive mode of production. Capital budgeting decisions also constitute an integral part of the second basic question. Allocation of available capital in long-term investment projects can be done through project appraisal methods.

Firms' third basic question relates to segmentation of market. A firm has to decide for whom it should produce the goods and services. For example, it has to decide whether to target the domestic market or the foreign market. Production of a premium good is another example of market segmentation. An analysis of market structure explains how price and output decisions are taken under different market forms.

Basic Questions & Related Concepts

Basic Questions	Related Concepts
Q1. What to produce and how much to produce?	Product decision: consumer demand, demand elasticities and demand forecasting.
Q2. How to produce?	Input-output decisions: production and cost analysis and capital budgeting.
Q3. For whom to produce?	Market segmentation decision.

Case 1 illustrates and integrates the scope of Managerial Economics in real world. It explains how Eicher Motors tries to solve the three basic questions faced by the company when introducing a new product. In the primary stage, customer preferences are captured to decide what to produce. They are translated into product design through 'Quality Function Deployment'. The later stages of 'House of Quality' take care of production and cost decisions, thereby taking the decision of how to produce. The development of a product for a particular section of society considers the question for whom to produce. For instance, manufacture of special vehicles for poultry segment and buses for school children.

Appropriate business decision making with the help of economic tools has gained recognition in view of complex business environment. Since the macroeconomic environment is dynamic, it changes over time; managerial decisions have to be reviewed constantly. In this context, concepts of consumer behaviour, demand elasticities, demand forecasting, production and cost analysis, market structure analysis and investment planning help in making prudent decisions.

Check Your Progress

What is the role of managerial economics in decision-making?

Note:(i) Write your answer in the space given below.

(ii) Check your answer with the one given at the end of this lesson.

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— —
— —
— —
— —
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Case Study 1: Managerial Economics and Decision Making

Eicher has always tried to associate its models with superior technology, fuel efficiency, speed, reliability and, of course, better design. Because as group chairman and chief executive, Sandilya says, "It is important to capture the raw voice of the customer". Listening to the customer, however, is not everything. Listening just gives a broad idea of what the customer wants; the idea is to capture the voice and translate it into product design. This process has a technical name: Quality Function Deployment (QFD).

The process originated in Japan as a means of translating customer requirements into appropriate technical requirements throughout the development and production process of a product. Says Sandilya, "QFD tries to translate the WHAT of the customer to HOW to fulfil requirement. Linking and documenting the processes make it an efficient system."

QFD is driven by the concept of quality and results in the best possible product to market. When appropriately applied, QFD has demonstrated a reduction of development time by one-half to one-third. This is possible because the first step in the process is to enable the company to define targets, for instance, in terms of product choice, power, fuel efficiency, coaching area. "Priority is the most important requirement. What is the consumer's priority and what price is he willing to pay for the features? This enables you to look at optimal product design," Sandilya says. The idea is to look at the pains in the current systems and what exciting features you could provide *vis-à-vis* design. This step is handled by the House of Quality.

The House of Quality is the most commonly used matrix in QFD. It includes the following components: an Objective Statement, the Voice of the Customer, Important

Contd...

Ratings, a Customer Competitive Assessment, the Voice of the Supplier, Target Goals, a Correlation Matrix, a Technical Assessment, Probability Factors, a Relationship Matrix, Absolute Score, and Relative Score. At Eicher, these steps are divided into House of Quality phases 1, 2 and 3.

Each part of the vehicle needs special attention from cabin interiors to the engineering of the vehicle. For instance, for a driver of Indian built, it is difficult to get inside the vehicle, so steps were built into the vehicle and handles made easily reachable.

"Customers have started paying a lot of attention to driver comfort. For our poultry segment, chickens are transported over 8-10 hours at night, as it is cooler and healthier for the chicken. Because of high mortality of chicken, owners want the driver to be comfortable so that he does not stop on the way. Ultimately, it is high productivity that everyone is looking at," says Sandilya.

For school buses, Eicher paid lot of attention to safety features after speaking to teachers and parents. School buses were designed with separate racks for water bottles and bags, grab rails were made easily reachable, the seat top handles were padded and the front seats were turned inside.

Adapted from The Economic Times, 2-8 June, 2000.

1.7 LET US SUM UP

Managerial Economics is a discipline that combines economic theory with managerial practice. This chapter discuss that how Managerial Economics bridge the gap between the problems of logic that intrigue economic theorist and problems of policy that plague practical managers. This chapter studies that how managerial economics enriches the analytical skill, helps in logical structuring of problems and provides adequate solutions to the economic problems.

1.8 LESSON END ACTIVITY

Managerial economics serves as "a link between traditional economics and the decision-making sciences" for business decision-making.

Do you agree with above statement? Give appropriate example in favour of your argument.

1.9 KEYWORDS

Micro Economics

Central Problems

Economic Theory

Quantitative Techniques

Economic Analysis

Decision Making

Scarcity

Choice Problem

1.10 QUESTIONS FOR DISCUSSION

1. 'Managerial Economics is often used to help business students integrate the knowledge of economic theory with business practice.' How is this integration

accomplished? What role does the subject play in shaping managerial decisions?

2. Explain the relation between scarcity and opportunity cost. How do they influence business decisions?

3. What is constrained optimisation? How do constraints impose restrictions on the operations of a firm?

4. Following are the examples of typical economic decisions made by managers of a firm. Determine whether each is an example of what, how, or for whom to produce:

(a) Should the company make its own spare parts or buy them from an outside vendor?

(b) Should the company continue to service the equipment it sells or ask the customers to use independent repair companies?

(c) Should a company expand its business to international markets or concentrate on domestic markets?

(d) Should the company replace its telephone operators with a computerised voice messaging system?

(e) Should the company buy or lease the fleet of trucks that it uses to translate its products to markets?

1.11 MODEL ANSWER TO "CHECK YOUR PROGRESS"

The essence of managerial economics is determination of optimal behaviour which is subject to constraints arising basically due to scarcity of resources. The objective of all the firms has been to maximise the output level or minimise the cost of production. Thus, the primary role of managerial economics in decision-making is evaluating the implications of alternative course of actions and choosing the best among several alternatives.

1.12 SUGGESTED READINGS

Malcolm P. McNair and Richard S. Meriam, *Problems in Business Economics,* McGraw-Hill Book Co., Inc.

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Haynes, Mote and Paul, *Managerial Economics—Analysis and Cases*, Vakils. Feffer and Simons Private Ltd., Bombay.

Hague, D.C., *Managerial Economics Longman.*

Introduction to Managerial Economics. Hutchinson University Library.

LESSON

2

FUNDAMENTAL CONCEPTS OF MANAGERIAL ECONOMICS

CONTENTS

2.0 AIMS AND OBJECTIVES

This lesson is intended to discuss basic principles and objectives which are useful in managerial decision-making. After studying this lesson you would be able to:

(i)   understand marginal principle and its use in managerial economics

(ii)   use equimarginal principle in consumer and producer is behaviour and pricing and output decision of firms

(iii) describe relation between scarcity and opportunity cost

(iv)   discount costs and revenues to obtain present value for comparison of alternatives available.

2.1 INTRODUCTION

Managerial economics draws on economic analysis for such concepts as opportunity cost, marginal and incremental principle, discounting principle etc. These concepts and tools help in reasoning and precise thinking. Some basic concepts, useful in managerial decision-making have been discussed below.

2.2 MARGINAL AND INCREMENTAL PRINCIPLE

A manager has to use resources of production carefully as they are scarce. Marginal analysis helps to assess the impact of a unit change in one variable on the other. For example, a firms' decision to change prices would depend on the resulting change in marginal revenue and marginal cost. Changes in these variables would, in turn, depend on the units sold as a result of a change in price. Change in the price is desirable if the additional revenue earned is more than the additional cost. Similarly, decision on additional investment is taken on the basis of the additional return from that investment, that is, the marginal changes.

The word 'marginal' is used for such small changes. In contrast, incremental concept applies to changes in revenue and cost due to a policy change. For example, additional cost of installing computer facilities will be incremental cost and the additional revenue earned due to access to Internet will be incremental revenue. Thus, a change in output because of a change in process, product or investment is regarded as an incremental change. Incremental reasoning highlights the fact that incremental cost, rather than full cost, should be taken in consideration to assess the profitability of a decision. The incremental principle states that a decision is profitable when:

●   it increases revenue more than costs;

●   it decreases some costs to a greater extent than it increases others;

●   it increases some revenues more than it decreases others; and

●   it reduces costs more than revenues.

Suppose a firm gets an order that brings additional revenue of Rs 3,000. The cost of production from this order is:

	Rs
	Rs
Labour	800
Materials	1,300
Overheads	1,000
Selling and administration expenses	700
Full cost	3,800

At a glance, the order appears to be unprofitable. But suppose the firm has some idle capacity that can be utilised to produce output for new order. There may be more efficient use of existing labour and no additional selling and administration expenses to be incurred. Then the incremental cost to accept the order will be:

	Rs
Labour	600
Materials	1,000
Overheads	800
Total incremental cost	2,400

Incremental reasoning shows that the firm would earn a net profit of Rs 600 (Rs 3,000 – 2,400), though initially it appeared to result in a loss of Rs 800. The order should be accepted.

2.3 EQUI–MARGINAL PRINCIPLE

The equi-marginal principle states that a rational decision maker would allocate or hire his resources in such a way that the ratio of marginal returns and marginal costs of various uses of a given resource is the same, in a given use. For example,

a consumer maximises utility or satisfaction from consumption of successive units of goods X, Y, and Z will allocate his consumption budget such that

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \frac{MU_z}{P_z}$$

where MU represents marginal utility and P the price of the good. Similarly, a producer seeking maximum profit will use the technique of production which would ensure that

$$\frac{MRP_1}{MC_1} = \frac{MRP_2}{MC_2} \ldots\ldots = \frac{MRP_n}{MC_n}$$

where MRP is the marginal revenue product of inputs and MC shows marginal cost.

2.4 OPPORTUNITY COST PRINCIPLE

The opportunity cost principle states that a decision to accept an employment for any factor of production is profitable if the total reward for the factor in that occupation is greater or at least no less than the factor's opportunity cost. This cost arises because most economic resources have more than one use. The opportunity cost is the amount of subjective value foregone in choosing one alternative over the next best alternative. It is the 'cost of sacrificed alternatives'.

If there are no sacrifices, there is no cost. Like the opportunity cost of using a machine to produce one product is the earnings foregone which would have been earned from producing other products. Similarly, the opportunity cost of using the premises for own business is the rent that would have been earned by giving it on rent.

2.5 TIME PERSPECTIVE PRINCIPLE

The time perspective principle argues that a manager should consider both short run and long run while taking decisions. Economists regard short run as the current period whereas long run as a future period. Some inputs of production are regarded as fixed in the short run. It is a time period in which the existing producers respond to price changes by using more or less of their variable inputs. From the standpoint of consumers, the short run is a period in which they respond to price changes with the prevalent tastes and preferences.

Long run is a time period in which new sellers may enter a market or a seller already existing may leave. This time period is sufficient for both old and new sellers to vary all their factors of production. From the standpoint of consumers, long run provides enough time to respond to price changes by actually changing their tastes and preferences or their alternative goods and services.

2.6 DISCOUNTING PRINCIPLE

Discounting principle states that when a decision affects costs and revenues at future dates, it is necessary to discount those costs and revenues to present values before a valid comparison of alternatives is possible. This is because money has time value, that is, a rupee to be received in the future is not worth a rupee today. Therefore, it is necessary to have techniques for measuring the value today (i.e., the present value) of rupee to be received or paid at different points in future. If the

interest rate is .10 and if the rupee is to be received in 4 years (n = 4), the present value of rupee equals

$$\frac{1}{(1+i)^n} = \frac{1}{(1+.10)^4} = \frac{1}{1.4641} = Rs\ 0.683$$

In other words, the present value of the rupee is 68.3 paise. Similarly, we can calculate the present value for longer periods. Present value of an annuity (a series of periodic equal payments) can be regarded as the sum of the present values of each of several amounts. For example, the present value of Re. 1 to be received at the end of each of the next 5 years, if the interest rate is .10, is

$$\sum_{t=1}^{n}\frac{1}{(1+i)^t} = \sum_{t=1}^{5}\frac{1}{(1+.10)^t} = \frac{1}{(1+.10)} + \frac{1}{(1+.10)^2} + \frac{1}{(1+.10)^3} + \frac{1}{(1+.10)^4} + \frac{1}{(1+.10)^5}$$

= .90909 + .82645 + .75131 + .68301 + .62092

= Rs 3.79

Check Your Progress

Discuss, with a real world example, the role of time perspective principle in managerial decision-making.

Notes: (i) Write your answers in the space given below.

(ii) Check your answer with the one given at the end of this lesson.

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2.7 ROLE OF MANAGERIAL ECONOMIST

Companies like Tatas, DCM, HLL and IPCL employ managerial economists to guide them in making appropriate economic decisions. A managerial economist makes an assessment of change in the consumer preferences, input prices, and related variables to make successful forecasts of their probable effect on the internal policies of the firm. They inform the management of a change in the competitive environment in which a firm functions, and suggest suitable policies for solution of problems like:

1. What product and services should be produced?

2. What inputs and production techniques should be used?

3. How much output should be produced and at what prices should it be sold?

4. What are the best sizes and locations of the new plant?

5. When should the equipment be replaced?

6. How should the available capital be allocated?

A managerial economist has to evaluate changes in the macroeconomic indicators like national income, population, and business cycles, and their likely impact on the functioning of the firm. He also studies the impact of changes in fiscal policy, monetary policy, employment policy and the like on the functioning of the firm. These topics come under the purview of macroeconomics. Therefore, they deserve a separate treatment. The scope of managerial economics is restricted to microeconomics.

2.8 IMPORTANCE OF MANAGEMENT DECISION MAKING

Managerial Economics serves as "a link between traditional economics and the decision making sciences" for business decision-making.

The best way to get acquainted with managerial economics and decision-making is to come fact to face with real world decision problems.

Tata's Vision 2000

Presently there are about 87 firms in the Tata empire. As many as 16 have recorded losses in 1995-96. Tata's companies that are in the limelight are TISCO, TELCO, ACC, Tata Exports and Tata Chemicals.

Contribution of bottom 20 companies	In terms of turnover: 35% of total of group. In terms of net profit: 0.2% of total sales of group. In terms of assets and net worth <1% of total sales of group.
The question view is :	Do such non-performers warrant an existence or will the group be better off it could hire off the divisions, or else amalgamate them with other existing units.
On the three basic indications:	Last two companies are way below the group as a whole; providing 4.2% return to shareholders; 1.9% return on capital employed.

Keeping these figures in mind, Tatas are planning refocusing exercises like

- Divestment   -   mergers

- Amalgamations   -   takeovers
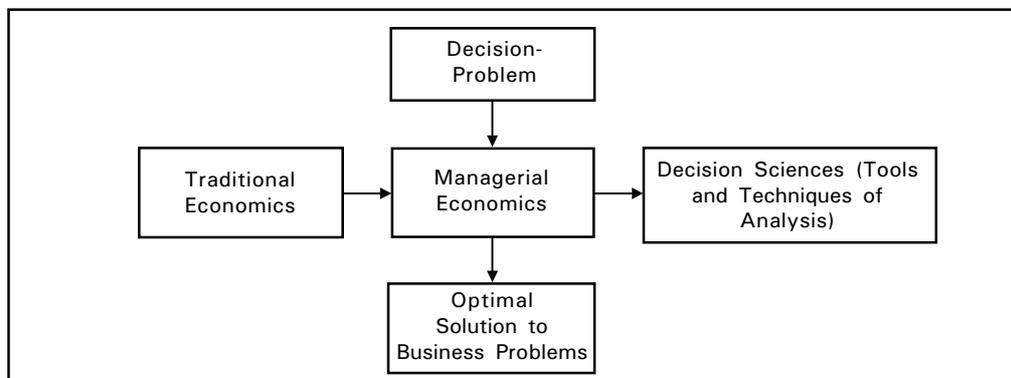
Figure 2.1: Decision Making

- To create a learner and suggestive group with an estimated turnover of Rs 1,10,000 crore by 2000.

- From being production-led to beings consumer and market-led; being up in top three in every segment.

Mr Tata's "Vision 2000" is a group. Why not give someone else a chance to run your business more efficiently if you cannot do so? It makes better economic as well as business sense. But then, the ball is in the court of Tatas. The What and How to do is their prerogative.

2.9 LET US SUM UP

In this lesson we have studied the fundamental concepts of managerial economics. This most important concept, in this regard, is the concept of marginalism. Marginal

analysis helps to assess the impact of a unit change in one variable on the other. The next important concept, used in managerial economics, is opportunity cost. It is the amount of subjective value foregone in choosing one alternative over the next best alternative. Other important concepts, we have discussed in this lesson, are time perspective principle and discounting principle.

2.10 LESSON END ACTIVITY

Calculate using the best estimate you can make:

(i) Your opportunity cost of attending college.

(ii) Your opportunity cost of taking this course (e.g. MBA).

2.11 KEYWORDS

Marginalism

Marginal Revenue

Marginal Cost

Incremental Cost

Incremental Revenue

Equi-marginal Principle

Opportunity Cost

Net Present Value

2.12 QUESTIONS FOR DISCUSSION

1. What is the importance of management decision-making?

2. Write short notes (about 200 words) on the following:

    (a) The marginal concept

    (b) The incremental concept

    (c) Opportunity cost

3. What is the difference between marginalisms and incrementalism? State the significance of marginal analysis in decision-making.

4. What are equi-marginal principle and time perspective principle? Describe their use in allocation of resources of a firm.

2.13 MODEL ANSWER TO "CHECK YOUR PROGRESS"

The time perspective principle argues that a manager should consider short run and long run while taking decisions. Economists regard short run as the current period whereas long run as a future period. Some companies provide a good free of cost, with a popular brand, in the current period with an eye of the future profits. HLL, for instance has done promas of Fair and Lovely on Lux soaps as the company is of the view that a large proportion of population does not use F&L in the current period.

2.14 SUGGESTED READINGS

Malcolm P. McNair and Richard S. Meriam, *Problems in Business Economics,* McGraw-Hill Book Co., Inc.

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Haynes, Mote and Paul, *Managerial Economics—Analysis and Cases*, Vakils. Feffer and Simons Private Ltd., Bombay.

Hague, D.C., *Managerial Economics Longman.*

Introduction to Managerial Economics. Hutchinson University Library.

LESSON
3

DEMAND ANALYSIS

3.0 AIMS AND OBJECTIVES

This lesson is intended to discuss basic concepts of demand analysis. After study this lesson you will be able to:

(i) define demand

(ii) differentiate between desire and demand

(iii) describe different types of demand

(iv) differentiate between movement along the demand curve and shift of the demand curve

3.1 INTRODUCTION

Demand is a widely used term, and in common parlance is considered synonymous with terms like 'want' , 'desire'. However, in economics, demand has a definite meaning which is different from ordinary use. In this unit, we will explain what is demand from the consumers' point of view, and analyze demand from the firm perspective.

3.2 MEANING OF DEMAND

In Managerial Economics we are concerned with demand for a commodity faced by the firm. This depends upon the size of the total market or industry demand for the commodity, which in turn is the sum of the demands for the commodity of the individual consumers in the market. Thus we begin by examining the theory of consumer demand in order to learn about the market demand on which the demand for the product faced by a particular firm depends.

Demand is one of the crucial requirements for the existence of any business enterprise. A firm is interested in its own profit and/or sales, both of which depend partially upon the demand for its product. The decision which management makes with respect to production, advertising, cost allocation, pricing etc. call for an analysis of demand.

Demand for a commodity refers to the quantity of the commodity which an individual household is willing to purchase per unit of time at a particular price.

Demand for a commodity implies:

(a) Desire to acquire it,

(b) Willingness to pay for it, and

(c) Ability to pay for it.

Demand has a specific meaning. Mere desire to buy a product is not demand. A miser's desire for and his ability to pay for a car is not demand because he does not have the necessary will to pay for it. Similarly, a poor man's desire for and his willingness to pay for a car is not demand because he lacks the necessary purchasing power. One can also conceive of a person who possesses both the will and purchasing power to pay for a commodity, yet this is not demand for that commodity if he does not have desire to have that commodity.

3.3 TYPES OF DEMAND

For a purposeful demand analysis for managerial decisions, it is necessary to classify the large number of goods and services available in every economy. Policy decisions are also facilitated by an understanding of demand at various levels of aggregation. A classification in these respects is as follows:

3.3.1 Consumer Goods and Producer Goods

Goods and services used for final consumption are called consumer goods. These include, goods consumed by human-beings, animals, birds etc. Producer goods refers to the goods used for production of other goods, like plant and machines, factory buildings, services of employees, raw materials etc.

3.3.2 Perishable and Durable Goods

Perishable goods become unusable after sometimes, others are durable goods. Precisely, perishable goods are those which can be consumed only once while in durable goods, their services only are consumed. Durable goods pose more complicated problems for demand analysis than do non-durables. Sales of non-durables are made largely to meet current demands which depends on current conditions. In contrast, sales of durable goods go partly to satisfy new demand and partly to replace old items. Further, the latter set of goods are generally more expensive than the former set, and their demand alone is subject to preponement and postponment, depending on current market conditions *vis-a-vis* expected: market conditions in future.

3.3.3 Autonomous and Derived Demand

The goods whose demand is not tied with the demand for some other goods are said to have autonomous demand, while the rest have derived demand. Thus the demand for all producer goods are derived demands as they are needed to obtain consumer or producer goods. So is money because of its purchasing power. However, there is hardly anything whose demand is totally independent of any other demand. But the degree of this dependence varies widely from product to product. Thus the autonomous and derived demand vary in degree more than in kind.

3.3.4 Individual's Demand and Market Demand

Market demand is the summation of demand for a good by all individual buyers in the market. For example, if the market of good *x* has, say only three buyers then individual and market demand (monthly) could be as stated in Table 3.1.

Table 3.1

	Demand of X in lit.			
Price of X *(Rs.)* *(1)*	*Buyer 1* *(2)*	*Buyer 2* *(3)*	*Buyer 3* *(4)*	*All Buyers* *Market Demand* *(5)*
8	5	10	0	15
7	8	12	4	24
6	12	15	7	34
5	20	19	12	51
4	30	25	20	75
3	45	30	30	105

This can be shown by a graph as:
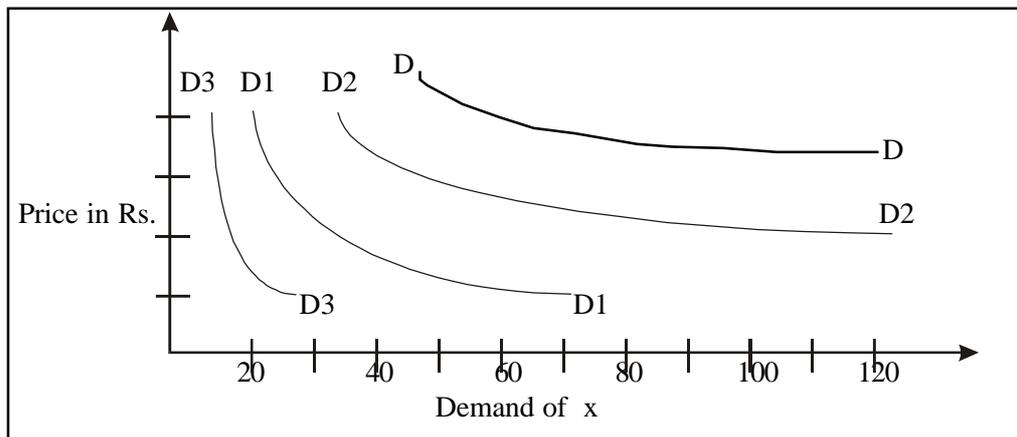
Figure 3.1

In Figure 3.1, D1 D1 represents demand curve of buyer 1, D2 D2 of buyer 2, D3 D3 of buyer 3 and DD that of all three of them called the market demand curve. The market demand curve is thus the horizontal summation of individual demand curves.

A firm would be interested in the market demand for its products while each consumer would be concerned basically with only his own individual demand.

3.3.5 Firm and Industry Demand

Goods are produced by more than one firm and so there is a difference between the demand facing an individual firm and that facing an industry. (All firms producing a

particular good constitute an industry engaged in the production of that good). For example, demand for Fiat car alone is a firm's demand and demand for all kinds of cars is industry's demand.

3.3.6 Demand by Market Segments and by Total Market

If the market is large in terms of geographical spread, product uses, distribution channels, customer sizes or product varieties, and if any one or more of these differences were significant in terms of product price, profit margins, competition, seasonal patterns or cyclical sensitivity, then it may be worthwhile to distinguish the market by specific segments for a meaningful analysis. In that case, the total demand would mean the total demand for the product from all market segments while a particular market segment demand would refer to demand for the product in that specific market segment.

3.4 DETERMINATION OF DEMAND

The demand for a commodity arises from the consumer's willingness and ability to purchase the commodity. The Demand Theory postulates that the quantity demanded of a commodity is a function of or depends on not only the price of a commodity, but also income, price of related goods—both substitutes and complements, taste of consumer, price expectation and all other factors. Demand function is a comprehensive formulation which specifies the factors that influence the demand for the product.

$$Dx \quad = \quad D\,(Px, Py, Pz, B, A, E, T, U)$$

where Dx = Demand for item X

Px = Price of substitutes

Pz = Price of complements

B = Income of consumer

E = Price expectation of the user

T = Taste or preference of user

U = all other factors.

The impact of these determinants on Demand is:

(i) **Price effect on demand:** Demand for x is inversely related to its own price.

$$\frac{\delta D_x}{\delta P_x} < 0$$

(ii) **Substitution effect on demand:** If y is a substitute of x, then as price of y increases, demand for x also increases.

$$\frac{\delta D_x}{\delta D_A} > 0$$

(iii) **Complementary effect on demand:** If z is a complement of x, then as the price of z falls, the demand for z goes up and thus the demand for x also tends to rise.

$$\frac{\delta D_x}{\delta P_y} < 0$$

(iv) **Price expectation effect on demand:** Here the relation may not be definite as the psychology of the consumer comes into play.

(v) **Income effect on demand:** As income rises, consumers buy more of normal goods (positive effect) and less of inferior goods (negative effect).

$$\frac{\delta D_x}{\delta B} \gtrless 0$$

(vi) ***Promotional effect on demand:*** Advertisement increases the sale of a firm up to a point.

$$\frac{\delta D_x}{\delta D_A} \gtrless 0$$

Socio-psychological determinants of demand like tastes and preferences, custom, habits etc. defy any theoretical explanation.

Demand curve considers only the price-demand relation, other factors remaining the same. The inverse relationship between the price and the quantity demanded for the commodity per time period is the DEMAND SCHEDULE for the commodity and the plot of the data (with price on the vertical axis and quantity on the horizontal axis) gives the DEMAND CURVE of the individual.

Table 3.2: An Individual's Demand Schedule for Commodity x

Price of x *(per Unit) Px*	*Quantity of x Demanded* *(in Units) Dx*
2.0	1.0
1.5	2.0
1.0	3.0
0.5	4.5
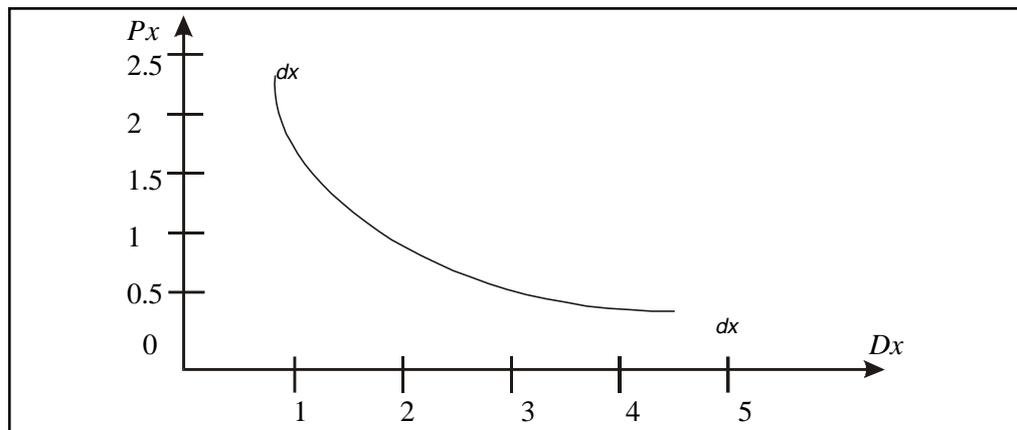
Figure 3.2: Demand Curve

The Demand curve is negatively sloped, indicating that the individual purchases more of the commodity per time period at lower prices (other factors being constant).

The inverse relationship between the price of the commodity and the quantity demanded per time period is referred to as the LAW OF DEMAND.

A fall in *Px* leads to an increase in *Dx* (so that the slope is negative) because of the substitution effect and income effect.

It is important to clearly distinguish between a movement along a given demand curve (as a result of a change in the price) from a shift in demand (as a result of change in income, price of related commodities and tastes). The first is known as a *change in quantity demanded* and the second is known as a *change in demand*.

Explain the effect on demand for butter in each of the following cases:

(a) The price of bread rises

— —

— —

(b) The price of jam falls

— —

— —

(c) The price of butter rises

— —

— —

(d) An increase in the family income

— —

— —

3.4.1 Change in Quantity Demanded (Movement Along the Demand Curve)

A movement along the demand curve is caused by a change in the price of the good only other things remaining constant. It is also called change in quantity demanded of the good. Movement is always along the same demand curve and is of the following types:

1. Expansion of demand, and

2. Contraction of demand

Expansion of Demand: It refers to rise in demand due to fall in the price of the good.

Contraction of Demand: It refers to fall in demand due to rise in the price of the good.

Movement along a demand curve is graphically shown in the Figure 3.3(a).
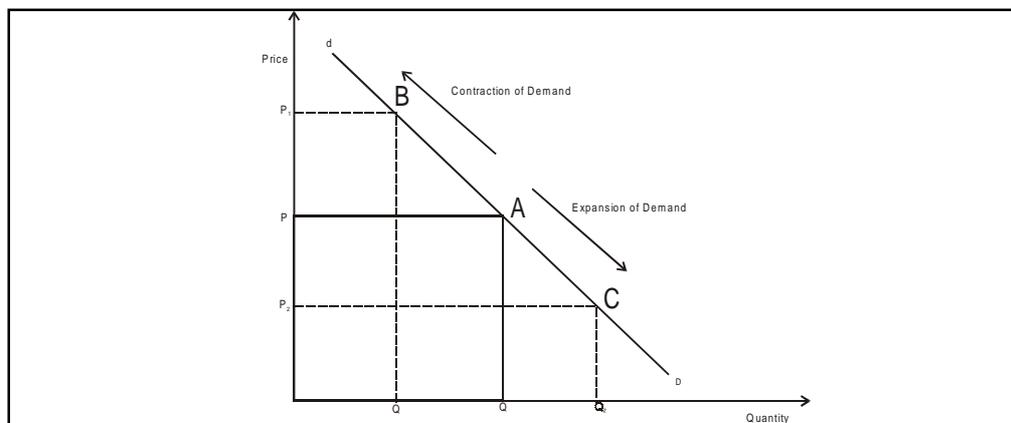
Figure 3.3 (a)

Point A on the demand curve (dd) is the original situation.

An upward movement from point A to a point such as point B shows contraction or lesser quantity demanded at a higher prices.

A downward movement from point A to a point such as point C Shows expansion or more quantity demanded at a lower price.

3.4.2 Shifts of the Demand Curve

If any of the things held constant in drawing a demand curve change, there is a shift in the demand curve. It is of two types:

(a) *Increase in demand:* The demand curve shifts UPWARD or to the right, so that the individual demands more of the commodity at each commodity price, provided the good is a normal good. If the price of a substitute commodity increases or the price of a complementary commodity falls, or if the consumer's taste for the commodity changes, the demand curve shifts upward to the right. This can be shown in Figure 3.3(b).
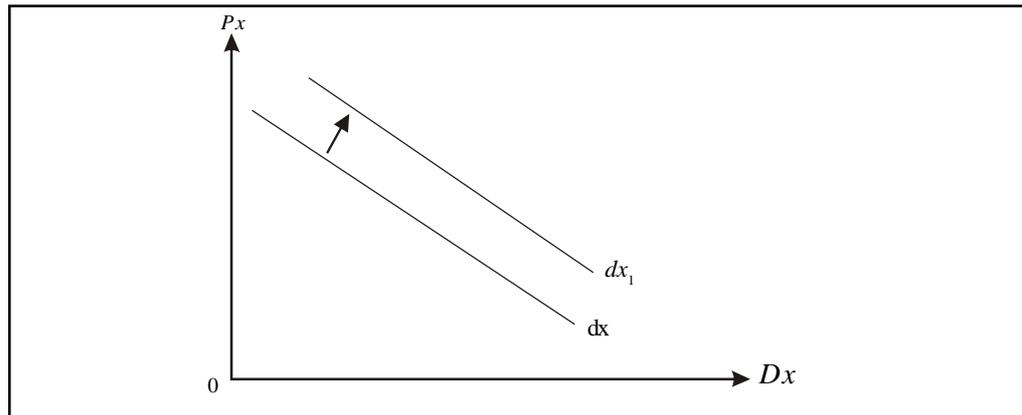

Figure 3.3 (b): Increase in Demand

(b) *Decrease in demand:* With opposite changes in factors affecting demand, the demand curve shifts to dx_2 (Figure 3.4).
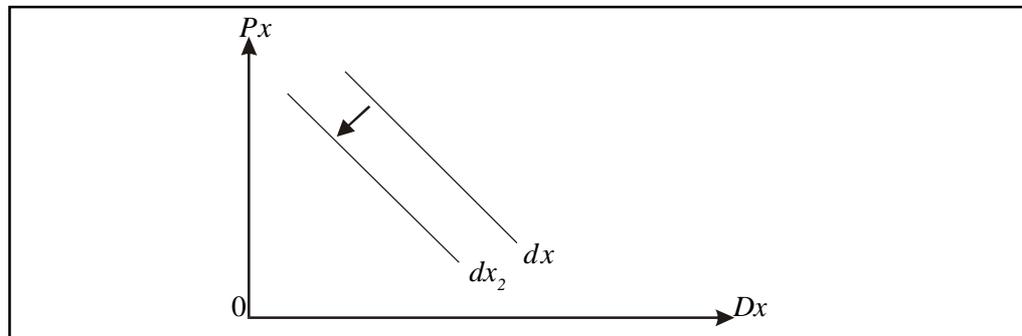

Figure 3.4: Decrease in Demand

3.4.3 Real World Example: The Real Estate Market Cycle

A crucial question for most market observers has been whether the property market in India, represented by the metropolitan property markets like Mumbai, Delhi, Bangalore and Chennai, have matured enough to indicate patterns of a typical real estate cycle. The answer to this question will be the key to understanding the behaviour of the property market ahead of time. The LaSalle Market Cycle Curve indicates where real estate markets are positioned in the cycle at a given point in time. Analysis of historical demand, supply movements and future projects help to determine the cycle position. There are four major phases of the cycle.
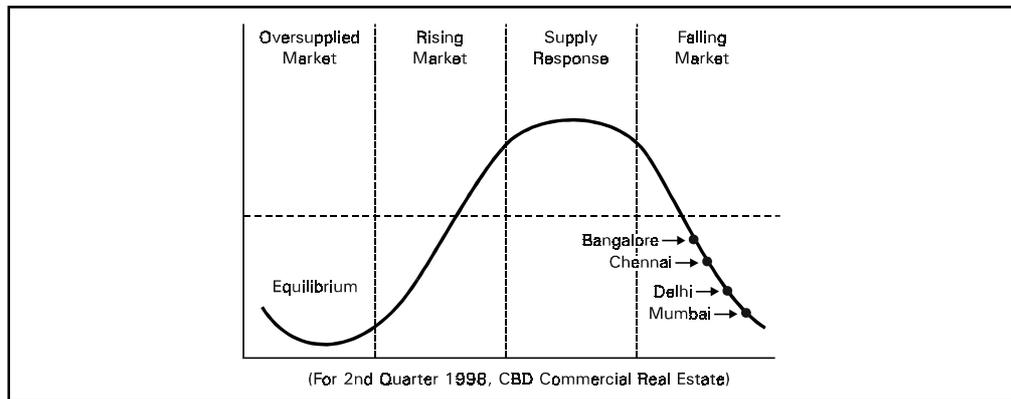
Figure 3.5: LaSalle Market Cycle Curve

i.   **Falling market:** When the market is moving down, prices are typically decreasing, stock levels are rising and demand is decreasing. For example combined with past construction, new space is becoming available that is no longer necessary, thus leading to an oversupply situation.

ii. **Oversupplied market:** Around the bottom of a cycle, signals are usually mixed i.e., the rate of decrease in prices is slowing but the future direction of demand is uncertain.

iii. **Rising market:** Once the market's upward movement has been confirmed through steady increases in demand (with strong future expectations of continued demand, robust economic growth coupled with slow response of new supply), prices being to increase steadily.

iv. **Supply response:** The market anticipates the peak of the cycle. Demand for stock begins to slow, large supply of new stock is nearing completion and prices continue to climb until demand is satisfied.

Based on past real estate trends and present demand supply dynamics, the market cycle position of prime commercial property in the central business districts (CBD) of Mumbai, Delhi, Bangalore and Chennai are summarized.

v.   **Mumbai:** Mumbai CBD office sector (Nariman Point) remains restrained due to lack of demand stimulus coupled with corporate relocation out of the CBD to the suburbs, which is evident from very low transaction volumes.

vi. **Delhi:** The Delhi CBD (Connaught Place) continues to be subdued as it factors the excess supply of quality office space arising due to many new projects about to come on stream.

vii. **Bangalore:** The Bangalore Central Business District (MG Road) office sector is yet to fully absorb the existing oversupply mainly due to a sizably inventory of prime commercial space.

viii. **Chennai:** The Chennai CBD (Anna Salai) office sector will continue to adjust to increased availability of office accommodation, as new commercial projects like Spencer Plaza II and Raheja Complex are completed.

3.5 LET US SUM UP

This chapter presents the economic concept of demand and discusses all the related aspects of law demand. The law of demand states that, other things being equal, at a higher price, consumers will purchase less of a commodity and at a lower price consumers will purchase more of it. However, there are many other determinants of demand which influence the consumer's buying behavior. Not only that there are other determinants, demand also has many types, as explained in the chapter.

3.6 LESSON END ACTIVITY

Plot the following demand schedule on a graph paper.

Demand of X			
Price of X	**Buyer 1**	**Buyer 2**	**Total demand**
10	5	8	13
8	8	10	18
6	12	15	27
4	20	20	40
2	50	50	100

3.7 KEYWORDS

Demand: The quantity of the commodity which an individual is willing to purchase per unit of time at a particular price.

Consumer goods: Goods and services used for final consumption are called consumer goods.

Producer goods: Goods used for production of other goods.

Perishable goods: Goods which become unusable after sometime.

Durable goods: Goods other than perishable goods.

Autonomous demand: Goods whose demand is not tied with the demand for some other goods.

Derived demand: Goods whose demand is tied with the demand for some other goods.

Market demand: Summation of demand for a good by all individual buyers in the market.

Demand theory: The theory that postulates that the quantity demanded of a commodity is a function of or depends on not only the price of a commodity, but also income, price of related goods - both substitutes and complements, taste of consumer, price expectation and all other factors.

Demand function: A comprehensive formulation which specifies the factors that influence the demand for the product.

Demand schedule: A schedule that depicts the inverse relationship between the price and the quantity demanded for the commodity per time period.

Law of demand: Other things being equal, at a higher price, consumers will purchase less of a commodity and at a lower price consumers will purchase more of it.

Income effect: Occurs due to increase (decrease) in real income resulting from a decrease (increase) in the price of a commodity.

Substitution effect: Occurs due to the consumer's inherent tendency to substitute cheaper goods for relatively expensive ones.

3.8 QUESTIONS FOR DISCUSSION

1. What is the importance of demand analysis? What are the different types of demand?

2. Distinguish between increase and extension of demand.

3.   Distinguish between the following:

     (i)   Industry demand and firm (company) demand.

     (ii)   Short-run and long-run demand.

     (iii)   Durable goods demand and non-durable goods demand.

3.9 MODEL ANSWER TO "CHECK YOUR PROGRESS"

(a)   As bread and butter are complementary goods, if the price of bread rises, the demand for butter will decline.

(b)   Since butter and jam are substitutes of each other, the fall in price of jam will reduce the demand for butter.

(c)   According to the law of demand, if the price of butter rises, the demand for it decline.

(d)   Since the income effect for normal goods in positive, the demand for butter will increase as a result of increase in family income.

3.10 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics* , Excel Books, Delhi.

Joan Robinson, *The Economics of Imperfect Competition*, Macmillan.

Englewood Cliffs, N.J., *Managerial Economics*, Prentice-Hall, Inc.

LESSON

4

ELASTICITY OF DEMAND

4.0 AIMS AND OBJECTIVES

In the previous lesson we discussed the law of demand and the determinants of demand. Here we will discuss about various elasticity of demand. After studying this lesson you will be able to:

(i)   define elasticity of demand,

(ii)   describe different degrees of price elasticity of demand,

(iii)   describe point and arc elasticities of demand, and

(v)   know factors determining elasticity of demand.

4.1 INTRODUCTION

The law of demand tells us that consumers will respond to a price decline by a buying more of a product. It does not, however, tell us anything about the degree of responsiveness of consumers to a price change. The contribution of the concept of elasticity lies in the fact that it not only tells us that consumer's demand responds to price changes but also the degrees of responsiveness of consumers to a price change.

4.2 MEANING OF PRICE ELASTICITY OF DEMAND

Price elasticity of demand (E_d) measures the degree of responsiveness of quantity demanded of a product to changes in its own price. In mathematical form it is expressed as:

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

or $\quad E_d = \dfrac{\Delta Q/Q}{\Delta P/P}$

Where $\quad \Delta Q$ = change in quantity demanded

ΔP = change in price

Q = Original quantity demanded

P = Original Price

4.3 CLASSIFICATIONS OF DEMAND CURVES ACCORDING TO THEIR PRICE ELASTICITIES

Depending on how the total revenue changes, when price changes we can classify all demand curves in the following five categories:

1. Perfectly inelastic demand curves.

2. Inelastic demand curves.

3. Unitary elastic demand curves.

4. Elastic demand curves.

5. Perfectly elastic demand curve.

Figure 4.1 helps us to explain what these five categories imply about the relationship between changes in total revenue and changes in price. It shows three different types of demand curves each having a different implication for total revenue when price is reduced from $10 to $5.
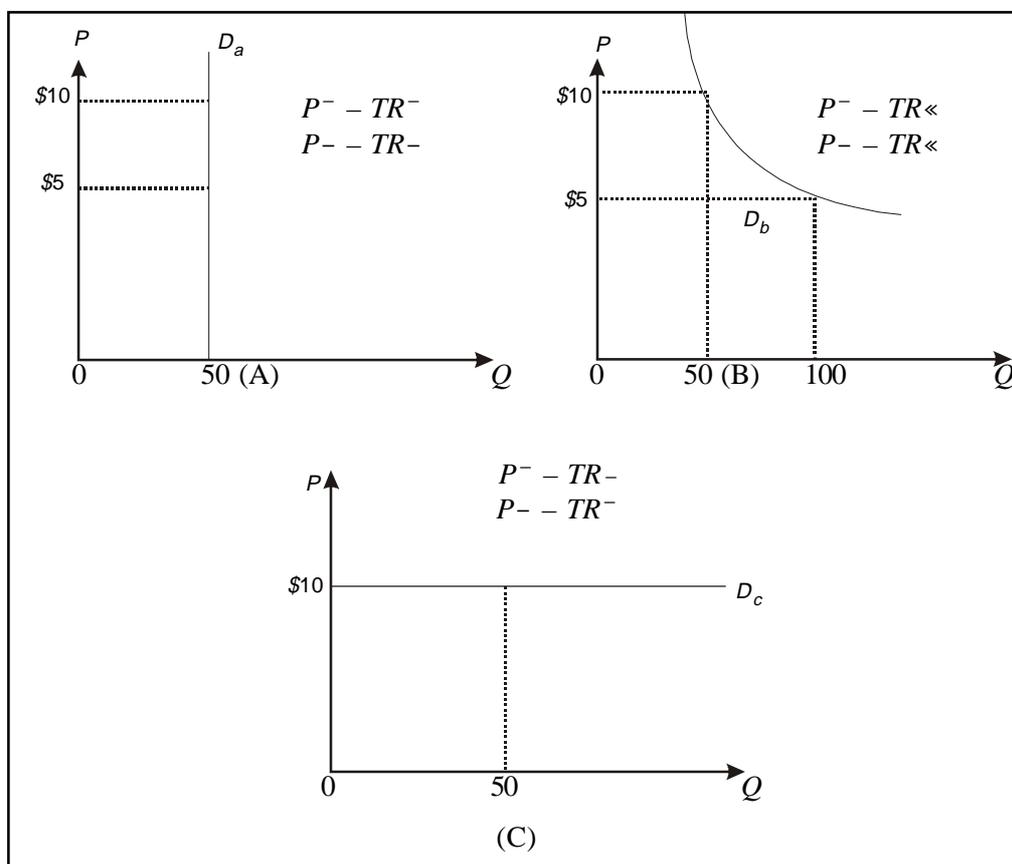

Figure 4.1

(i)   In the case of demand curve D_a in Figure 2.6 (A), when the price is $10 total revenue is $500 (=10 x 50). When the price changes to $5, the quantity demanded does not respond at all and remains at 50. The total revenue when the price is $5 is $250. In other words, when price decreases, total revenue decreases as well.

All such demand curves where quantity demanded is totally unresponsive to changes in price are called **Perfectly inelastic Demand curves.**

Further, such demand curves imply that when price decreases the total revenue decreases and *vice-versa*.

Finally, all such demand curves are supposed to have an elasticity coefficient, E_d equal to 0. Elasticity coefficient is a number describing the elasticity of a demand curve.

Life saving drugs are most likely to have demand curves which resemble perfectly inelastic demand curves. For example, a diabetic would be willing to pay almost any price to get the required amount of insulin.

(ii)   Demand curve D_c in Fig. above represents another extreme case, a perfectly horizontal demand curve. When the price is $10, 50 units are being sold and the total revenue is $500. When the price falls to $5, the quantity demanded increases infinitely and so does the total revenue. On the other hand, when price rises above $10 the quantity demanded falls to Zero and total revenue also falls to zero.

Such horizontal demand curves, where quantity demanded is infinitely responsive to price changes, are called **Perfectly Elastic Demand Curves**.

These perfectly elastic demand curves have a property that when price decreases total revenue increases, and *vice-versa.*

The elasticity coefficient, E_d is equal to infinity $(E_d = a)$.

(iii) The demand curve D_b in Fig. above represents the midpoint of a spectrum where extremes are represented by the demand curves D_a and D_c.

In the case of D_b when price decreases from $10 to $5 the total revenue remains unaffected at $500. Such a demand curve is said to be **Unitary Elastic** and has the property that when price increases or decreases, the total revenue remains constant. The elasticity coefficient for such demand curve is equal to one. Examples of unitary elastic demand curves occur when a person budgets a certain amount of money for, say, meat or magazines and will not deviate from that figure regardless of price. However, such cases are also unusual in that few demand curves have constant unitary elasticity.

Besides the three types of demand curves we have discussed, there are two more types of demand curves.

Demand curves which have an elasticity coefficient between 0 and 1 are called RELATIVELY INELASTIC or simply INELASTIC. When the price falls, the quantity demanded expands but total revenue still decreases. Figure 4.2 shows D_a as an example of a relatively inelastic curve.
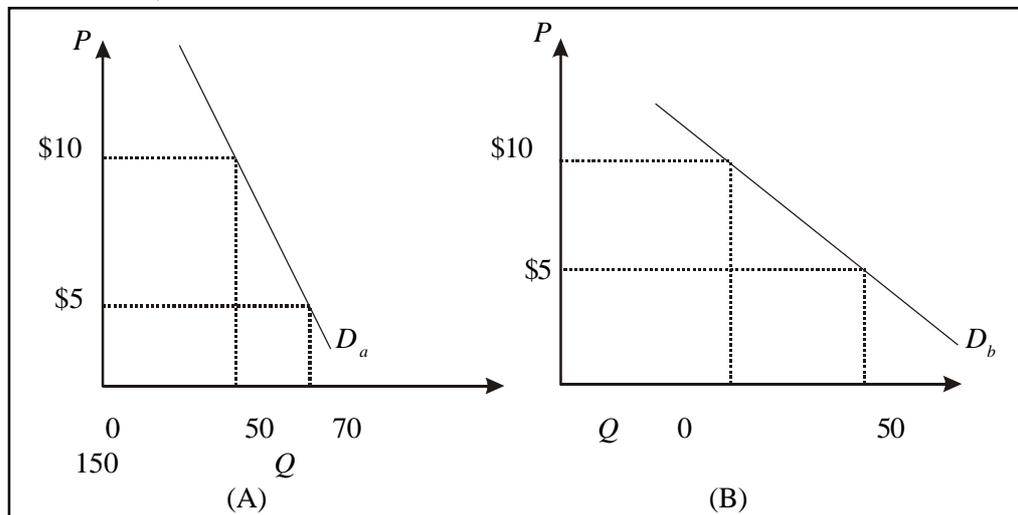

Figure 4.2

Finally, demand curve D_b in the figure is an example of a relatively elastic or simply elastic demand curve. Such demand curves have an elasticity coefficient between 1 and ∞ have the property that when price decreases total revenue increases and *vice-versa*.

Believe it or not, in the real world, 99.99 per cent of the demand curves are either relatively elastic or relatively inelastic.

Table 6 summarizes the discussion we have had so far. It tells us how the firm's total revenues (and the consumer's total expenditure) for a product will change as prices are raised or lowered. As shown in the table the value of the elasticity coefficient, E_d can be anything from zero to infinity and each value can immediately tell us the elasticity of the demand curve at the relevant price. For instance, if a demand curve has an elasticity coefficient of 0.5 at a given price, then we know that this is an inelastic demand curve at that price.

Table 4.1

Price Elasticity of Demand (E_d)		How total revenues or expenditures are affected by price changes	
E_d **Value**	**Term for Elasticity of demand**	**Price increases**	**Price decreases**
Zero	Perfectly inelastic	Increase proportionally with price	Decrease proportionally with price
$0 < E_d < 1$	Relatively inelastic proportionally with price	Increase less than proportionately with price	Decrease less than Proportionately with price
$E_d = 1$	Unitary elastic	UNAFFECTED BY PRICE CHANGES	
$a > E_d > 1$	Relatively elastic	Decrease but less than proportionally	Increase, but less than proportionally
$E_d = \infty$	Perfectly elastic	Total revenue falls to zero	Increase more than proportionally

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Check Your Progress 1

1. Against each line drawn on the diagram, write the approximate value of demand elasticity ($<1, >1, =1, =0, =\infty$)
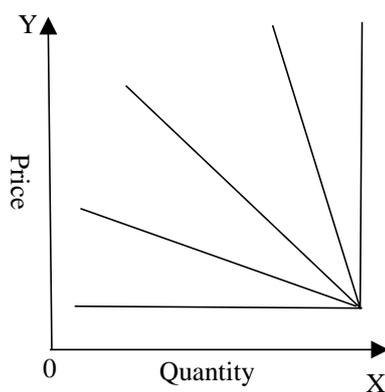
4.4 NUMERICAL MEASUREMENT OF ELASTICITY

What does it mean to say that the elasticity of demand is 0.5? 0.4? 2.3?. To answer this question we have to examine the following definition for elasticity coefficient (E_d).

Elasticity Coefficient (E_d):

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

One calculates these percentage changes, of course, by dividing the change in price by the original price and the consequent change in quantity demanded by the original quantity demanded. Thus we can restate our formula as:

$$E_d = \frac{\dfrac{\text{Change in quantity demanded}}{\text{Original quantity demanded}}}{\dfrac{\text{Change in Price}}{\text{Original Price}}}$$

This formula can also be written as:

$$E_d = \frac{\dfrac{Q_1 - Q_0}{Q_0}}{\dfrac{P_1 - P_0}{P_0}}$$

where $P_0 =$ Original Price, $P_1 =$ New price

$Q_0 =$ Original quantity demanded

$Q_1 =$ New quantity demanded

Sometimes we may also find this written as:

$$E_d = \frac{\dfrac{\Delta Q}{Q}}{\dfrac{\Delta P}{P}}$$

where Δ is a notation used to denote change.

Let us answer a basic question about this formula: Why use percentages rather than absolute amounts in measuring consumer responsiveness? The answer is that if we use absolute changes, our impression of buyer responsiveness will be arbitrarily affected by the choice of units.

To illustrate: If the price of product *X* falls from $3 to $2 and consumers as a result, increase their purchases from 60 to 100 pounds, we get the impression that the consumers are quite sensitive to price changes and therefore that demand is elastic. After all, a price change of "one" has caused a change in the amount demanded of "forty". But by changing the monetary units from dollars to pennies (Why not?), we find a price change of "one hundred" causes a quantity change of "forty", giving the impression of inelasticity. The use of percentage changes avoids this problem. The given price decrease is 33 per cent whether measured in terms of dollars or in terms of pennies. Thus, the use of percentages gives us the nice property that the units in which the money or goods are measured—bushels or tons of wheat, dollars or cents or rupees—do not affect elasticity.

Interpreting the formula: Demand is elastic if a given percentage change in price results in a larger percentage change in quantity demanded. For example, if a 2 per cent decline in price results in a 4 per cent increase in quantity demanded, demand is then said to be elastic. If a given percentage change in price is accompanied by a relatively smaller change in the quantity demanded, demand is inelastic. For example, if a 3 per cent change in price gives rise to a 1 per cent increase in the amount demanded, demand is then said to be inelastic. The borderline case of unitary elasticity, which separates elastic and inelastic demands, occurs where a percentage change in price and accompanying percentage change in quantity demanded happen to be equal.

Computation of Elasticity Coefficients

We may use two measures of elasticity:

(a) Arc elasticity, if the data is discrete and therefore incremental changes are measurable.

(b) Point elasticity, if the demand function is continuous and therefore only marginal changes are calculable.

Example: Let us see how one can calculate elasticity when the price change is finite (i.e. elasticity measured over a finite stretch of demand curve) the price and quantity situations are given in the following table. We want to calculate elasticity when price changes from Rs. 4 to Rs. 3 per unit.

Table 4.2

Price of Commodity X (in Rs.)	Quantity demanded of Commodity X (in Kg)
5	10
4	16
3	25
2	30
1	34
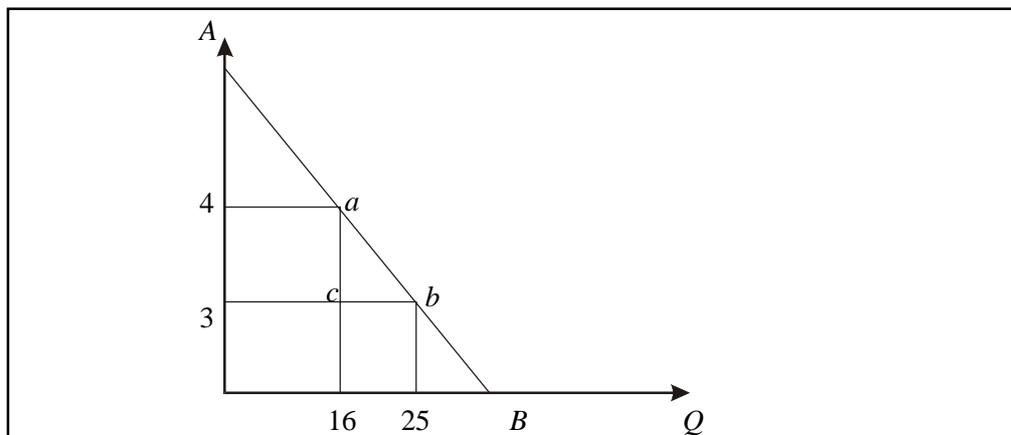
Figure 4.3

When price changes from Rs. 3 to Rs. 4, ΔP = Rs. 3 – Rs. 4 = – Rs. 1.00 (i.e. the price change is negative since it is a price fall). The change in quantity demanded is ΔQ = 25 –16 = 9 (quantity change is positive).

$$e = \frac{\Delta Q/Q}{\Delta P/P} = \frac{9/16}{-1/4} = -9/4 = -2.25$$

Now if we calculate the elasticity when price increases from Rs. 3 to Rs. 4 we find that for the same stretch of the demand curve, elasticity would be different.

$$e = \frac{\Delta Q/Q}{\Delta P/P} = \frac{-9/25}{+1/3} = \frac{-9}{-25} \times 3 = \frac{-27}{25} = -1.08$$

The question is, how is it that we get different demand responses for the same range of price change? The answer is that our initial quantity demanded and price have been different. When we calculate for price fall, they are 16 for initial quantity demanded and

Rs. 4 for initial price. When we calculate it for price rise they are 25 for initial quantity demanded and Rs. 3 for initial price. Hence elasticity tends to depend on our choice of the initial situation. However, demand response should be the same for the same finite stretch of the demand curve. To get rid of this dilemma created by the choice of the initial situations, we take the arithmetic mean of the two quantities Q and the mean of the two prices P. This gives us a concept of *arc* elasticity of demand.

$$Arc \text{ elasticity} = \frac{DQ}{Q_0 + Q_1} \times \frac{P_0 + P_1}{DP}$$

$$\text{or, } e = \frac{DQ}{DP} \times \frac{P_0 + P_1}{Q_0 + Q_1}$$

Where Q_0 and Q_1 are the two quantities corresponding to the two points on the demand curve. Similarly P_0 and P_1 are the two prices.

4.5 GEOMETRICAL MEASUREMENT OF ELASTICITY

The measurement of elasticity is done by two methods, namely, Geometrical Method and Arithmetical (Numerical) Method.

A geometrical way of measuring the elasticity at any point on a demand curve is now in order.

Consider point P on the demand curve Dx in the diagram (we have taken a nonlinear demand curve). Draw a tangent line AB at point P on the demand curve. Applying point elasticity formula, it follows the elasticity at point P is:

$$e = \frac{dQ}{dP} \bullet \frac{P}{Q} = \frac{\frac{dQ}{dp}}{D/p}$$

$\frac{dQ}{dp}$ is the inverse of the slope of the demand curve, hence is equal to $\frac{MB}{PM}$
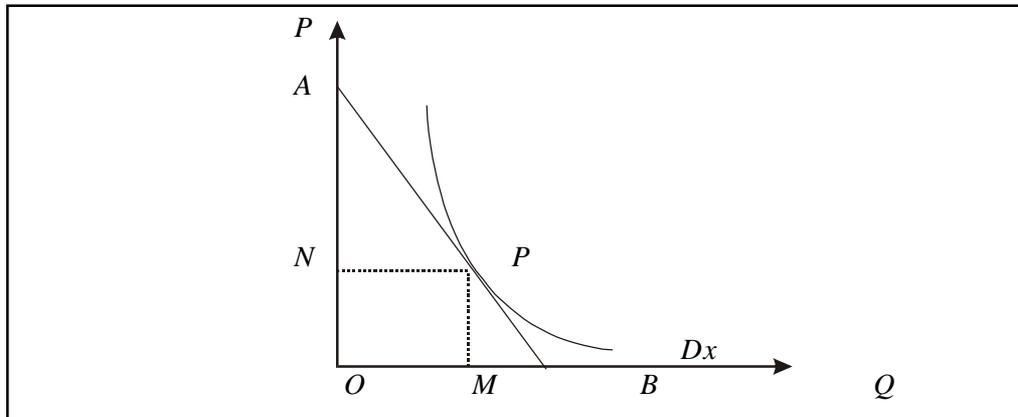
Figure 4.4

Price is equal to PM and quantity is equal to OM.

$$e = \frac{\frac{MB}{PM}}{\frac{OM}{PM}} = \frac{MB}{PM} \bullet \frac{PM}{OM} = \frac{MB}{OM}$$

In other words, the price elasticity of demand is measure graphically by the ratio of the two segments of the horizontal axis identified by the intersection of the target to the point considered, with the horizontal axis and by the perpendicular from that point to the same axis.

If we now consider the similar triangles APN and PBM then $AP/PM = PB/MB$ (from properties of similar triangles) or $MB/PN = PB/AP$. Hence elasticity = MB/ON can be

written as equal to *PB/AP* i.e. elasticity at *P* is also equal to *PB/AP* the ratio of the lower segment of the demand curve to the upper segment.

In the same way we can show that elasticity is equal to *ON/NA* (taking again similar triangles and equating the ratio of sides).

4.6 TYPES OF ELASTICITIES OF DEMAND

Direct price elasticity of demand is the most important as discussed. But demand depends not only on own price but also on other factors. So we have different types of elasticities besides the price elasticity of demand.

4.6.1 Cross (Price) Elasticity of Demand

In order to evaluate the effect of variations in the price of a product (tea) on a quantity demanded of another product (coffee) we define cross (price) elasticity of demand as follows:

The sign e_{ij} shows the relation which exists between the two goods.

Cross (price) elasticity of demand is given by

$$e_{ij} = \frac{\% \text{ change in quantity demanded of good i}}{\% \text{ change in price of good j}}$$

$$\text{or} \quad e_{ij} = \frac{\Delta Q_i / \Delta Q_i}{\Delta P_j / P_j}$$

In general, if

(i) $e_{ij} > 0$ then *i* and *j* are substitute goods. An increase in price of jth goods (tea) increases the quantity demanded for i[th] goods (coffee). Hence the sign of cross elasticity will be positive.

(ii) $e_{ij} = 0$ if and only if *i* and *j* are independent goods (not related).

(iii) $e_{ij} < 0$ implying *i* and *j* are complementary goods. An increase in the price of *j*th goods (sugar) reduces the quantity demanded of the *i*th goods (tea). Hence the relationship between variables is negative, thus cross elasticity is negative.

The greater the absolute value of e_{ij}, the more intense is the relationship (any kind) existing between the two goods.

4.6.2 Income Elasticity of Demand

This measures the degree of responsiveness of quantity demanded of goods with respect to a change in the level of income of a consumer, other things remaining constant (like prices etc.). It is given by the ratio $\frac{DQ}{Q} \Big/ \frac{DR}{R}$ where R stands for total income (expenditure).

It is the ratio of percentage for proportionate change in quantity demanded to a percentage (proportionate) change in consumer's income. For changes in income two formulas are used:

(a)   arc elasticity

(b)   point elasticity

The are elasticity formula is used for finite change in income and for an infinitesimal change in income point elasticity is used.

Income elasticity, $e_i = \dfrac{DQ}{Q_0+Q_1} \quad \dfrac{R_0 + R_1}{DR}$

The income elasticity shows the following:

(a) Income elasticity is always positive except for inferior goods.

(b) The value of income elasticity tells about the class of goods. When it is less than one, the goods are necessary goods; luxury goods have their value greater than one and inferior goods have a negative value.

(c) Income elasticity varies along a given demand curve. It is a decreasing function of income; it falls as income rises. This is because consumers tend to modify their consumption pattern rather than increase their purchases of the same goods when faced with increasing level of income.

(d) The weighted sum of income elasticity of demand for various goods must add to one.

$$m_1 q_1 + m_2 q_2 = 1$$

where q_1 and q_2 are income elasticity of demand for goods 1 and 2 but m_1 and m_2 are the proportion of income spent on 1 and 2.

$$m_1 = \frac{P_1 \acute{} 1}{R} \quad \text{and} \quad m_2 = \frac{P_2 \acute{} 2}{R}$$

It measures the case with which one product can be substituted for another in consumption. It determines the rate of substitutability between two goods.

4.6.3 Elasticity of Demand with Respect to Advertisement

It is the ratio of percentage change in the quantity demanded of a commodity (Q) to percentage in the advertisement outlay on the commodity (A). It is also called promotional elasticity and plays an important role in the context of marketing management.

This is defined as the percentage change in the level of future prices (P_t+1) expected as a result of a change in the level of current prices (P_1).

$$E = \qquad \bullet$$

It measures the ratio of the percentage rise in expected future prices to the percentage rise in its current price. When an increase in current price is expected to result in future prices then $E = 1$, if increase in future price is more than proportional to current price rise, then E is greater than one, for less the proportional increase, E is less than one.

4.7 FACTORS DETERMINING ELASTICITY OF DEMAND

Some important factors that determine the elasticity of demand are:

1. *Luxury or necessity goods:* Luxury goods tend to have an elastic demand, while necessity goods have an inelastic demand. Purchasers can stop buying the luxury goods when their prices rise.

2. *Percentage of income:* Big items in a budget tend to have a more elastic demand than small items. For example, consumers may be affected by 1 per cent rise or fall in price of a flat but are insensitive to such fluctuations in prices of pens.

3. *Substitutes:* Items that can be substituted easily have a more elastic demand than those that do not.

4. *Time:* The demand for a product becomes more elastic the longer the time period under consideration. It takes time to decide about other product before buying it as one develops a habit of using a particular product.

1. How is the demand elasticity useful to a business manager?

4.8 THE RELATIONSHIP BETWEEN THE PRICE ELASTICITY, AVERAGE REVENUE AND MARGINAL REVENUE

The relationship between marginal revenue, average revenue and price elasticity of demand is shown by J. Robinson in the following equation.

Price elasticity of demand (e_p)

$$= \frac{\text{Average Revenue}}{\text{Average Revenue} - \text{Marginal Revenue}}$$

$$= \frac{A}{A - M} \text{ (where, } A \text{ refers to average revenue and } M \text{ to marginal revenue)}$$

or
$$e_p (A - M) = A$$

$$e_p A - e_p M = A$$

$$e_p A - A = e_p M$$

$$A(e_p - 1) = e_p M$$

$$A = M \frac{(e_p - 1)}{ep}$$

This relationship can also be expressed as

$$M = A = \frac{e_p}{(e_p - 1)}$$

Let us take a numerical example to illustrate the above relationship. Suppose the price of a product is Rs. 100 and $e_p = 2$ at that price, then the marginal revenue at that price would be

$$MR = \text{Rs. } 100 \ \frac{(2-1)}{2} = \text{Rs. } 100 \times \frac{1}{2} = \text{Rs. } 50$$

It should be noted that when elasticity of demand is unity, marginal revenue would be zero, irrespective of price (i.e. average revenue). It follows from this that if a demand curve shows unit elasticity throughout its length, marginal revenue would be zero throughout.

4.9 LET US SUM UP

The chapter also discusses the concept of price elasticity of demand. Price elasticity of demand is the responsiveness of demand for a commodity to a change in its price. There are many factors which impact price elasticity. It can be measured numerically and graphically. Besides price elasticity, the unit also deals with income elasticity, cross-elasticity and advertisement elasticity. Also, there is a direct relationship between price elasticity, average revenue and marginal revenue, as shown in the chapter.

Lastly, the chapter deals with demand forecasting, and discusses the various techniques of demand forecasting like survey methods, trend methods, regression methods and indicator methods.

4.10 LESSON END ACTIVITY

1. Explain each of the following terms and describe briefly the factors that determine each of them.

a.   price elasticity of demand

b.   income elasticity of demand

c.   cross elasticity of demand

4.11 KEYWORDS

Arc elasticity: Computed if the data is discrete and therefore incremental change is measurable.

Point elasticity: Computed if the demand function is continuous and therefore only marginal changes are calculable.

Price elasticity of demand: Responsiveness of demand for a commodity to a change in its price.

Income elasticity of demand: Responsiveness of demand to the change in income, other determinants of demand remaining constant.

Cross-elasticity of demand: Responsiveness to a change in the price of a related commodity.

4.12 QUESTIONS FOR DISCUSSION

1.   Define price elasticity of demand and distinguish its various types. Discuss the role of price elasticity of demand in managerial decisions.

2.   Allied Electric Co. is developing a new design for its portable electric hair-dryer Test market data indicate a demand for the new hair-dryer as follows:

$Q=30,000 - 1,000P$

where Q is hair-dryer sales and P is its price.

(i)   How many hair-dryers could Allied sell at Rs. 22.50 each?

(ii)   What price would Allied have to charge to sell 12,000 hair-dryers?

(iii) At what price would hair-dryer sales be zero?

(iv) Calculate point price elasticity of demand at a price of Rs. 20.

4.13 MODEL ANSWERS TO "CHECK YOUR PROGRESS"

Check Your Progress 1
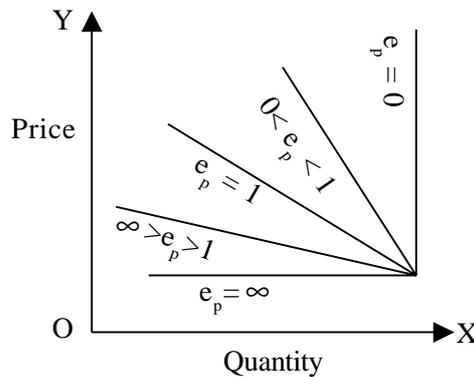
Check Your Progress 2

Using information related to price elasticity of demand, a business manager can

(i)   determine what effect a price increase would have on total revenue

(ii)   evaluate how sale of his company's product would change during a period of rising income

(iii) assess the probable impact if competitors change their prices.

4.14 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Joan Robinson*, The Economics of Imperfect Competition*, Macmillan.

Englewood Cliffs, N.J., *Managerial Economics*, Prentice-Hall, Inc.

UNIT-II

LESSON

5

SUPPLY ANALYSIS

CONTENTS

5.0 Aims and Objectives

5.1 Introduction

5.2 Concept of supply

5.3 Determinants of Supply (Law of Supply)

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5.9 Model Answers to "Check Your Progress"

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5.0 AIMS AND OBJECTIVES

The importance of interplay of supply and demand makes it only natural that early in any managerial economics course, one learns about supply and demand. In previous lesson we have studied the concept of demand, so in this lesson we will study about supply. After studying this lesson you will be able to:

(i) know the concept of supply

(ii) describe how price regulates supply, i.e., law of supply

(iii) know the concept of elasticity of supply and factors influencing it.

5.1 INTRODUCTION

Demand and supply are the most used words in economic analysis. And for good reason, they provide a good off-the-cuff for any economic question. Price theory answers the question of interaction of demand and supply to determine price in a competitive market. Supply is a positive function of price.

5.2 CONCEPT OF SUPPLY

Supply is the willingness and ability of producers to make a specific quantity of output available to consumers at a particular price over a given period of time. Individuals control the inputs, or resources, necessary to produce goods. In one sense, supply is the mirror image of demand. Individuals' supply of the factors of production or inputs to market mirrors other individuals' demand for these factors. For example, if we want to rest instead of weeding the garden, we hire someone: we demand labour. For a large number of goods, however, the supply process is more complicated than demand.

For a large number of goods, there is an intermediate step in supply. Individuals supply factors of production to firms. Firms are organisations of individuals that transform factors of production into consumable goods. For produced goods, supply depends not

only on individual's decision to supply factors of production; it also depends on firms' ability to produce – to transform these factors of production into consumable goods.

The supply of non-produced goods is more direct. Individuals supply their labour in the form of services directly to the factors market. For example, an independent contractor may repair a washing machine. The contractor supplies his labour directly.
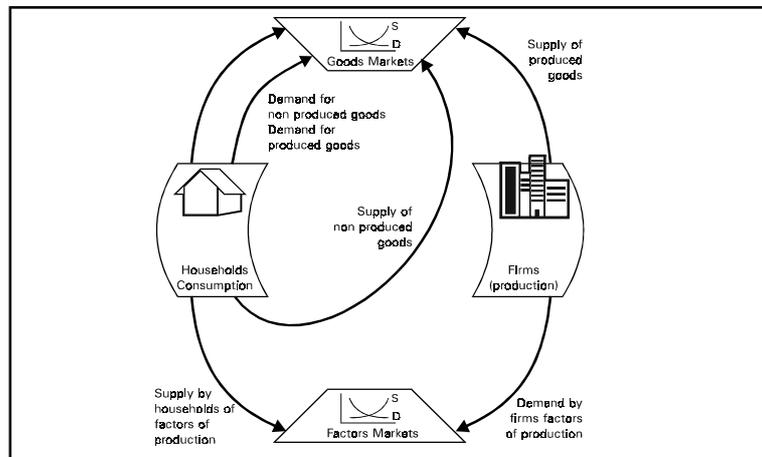

Figure 5.1

5.3 DETERMINANTS OF SUPPLY (LAW OF SUPPLY)

Supply refers to the various quantities offered for sale at various prices. According to the Law of Supply, more of a good will be supplied the higher its price, other things constant or less of a good will be supplied the lower its price, other things remaining constant.

Price regulates quantity supplied just as it regulates quantity demanded. In graphical terms supply refers to the entire supply curve because a supply curve tells us how much will be offered for sale at various prices. Quantity supplied refers to a point on a supply curve. When the price of a good rises, individuals and firms can rearrange their activities in order to supply more of that good to the market, substituting production of that good for production of other goods.

With the firms, there is another explanation. Assuming firm's costs are constant, higher price means higher profits (the difference between a firm's revenues and its costs). The expectation of those higher profits leads it to increase output as price rises, which is what the law of supply states.
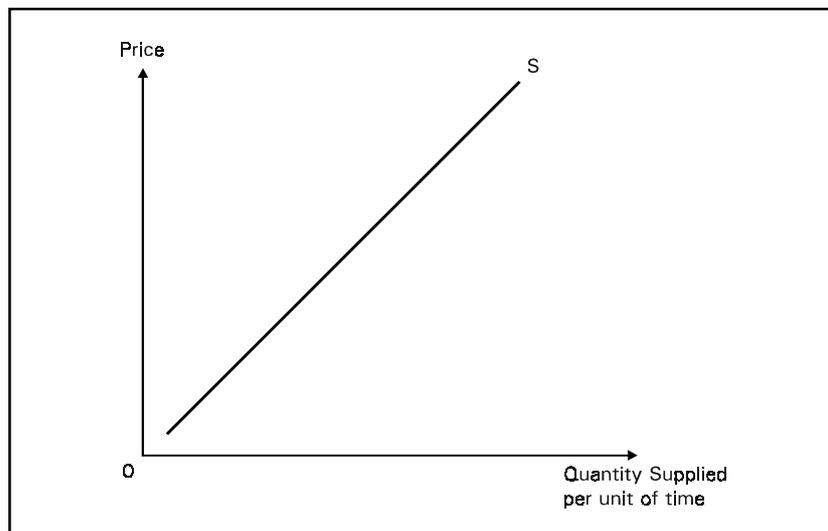
Figure 5.2

The law of supply also assumes that other things are held constant. Other variables might change causing a shift in supply curve.

As with market demand, market supply is the summation of all individual supplies at a given price. The market supply curve is the horizontal sum of the individual supply curve.

From a supply table to a supply curve:

Price	Supply by			Market
	A	**B**	**C**	
0.00	0	0	0	0
0.50	1	0	0	1
1.00	2	1	0	3
1.50	3	2	0	5
2.00	4	3	0	7
3.00	6	5	0	11
3.50	7	5	2	14
4.00	8	5	2	15
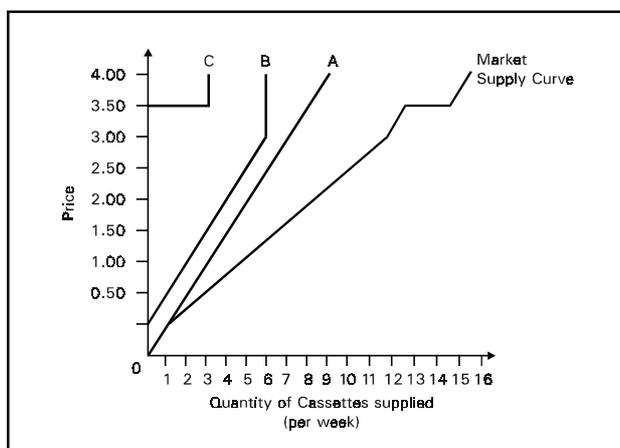
Figure 5.3

Check Your Progress

Give one example of exception of law of supply. Show it with the help of a diagram.

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Important shift factors of supply curve are:

● Changes in the prices of inputs used in production of a good

- Changes in technology
- Changes in suppliers expectations
- Changes in taxes and subsidies

Each of these shift factors will cause a shift in supply, whereas a change in price causes a movement along the supply curve.

Any change in price will cause a movement along an existing supply curve. The result will be an extension or contraction of supply, in other words, an increase or decrease in the quantity supplied. For example, when price increases from P to P_1, quantity supply increases from Q to Q_1. Conversely, when supply decreases from P_1 to P, quantity supplied decreases from Q_1 to Q.

Variables other than prices of the commodity also affect the supply curve by shifting the entire curve. This is because changes in these variables will mean that at each and every price, producers will be able to produce either more or less than before, and a new supply curve will be drawn. The major variables other than price are:

i. *Money costs of production*: The cost of factor inputs like land, labour, capital has a major influence on supply. If at any given level of output, there is an increase in costs of production, this will reduce the ability of producers to purchase factors of
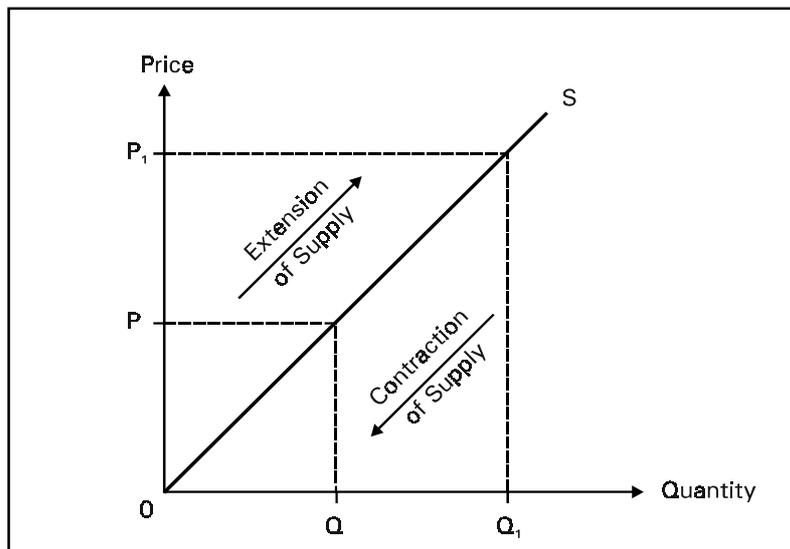


Figure 5.4: Movements along a supply curve
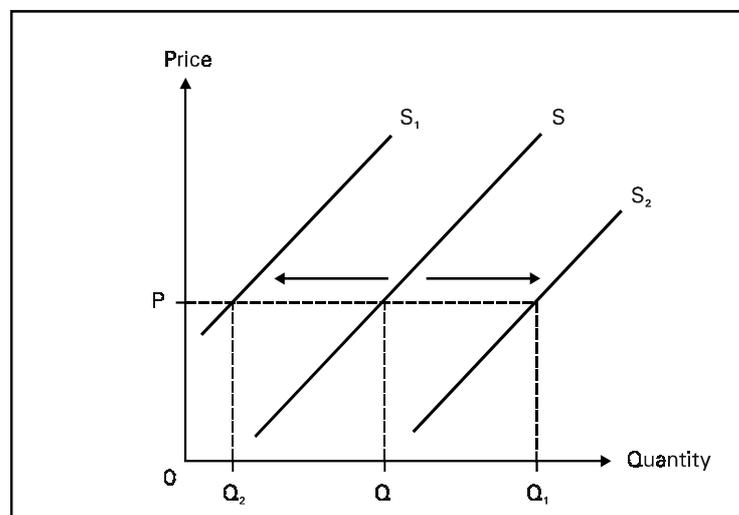
Figure 5.5: Decrease or Increase in Supply

production at any given price for their product. In consequence, the supply curve will shift to the left – there will be reduction in supply and vice versa.

ii. ***Interrelated supply:*** Some goods are in joint supply so that variations in the amount of one good produced almost automatically affect the supply of by-products. Other goods are in competitive supply, especially when they use a common raw material. Thus increase in supply of cheese can reduce supply of butter as both are made from milk.

iii. Events beyond human control like good/bad harvest, weather conditions and natural disasters like floods.

iv. Taxes and subsidies also have an important effect on supply.

Thus, shifts in supply and movement along a supply curve can be shown as follows Figure 5.6.
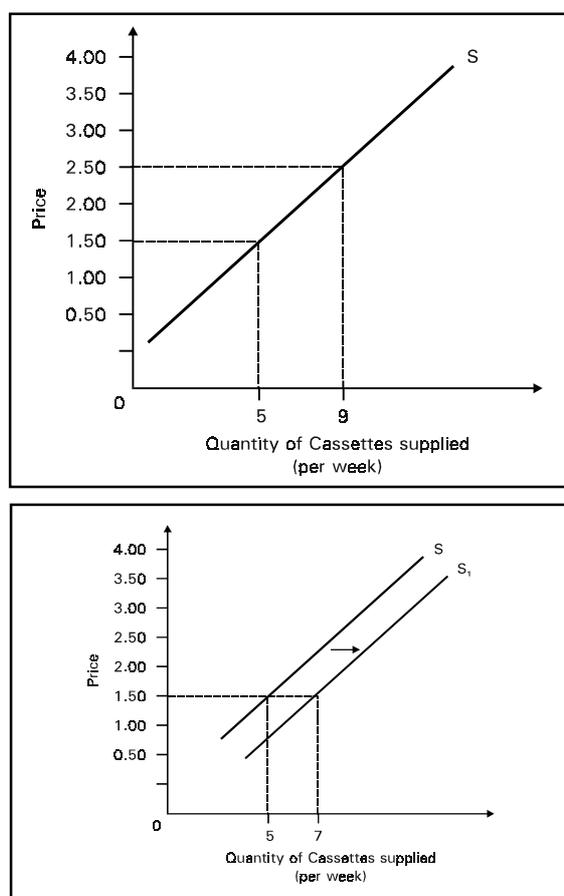
Figure 5.6: Shifts in Supply versus movement along a Supply Curve

If the price of cassette rentals is Rs 1.50, 5 cassettes would be supplied (Point A). But if the price of cassettes rentals increases for some reason to say Rs 2.50, suppliers would increase supply to 9 (Point B) - The change in price results in a movement along the supply curve (A to B).

If some new technology were introduced, lowering the cost of producing the cassette, then suppliers would supply seven cassettes instead of five at the price of Rs 1.50 (Point C). An improvement in technology results in a shift in the supply curve from S to S_1.

Six Things to Remember when Considering a Supply Curve

● A supply curve follows the law of supply when price and quantity supplied increases, and vice-versa.

- The horizontal axis – quantity axis – has a time dimension.
- The quantities are of the same quality.
- The vertical axis – price axis – is a relative price.
- The curve assumes everything else is constant.
- Effects of price changes are shown by movements along the supply curve. Effects of non-price determinants of supply are shown by shifts of the entire supply curve.

5.4 ELASTICITY OF SUPPLY

There is only one type of identifiable elasticity of supply measuring the responsiveness of market supply to changes in the price of the product. The elasticity of supply, Es, is measured by using the formulae

$$Es \quad \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

or

$$Es \quad \frac{P}{Q} \frac{dQ}{dP}$$

Wher**e** P = original price, Q= original quantity supplied, dP = change in price, dQ = change in quantity supplied.

Because supply curves normally slope upward from left to right, elasticity of supply is usually positive. The main types of elasticity of supply are mentioned in Figure 5.7.

Factors influencing Elasticity of Supply

i. Time factor: There are three supply periods based on the time factor – the momentary period, the short period and the long period.

In the momentary time period, the supply of tomatoes is fixed, i.e., the elasticity of supply is zero. For example, on any particular day growers send a certain quantity of tomatoes to the market and no matter what happens to price, supply cannot be varied on that day.

In the short run, tomato growers can increase their use of variable factors (water, fertilizers, labour) in order to exploit their fixed factors more intensively. They can increase the temperature of their greenhouses and boost production. The supply curve for tomatoes is thus more elastic in the short run than in the momentary period.

In the long run, all factors are variable and so supply is more elastic than in the short run.

ii. Ability to store the product: Products which can be stored for longer periods are more able to react to price rises by releasing stocks or to price falls by building up stocks.

iii. Barriers to entry: Some industries restrict the entry of new firms into the market and this influences the responsiveness of supply to changes in price.
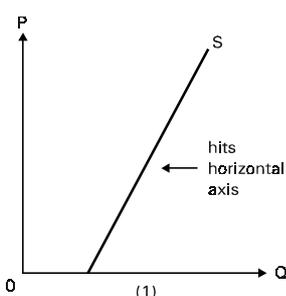
1. **Relatively Inelastic Supply**
   0 < Es < 1
   *Quantity supplied changes less than proportionally to (by a smaller percentage than) price*
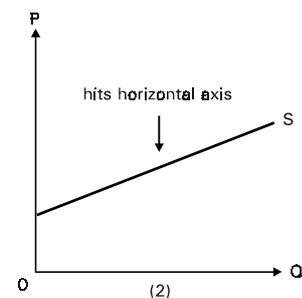
2. **Relatively Elastic Supply**
   0 < Es < ∞
   Quantity supplied changes more than proportionally to (by a larger percentage than) price
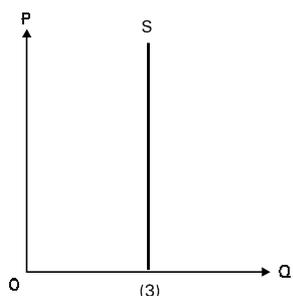
3. **Perfectly Inelastic Supply**

   Es = 0

   **Quantity supplied remains the same, whatever the price**
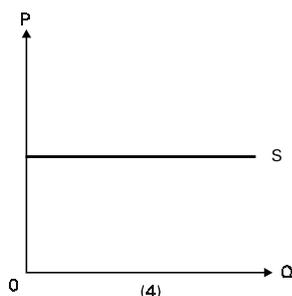
4. **Perfectly Elastic Supply**

   Es = ∞

   Suppliers will produce an unlimited quantity at the existing price
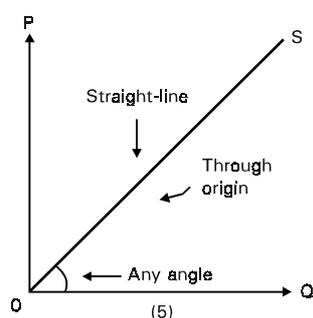
5. **Unit Supply Elasticity**

   Es = 1

   Quantity supplied changes in proportion to (by the same percentage as) price.

Figure 5.7 (Price) Elasticity of Supply (Es)

5.5 LET US SUM UP

In this lesson we have studied the basic concept of supply, determining factors of supply and elasticity of supply. Supply is the willingness and ability of producers to make a specific quantity of output available to consumers at a particular price over a given period of time. According to the law of supply, more of a good will be supplied, the higher its price, *ceteris paribus,* and vice-versa. Important shift factors of supply curve: changes in the prices of inputs, changes in technology, changes in suppliers expectations, changes in taxes and subsidies, etc. Since supply curves normally slopes upward from left to right, elasticity of supply is usually positive.

5.6 LESSON END ACTIVITY

1. What do a supply schedule and supply curve show? What is the shape of the supply curve? why?

5.7 KEYWORDS

Inputs

Resources

Supply

Low of Supply

Elasticity of Supply

5.8 QUESTIONS FOR DISCUSSION

1. What is the importance of supply analysis?

2. Why supply curve slopes upward?

3. What are the determining factors of supply?

4. What do you understand by interrelated supply?

5.9 MODEL ANSWERS TO "CHECK YOUR PROGRESS"

One exception to the law of upward sloping supply is the case of the backward sloping supply curve for labour, as shown in the following curve.
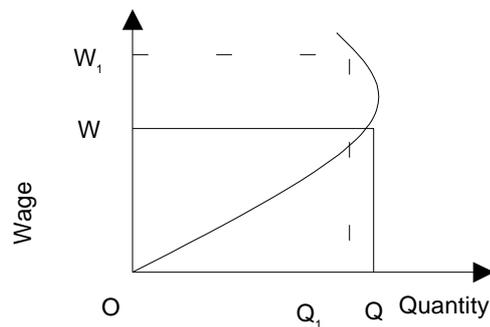
An increase in the wage rate from w to w_1 actually reduces the number of hours worked from Q to Q_1. The supply curve is normal up to w then slopes backwards.

5.10 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Curwen, *Managerial Economics*, Macmillan.

Earl Heady, *Economics of Agricultural Production and Resource Use*, Prentice-Hall, Inc.

J.K. Eastham, *An Introduction to Economic Analysis*, Universities Press.

Nemmers, E.E., *Managerial Economics: Test and Cases*, John Wiley & Sons, Inc.

LESSON

6

PRODUCTION FUNCTION

6.0 AIMS AND OBJECTIVES

This lesson is intended to study various aspects of production decision and production process. After study this lesson you will be able to:

(i)   define production

(ii)   describe short and long run production functions

(iii) know law of variable proportion

(iv) understand equilibrium of a firm.

6.1 INTRODUCTION

Production is a process in which economic resources or inputs are combined by entrepreneurs to create economic goods and services (outputs). Firms are required to take different but interrelated production decisions like:

(i)   Whether or not to actually produce?

(ii)   How much to produce?

(iii)   What input combination to use?

The firm seeks either to minimise cost with a given level of output or maximise the output level with a given level of cost. All these are discussed, in details, in this chapter.

6.2 PRODUCTION DECISION

Production refers to the transformation of inputs or resources into output of goods and services. **Inputs** are the resources used in the production of goods and services and are generally classified into three broad categories—labour, capital and land or natural resources. They may be fixed or variable. **Fixed Inputs** are those that cannot be readily changed during the time period under consideration except, perhaps at a very great expenses. (e.g., a firm's plant). **Variable Inputs** are those that can be varied easily and on very short notice (e.g., most raw materials and unskilled labour). The time period during which at least one input is fixed is called the **Short-Run**, while the time period when all inputs are variable is called the **Long-Run**. The length of the long-run depends on the type of industry, e.g., the long-run for a dry cleaning business may be a few weeks or months. Generally, a firm operates in the short-run and plans increases or reductions in its scale of operation in the long-run. In the long-run, technology generally improves, so that more output can be obtained from a given quantity of inputs, or the same output from less inputs.

Examples: (1) Siemens Ltd.

Siemens is embarking on an internal restructuring exercise to tackle one of its worst problems: *Excess manpower*. Net loss: Rs. 84.5 crore for the current financial year.

Last year the company had reported a net profit of Rs. 37.2 crore.

Thus Siemens has announced a *cost-cutting programme to optimize operations*. One of the major internal problems is that of excess manpower resulting in lower production and profit level. It has also led to high debt-equity ratio (2.5:1) — interest — increased (Rs. 64.2 crore to Rs. 93.3 crore—49%)

Hence, management is talking about restructuring and changing capital structure as well as Voluntary Retirement Scheme (VRS.).

SIEMENS' Production = f(manpower, capital......)

Loss of Siemens' = f($AP_{LK,}$ MP_{LK}......)

(i) MP_{LK} and AP_{LK} is ¯ down due to excess manpower Þ Fall in productivity of manpower.

(ii) MP_{LK} and AP_{LK} ¯ down due to (i) and also because of rising interest burden.

(2) Vijaypat Singhania Group Ltd.

After 4 decades of profitable existence the group suffered dismal performance in 1996-97 — a 91% dip in net profit.

The labour trouble in the first half of 1996-97 caused a fall in sale. It also resulted in loss of production worth Rs. 180 crore which alone contributed between 50-60% of the drop in profit.

The biggest textile plant at Chindwara in M.P. was closed from Sept '96 to March '97. Fall in production, besides other factor has been due to fall in labour productivity because of labour-management relationships.

In a textile industry, labour is an important factor of production.

(3) Cement Industry

Today, India is the 4th largest producer of cement in the world with 106 large plants belonging to 54 companies having an installed capacity of 105 m. tonnes

—   employs a workforce of 1.3 lakhs.

—   contributes to national exchequer by way of excise duty—Rs. 2500 crore.

—   geared to reach a production level of 100 m. tonnes by 2000 A.D.

The cement industry is fraught with problems as far as *inputs* go.

Cement Industry
Installed Capacity, Productivity and Exports (1996-97)

(M. tonnes)

	Install Cap.	Cement Pro.	Export Cement	Clinku
Large Plants				
Mini & White	096.25	69.98	1.71	1.01
Cement Plants	009.00	06.24	–	–
Total	**105.25**	**76.22**	**1.71**	**1.01**

Cement-capacity, Cement Productivity and Capacity Utilization
from 1990-91 to 1996-96 (Large Plants)

Year	Cap. (Yr. end)	Cement Pro.	% Growth/ Pro.
1990-91	59.12	45.75	-
1991-92	61.31	50.61	11
1992-93	64.94	50.72	-
1993-94	71.18	54.09	7
1994-95	77.99	58.35	8
1995-96	88.25	64.47	10
1996-97	96.25	69.98	9

Variable Inputs

Power

Quality of *coal* (cost of) freight, Cement Packing

these have had a most undesirable effect on the final *output*

POOR QUALITY CEMENT

Profitability of cement companies rose in 96-97 due to increase in rate of growth in demand, reduction in customs duty on non-coking coal and HDPE bags (used for packing).

But increase in cost of inputs like hike in rail freight, price of diesel increased, impact of price depression, imposition of MAT resulted in reduced levels of profitability.

Outlook for 1997-98 in the production and growth is however promising due to reduced cost of inputs like:

- reduced custom duty on coal

- dilution of MAT

- Use of new technologies—efficient

- Use of raw material, economical-use of fuel, labour, eye on pollution control etc.

For example Ready-Mixed-Concrete (RME) is a concept that has already gained ground in developed nations and in beginning to make inroads in the Indian Industry. In contract to make concrete at the site of construction RMC offers many advantages—increase in speed of construction, reduction in cost of labour and supervision, eliminates need for transportation of raw materials etc.

Productivity and profitability of the Cement-Industry is closely related to changes in fixed and variable inputs.

6.3 THE PRODUCTION FUNCTION

The task of a production unit is to organize a production process—a process of combining the different factors in some proportion so that those inputs can be efficiently transformed into products or outputs. Various terms are used for inputs and outputs.

INPUTS	OUTPUTS
Factors	Quantity (Q)
Factors of production	Total Product (P)
Resources	Product

A production function defines the relationship between inputs and the maximum amount that can be produced within a given period of time with a given level of technology.

Decisions on input and output are taken after considering various technological specifications. The technological information is summarized in the equation

$$Q = Q \ (L, \ N, \ K.................)$$

Production Function states that Q is the maximum amount of an output which the firm can produce if it combines the inputs (Land L, Labour N, and Capital K). The ratio of the factor-combination depends on the form of the estimated production function. The existence of such a function implies that the firm has undertaken on set of optimally calculations whereby they have examined the many alternative ways in which the inputs L, N and K can be combined to produce an output in the different technological process available for use in the productive process, and that it is on the basis of these calculations, that it has been found that Q is the maximum amount of a given output possible with the given set of inputs (L, N, K).

Mathematically, the production function can also be shown as:

$$Q = f \ (X_1, \ X_2 \ ....X_k)$$

where Q = Output

X_1..............X_k = Inputs used.

For purposes of analysis, the equation can be reduced to two inputs X and Y. Restating,

$Q = f(X,Y)$

where Q = Output

X = Labour

Y = Capital

Two special features of a production function are given below:

(a) Labour and capital are both inevitable inputs to produce any quantity of goods, and

(b) Labour and capital are substitutes to each other in production.

Check Your Progress 1

For the given table, find the different combinations of labour and capital used to produce 798 units and 997 units a commodity. What is the inference that you can draw about the production function from this table?

Capital					
4		798	997	1020	1152
3		756	920	997	1001
2		725	856	940	997
1		708	820	901	798
0		1	2	3	4
			Labour		

Short-run and Long-run Production Functions

The above features of Production function imply that some quantity of both the inputs are required to produce a given quantity of output. A two variable input—long-run—production function for quantities of labour and capital up to 10 units can be expressed in the form as in Table 6.1.

Table 6.1: Long-run Production Function

| Labour (L)						Capital (K)					
	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	5	15	35	47	55	62	61	59	56	52
2	0	12	31	49	58	66	72	77	72	74	71
3	0	35	48	59	68	75	82	87	91	89	87
4	0	48	59	68	72	84	91	96	99	102	101
5	0	56	68	76	85	92	99	104	108	111	113
6	0	55	72	83	91	99	107	112	117	120	122
7	0	53	73	89	97	104	111	117	122	125	127
8	0	50	72	91	100	107	114	120	124	127	129
9	0	46	70	90	102	109	116	121	125	128	130
10	0	40	67	89	103	110	117	122	126	129	131

If capital was the fixed input in the short-run, then each column of the table represents a short-run production function with respect to a specific quantity of the fixed (Capital)

input. For example, for $K = 2$, the short-run production function would be as in Table 6.2.

Table 6.2: Short-run Production Function

Labour (L)	0	1	2	3	4	5	6	7	8	9	10
Output (Q)	0	15	31	31	48	59	68	72-73	72	70	67

The above functions can be plotted on a two-dimensional diagram with a family of production curves, one for each production level. Fig. 3.7 gives such a representation for two selected levels of production—$Q=91$ and $Q=122$. Table above shows that there are four alternative ways of producing 91 units and three for producing 122 units of output.

	Q=91		Q=122	
	L	K	L	K
	3	8	6	10
	4	6	7	8
	6	4	10	7
	8	3		
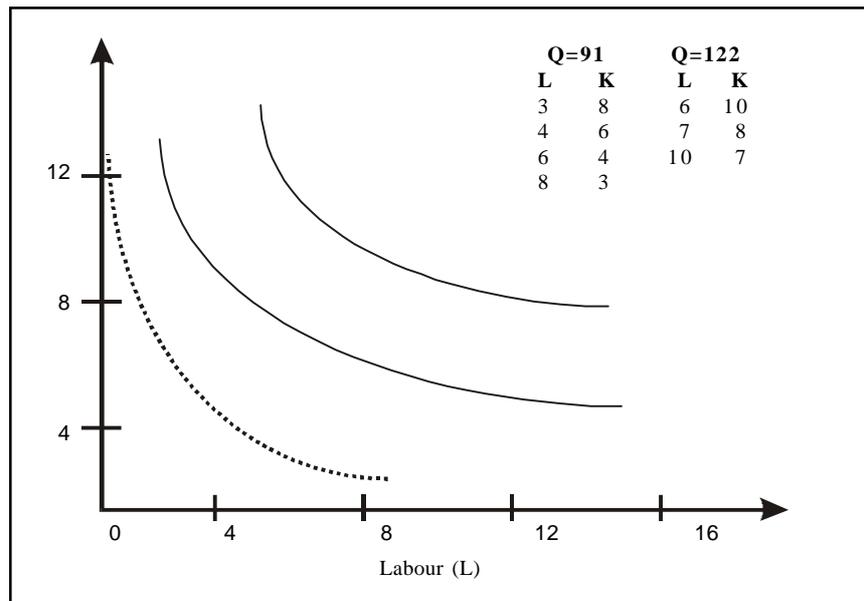
Figure 6.1: Long-run Production Function

6.4 PRODUCTION FUNCTION: ONE VARIABLE INPUT CASE: SHORT-RUN ANALYSIS

6.4.1 Law of Variable Proportion or Diminishing Marginal Returns

If all inputs of a firm are fixed and only the amount of labour services vary, then any decrease or increase in output is achieved with the help of changes in the amount of labour services used. When the firm changes the amount of labour services only, it alters the proportion between the fixed input and the variable input. As the firm keeps on altering this proportion by changing the amount of labour, it experiences the law of variable proportion or diminishing marginal returns. This law states:

As more and more of the factor input is employed, all other input quantities constant, a point will eventually be reached where additional quantities of varying input will yield diminishing marginal contributions to total product.

This underlies the short-run production function. It can be shown in a Table and Figure as done below:

Table 6.3: Production Function with One Variable Input

Number of LabourUnits (L)	Total Physical Product	Average Physical Product	Marginal Physical Product
1	2	3=1+2	4
1	100	100	100

Contd...

2	210	105	110
3	330	110	120
4	430	107.5	100
5	520	104	90
6	600	100	80
7	670	95.7	70
8	720	90	50
9	750	83.3	30
10	760	76	10
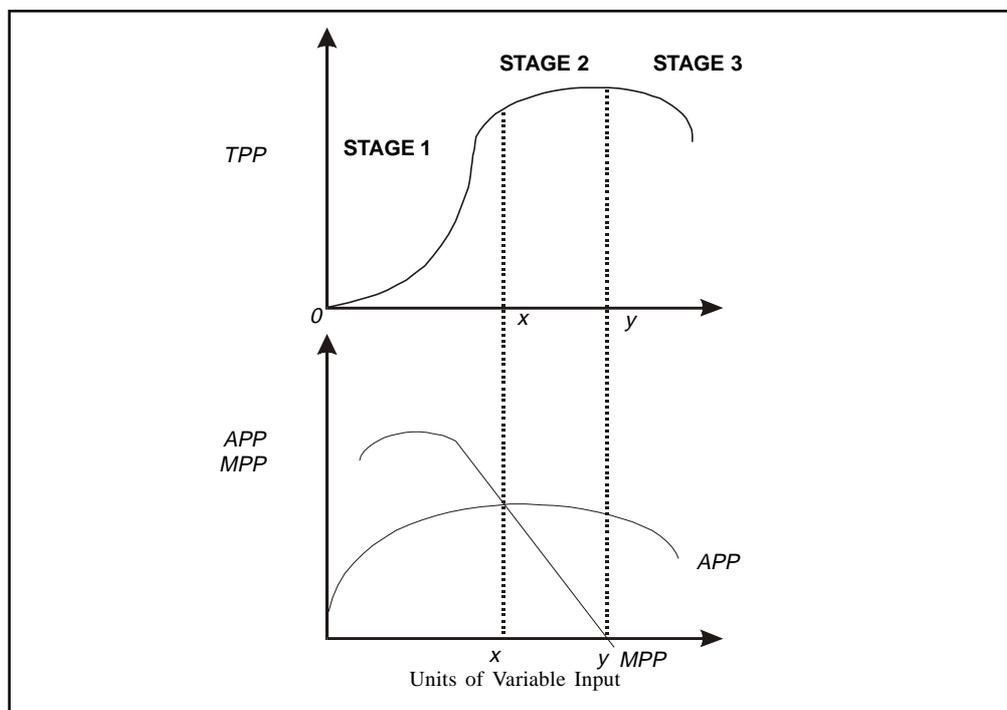
Figure: 6.2

In Table 6.3 labour is assumed to be the only variable input. Columns 1 and 2 together represent the production function of the firm. Column 3 shows the average combination of labour units involved. Column 4 lists the amount of increase in output as a result of each additional unit of labour, e.g., the marginal physical product of 5th unit of labour is the total physical product of 5 units of labour minus the total physical product of 4 units. Column 4 shows that the marginal physical product starts declining from 4th unit of labour onward. If labour units employed increase beyond 10, the marginal physical product will become zero and later become negative. The stage from where the marginal physical product starts declining shows the law of diminishing returns or law of variable proportions.

6.4.2 The Three Stages of Production

Diminishing returns to a factor can be graphically understood with the help of total and marginal product curves. In the Figure 3.9, the *TPP* curve rises first to an increasing rate up to a point 1, and later at a diminishing rate up to point 2. At point 2, the *TPP* remains constant. Thus, the total output increases more than proportionately until *X* units of labour are employed; between *X* units and *Y* units of labour use, the total output rises with every additional unit of labour but this increase is less than proportionate. If labour units increases beyond level *Y*, the total output eventually starts declining. Correspondingly when *TPP* is rising at an increasing rate, *MPP* and *APP* curves rise; and when total product is rising at a diminishing rate, this *MPP* and *APP* curves are declining. At *Y*, where *TPP* becomes constant, the *MPP* becomes zero, and additional labour beyond *Y* makes *MPP* negative. These three phases of *TPP* curve are called the three stages of production and are summarized below:

Table 6.4

Total Physical Product	Marginal Physical Product	Average Physical Product
Stage I Increases at an increasing rate	Increases and reaches its maximum	Increases (but slower than *MPP)*
Stage II Increases at a diminishing rate and becomes maximum	Starts diminishing and becomes equal to zero	Starts diminishing
Stage III Reaches its maximum, diminish becomes constant and then starts declining	Keeps on declining and becomes negative	Continues to but must always be greater than zero

No firm will choose to operate either in Stage I or Stage III. In Stage I the marginal physical product is rising, i.e., each additional unit of the variable factor is contributing to output more than the earlier units of the factor; it is therefore profitable for the firm to keep on increasing the use of labour. In Stage III, marginal contribution to output of each additional unit of labour is negative. It is therefore, inadvisable to use any additional labour. Even if cost of labour use is zero, it is still unprofitable to move into the Stage III. Thus, Stage II is the only relevant range for a rational firm in a competitive situation. However, the exact number of labour units hired can be found only when the corresponding data on wage rates is available.
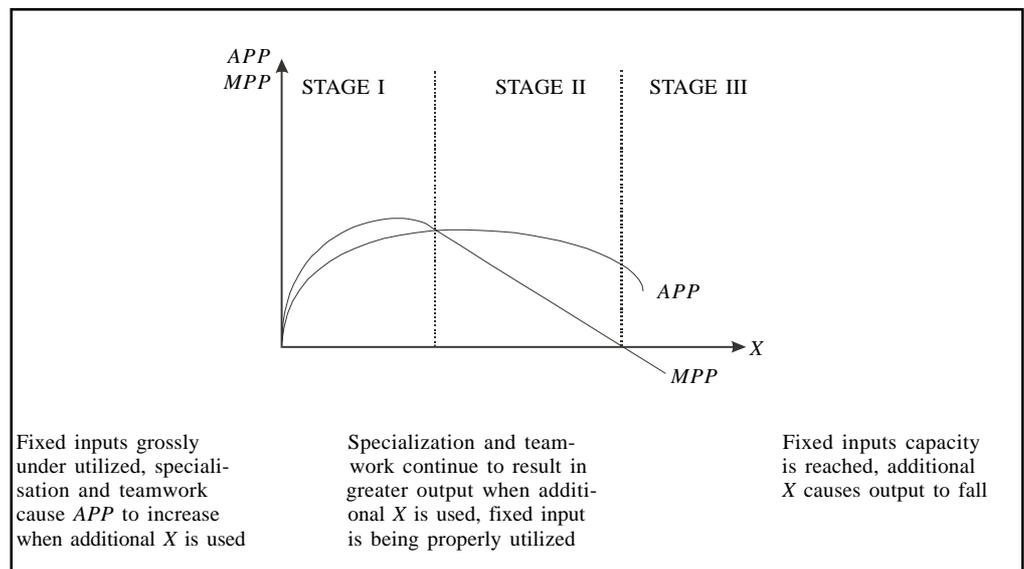
Figure 6.3

6.4.3 Optimal Use of the Variable Input

It is important for the firm to decide how much labour it should use in order to maximize profits. The firm should employ an additional unit of labour as long as the extra revenue generated from the sale of the output produced exceeds the extra cost of hiring the unit of labour, i.e., until the extra revenue equals the extra cost.

Thus, if an additional unit of labour generates Rs. 300 in extra revenue and costs an extra Rs. 200 then it pays for the firm to hire this unit of labour, as its total profit increases. This is an example of application of the general optimization principle.

The extra revenue generated by the use of an additional unit of labour is called the MARGINAL REVENUE PRODUCT OF LABOUR (MRP_L). This equals the MARGINAL PRODUCT OF LABOUR (MP_L) times the MARGINAL REVENUE (MR) from the sale of the extra output produced. Thus,

$$MRP_L. = (MP_L)\ (MR)$$

The extra cost of hiring an additional unit of labour or MARGINAL RESOURCE COST OF LABOUR (MRC_L) is equal to the increase in the total cost to the firm resulting from hiring the additional unit of labour. Thus,

$$MRP_L = \frac{\Delta TC}{\Delta T}$$

A firm should continue to hire labour as long as $MRP_L > MRC_L$ and until

$$MRP_L = MRC_L$$

This is applicable to any variable input and not just labour.

6.5 THE PRODUCTION FUNCTION WITH TWO VARIABLE INPUTS: LONG-RUN PRODUCTION FUNCTION

A firm may increase its output by using more of two variable inputs that are substitutes for each other, e.g. labour and capital. There may be various technical possibilities of producing a given output by using different factor combinations. Which particular factor combination will be actually selected by the firm depends both on the technical possibilities of factor substitution as well as on the prices of the factors of production.

The technical possibilities of producing an output level by various combinations of the two factors can be graphically represented in terms of an isoquant (also called iso-product curve, equal-product curve, or production indifference curve).

6.5.1 Isoquants

Isoquants are a geometric representation of the production function. The same level of output can be produced by various combinations of factor inputs. Assuming continuous variation in the possible combination of labour and capital, we can draw a curve by plotting all these alternative combinations for a given level of output. This curve which is the locus of all possible combinations is called the ISOQUANT.

Types of Isoquants

The production isoquant may assume various shapes depending on the degree of substitutability of factors.

A. *Linear isoquant:* This type assumes perfect substitutability of factors of production. A given commodity may be produced by using only capital, or only labour, or by an infinite combination of K and L.

B. *Input-output isoquant:* This assumes strict complementarity, that is, zero substitutability of the factors of production. There is only one method of production for any one commodity. The isoquant takes the shape of a right angle. This type of isoquant is called "Leontief Isoquant".

C. *Kinked isoquant:* This assumes limited substitutability of K and L. There are only a few processes for producing any one commodity. Substitutability of factors is

possible only at the kinks. It is also called "activity analysis-isoquant" or "linear-programming isoquant", because it is basically used in linear programming.

D. ***Smooth, convex isoquant:*** This form assumes continuous substitutability of *K* and *L* only over a certain range, beyond which factors cannot substitute each other. This isoquant appears as a smooth curve convex to the origin.
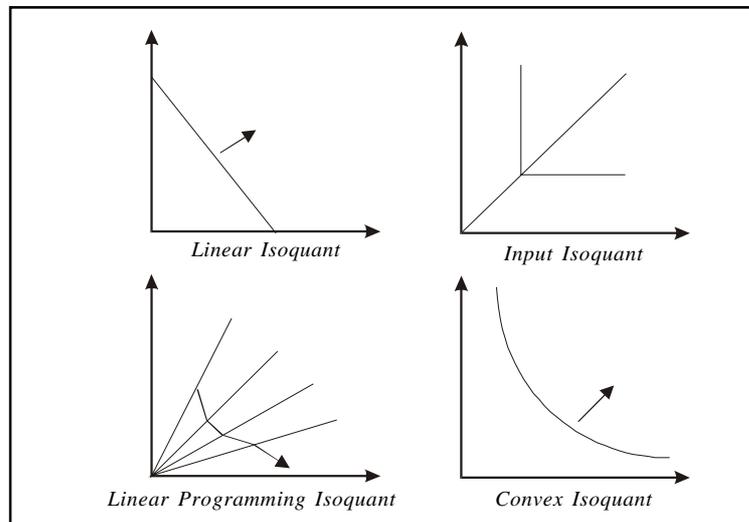

Figure 6.4: Types of Isoquant

Kinked isoquants are more realistic. We may consider the continuous isoquant as an approximation to the more realistic form of a kinked isoquant: as we increase the number of processes the kinks come closer and closer, until at the limit the isoquant becomes a smooth curve.

The production function describes not only a single isoquant, but the whole array of isoquants, each of which shows a different level of output. It shows how output, *X*, varies as the factor inputs (*L, K*) change. It is called an ISOQUANT MAP. A higher isoquant refers to a larger output, while a lower isoquant refers to a smaller output (*X*).

Table 6.5 shows different input-output relationships which results in different levels of output (*X*). These are shown in the form of an Isoquant Map in Fig. 6.5.

Table 6.5: Input-Output Relationship

X=2		X=5		X=9		X=12		X=14	
L	K	L	K	L	K	L	K	L	K
1	20	2	20	3	30	4	20	5	20
2	12	3	14	4	13	5	15	6	17
3	8	4	10	5	10	6	12	7	15
4	6	5	7	6	8	7	10	8	13
5	4	6	5	7	6	8	8	9	11
6	3	7	4	8	5	9	7	10	10
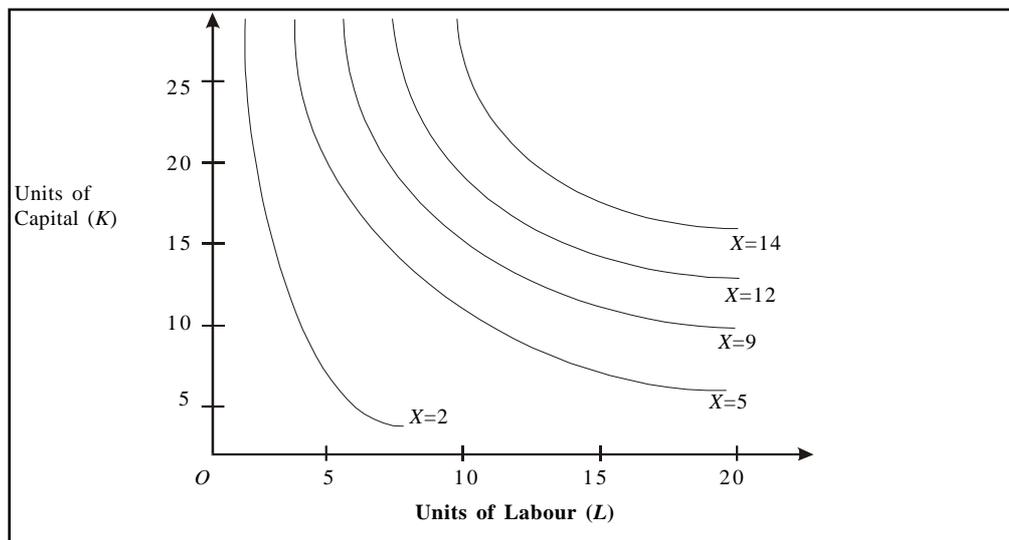
Figure 6.5: Isoquant Map

Characteristics of Isoquant

The isoquants show the following properties:

(a)   An isoquant slopes downward to the right.

(b)   An isoquant is convex to origin.

(c)   An isoquant is smooth and continuous.

(d)   Two isoquants do not intersect.

6.5.2 Marginal Rate of Technical Substitution

The marginal rate of technical substitution *(MRTS)* indicates the rate at which one input must be substituted for another as one moves down towards right along an isoquant. The *MRTS* of input *X* for input *Y* may be defined as the amount of input *Y* which can be replaced by one unit of input *X* so as to keep the level of output same.

According to the principle of diminishing *MRTS,* the value of the *MRTS* diminishes as one moves along an isoquant down towards right. This is shown in Table 6.6 and Fig. 6.6. The labour and capital have been taken as inputs. It has been assumed that this isoquant refers to 5 units production of commodity Z.
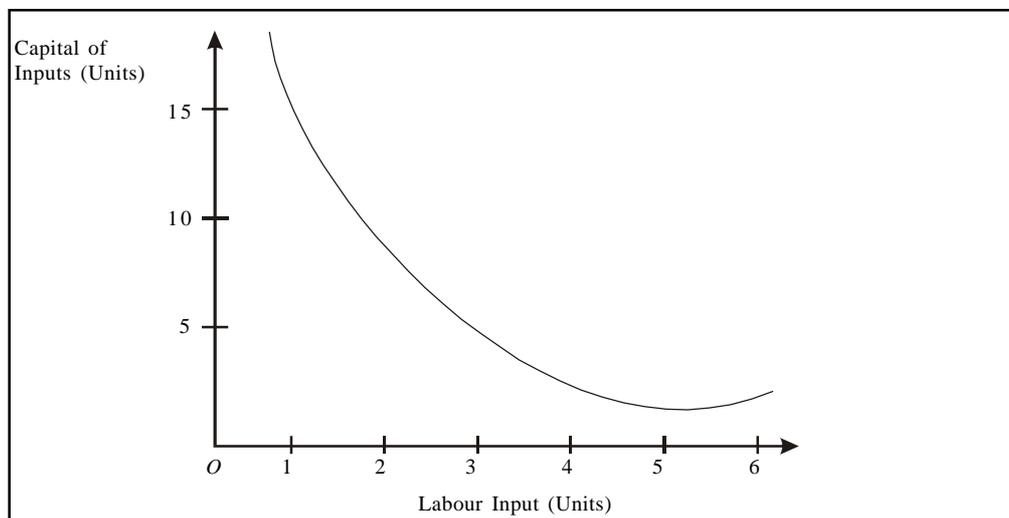
Figure 6.6: MRTS

Table 6.6: Equal Product Combinations of Labour and Capital

Combination	Unit of Labour (L)	Units of Capital (K)	$MRTS_{LK} =$
1	1	16	—
2	2	11	5
3	3	7	4
4	4	4	3
5	5	2	2
6	6	1	1
	Production of Commodity Z = 5 Units		

The isoquant slopes downward and is convex to origin. In combination 1, the capital is too much in comparison to labour and the labour is relatively very insignificant. As one moves towards combination 2, the addition of one unit of labour can compensate for the loss of 5 units of capital. On the other hand, when the capital becomes too less in comparison to labour, an addition of one unit of labour can compensate for the loss of only one unit of capital as one moves from combination 5 to 6. The *MRTS* of labour for capital diminishes from 5 to 1 from combination 1 to 6.

It can be shown that the marginal rate of technical substitution of labour for capital ($MRTS_{LK}$) is equal to the ratio of marginal productivities of labour and capital. In a change from combination 3 to 4 in the Fig. above let DL (=1) be the increase in labour employed and DK (=3) be the decrease in capital employed. Since the output remains the same at combinations 3 and 4, the gain in output due to increase in labour employed must neutralize the loss in output due to decrease in capital employed. Let MP_L and MP_K be the marginal productivities of labour and capital, respectively, then

$$\Delta K \times MP_K = \Delta L \times MP_L$$

$$\Rightarrow \frac{\Delta K}{\Delta L} = \frac{MP_L}{MP_K} = MRTS_{LK}$$

6.5.3 Isocost Lines

If a firm uses only labour and capital, the total cost or expenditure of the firm can be represented by

$$C = wL + rK$$

where C = total cost

  w = wage rate of labour

  L = quantity of labour used

  r = rental price of capital

  K = quantity of capital used

The equation shows that the total cost of the firm (C) is equal to the sum of its expenditures on labour (wL) and capital (rK). This equation is a general one of the firm's isocost line or equal-cost line. It shows the various combinations of labour and capital that the firm can hire or rent at a given total cost. For example, C = 900 units, w = 10 units and r = 10 units, the firm could either hire 10 L or rent 10 K or any combination of L and K shown on isocost line *AB* in Figure 6.7. For each unit of capital the firm gives up, it can hire one additional unit of labour. Thus the slope of the isocost line is -1.
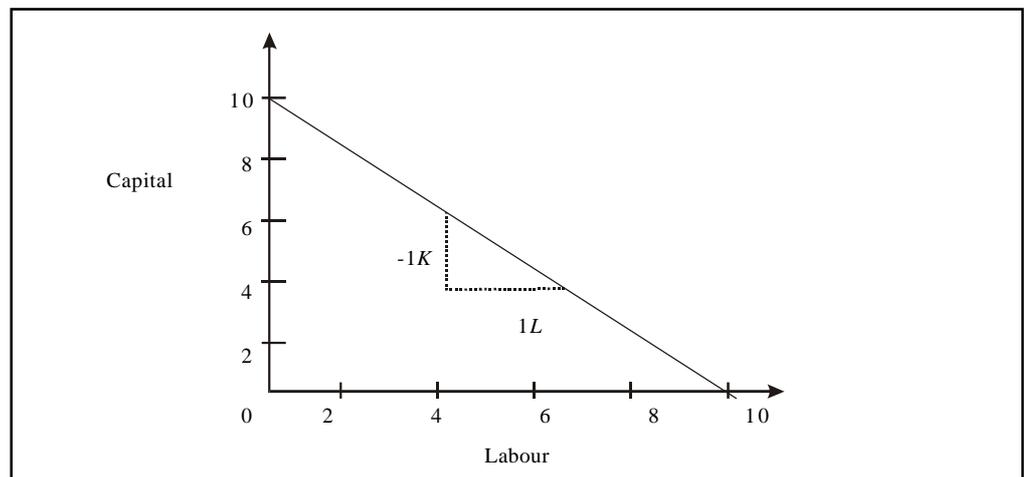
Figure 6.7: Isocost Line

By subtracting *wL* from both sides of the equation above and then dividing by *r*, we get the general equation of the isocost line in the following more useful form:

$$K = \frac{X}{P} - \frac{w}{r}L$$

where *C/R* is the vertical intercept of the isocost line and *-w/r* is its slope. Thus for *C*=100 units and *w*=*r*=10 units, the vertical intercept is *C/R* = 100/10=*K*, and the slope is *-w/r* = −10/10 = −1. A different total cost by the firm would define a different but parallel isocost line, while different relative input prices would define an isocost line with a different slope.

6.5.4 Optimal Factor Combinations

The theory of production may be viewed from two angles which are dual to each other. A firm may decide to produce a particular level of output and then attempt to minimize the cost of total inputs or it may attempt to maximize its output subject to a cost constraint.

A firm spends money on two inputs only, *X* and *Y*. It decides its budget and knows the price of each of the inputs which remains constant. If the firm spends all its budget it can buy either *OB* units of input *X* or *OA* units of input *Y* or a combination of *X* and *Y* represented by a point lying on the straight line *AB* in Fig. 6.8. The line *AB* is the budget line of the firm.
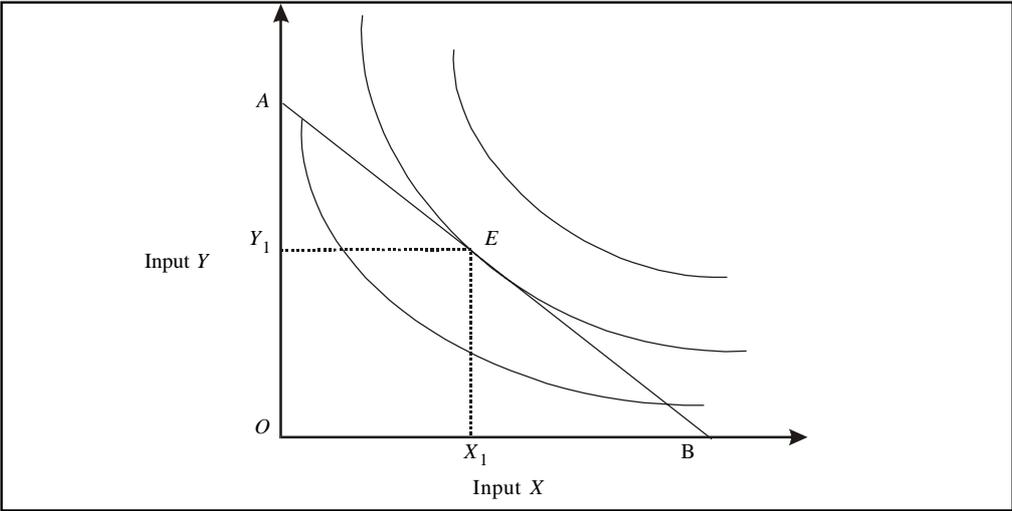
Figure 6.8: Optimum Factor Combination

The slope of the budget line on the isocost line will be $\frac{OA}{OB}$, where

$$OA = \frac{Cost}{Price\ of\ Y} = and\ OB = \frac{Cost}{Price\ of\ X}$$

Therefore, slope of $AB = -\frac{OA}{OB}$

$$= -\frac{Price\ of\ X}{Price\ of\ Y} = -\frac{P_X}{P_Y}$$

The negative sign indicates negative slope. In absolute terms the slope of the budget line is equal to the price ratio of the two inputs.

The budget line of the firm has been superimposed on its isoquant map. The firm would be in equilibrium at a point where an isoquant is tangent to the budget line *AB* i.e., point *E*. Thus in equilibrium, the firm produces on the isoquant Q_2 and uses OX_1 units of input *X* and OY_1 unit of input *Y*. At point *E*, the slope of the isoquant Q_2 is equal to the slope of the budget line, i.e., the marginal rate of technical substitution of *X* and *Y* is equal to the ratio of prices of two inputs.

Thus $MRTS_{XY}$ $\dfrac{MP_X}{MP_Y} = \dfrac{P_X}{P_Y}$

Thus to minimize production costs (or to maximize output for a given cost outlay), the extra output or marginal product spent on labour must be equal to the marginal product per unit spent on capital.

6.5.5 Equilibrium of a Multi Product Producer

Most of the firms today produce a combination of products—at least main product and its by-products. For example, Durgapur Steel Plant produces steel and gas. It can be assumed, thus, that a firm produces, say, two products Q_1 and Q_2 jointly out of a given factor, *F*. Our interest is to know the optimal product-mix in this case.

$F=F(Q_1, Q_2)$ is the transformation possibility function, which when plotted, gives the produce transformation curve.

The slope of this curve, $\dfrac{\Delta Q_1}{\Delta Q_2}$ measures the Marginal Rate of Product Transformation

(MRPT Q_1, Q_2)
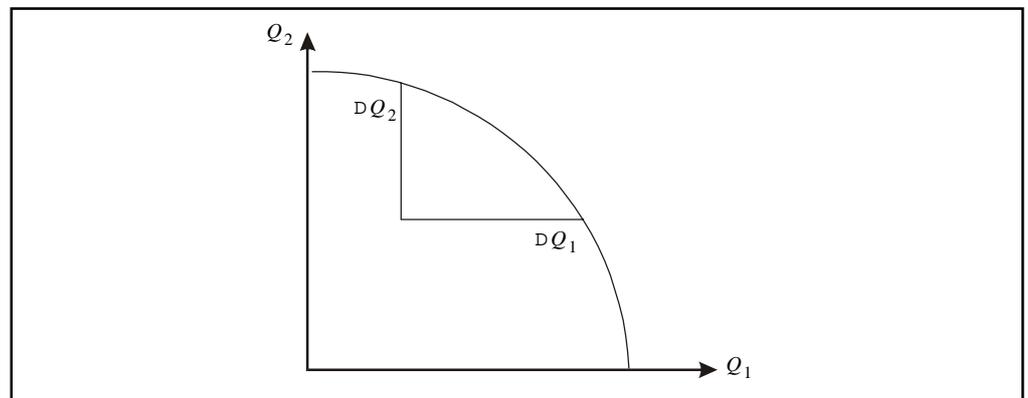
Figure 6.9

Now the producer gets his revenue from the market by producing and selling both products. Thus the total revenue of the producer, $TR=P_1Q_1 + P_2Q_2$ when P_1 and P_2 are respective prices of Q_1 and Q_2. We now get *AB*, the *iso-revenue curve,* where slope

measures the product price ratio $\dfrac{P_1}{P_2}$
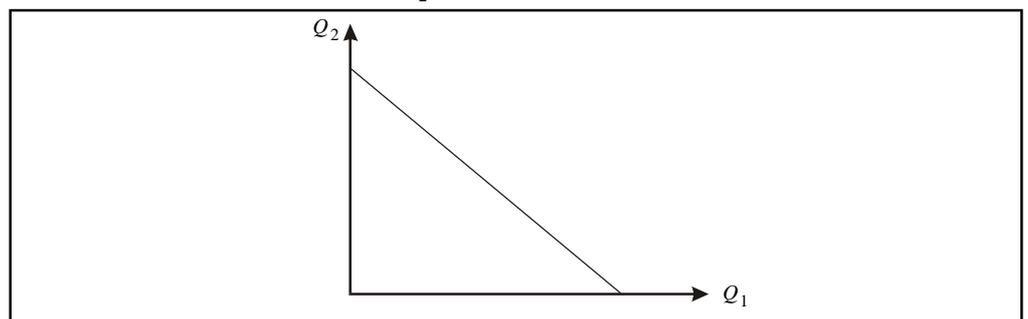
Figure 6.10

The firm may now try to maximize the revenue subject to the constraint imposed by the production possibility or minimize the resource use to attain a given revenue. Either way, the decision rule for an optimum product-mix is:

$$\frac{\Delta Q_1}{\Delta Q_2} = MRPT \; Q_1 \; Q_2 = \frac{P_1}{P_2}$$

This is shown in the Figure 3.17; corresponding to the equilibrium condition, the firm produces a combination of OQ_1^* and OQ_2^*. Some degree of substitutability between Q_1 and Q_2 is being assumed. If more of Q_1 is produced out of a given resource F, less of Q_2 can be produced.
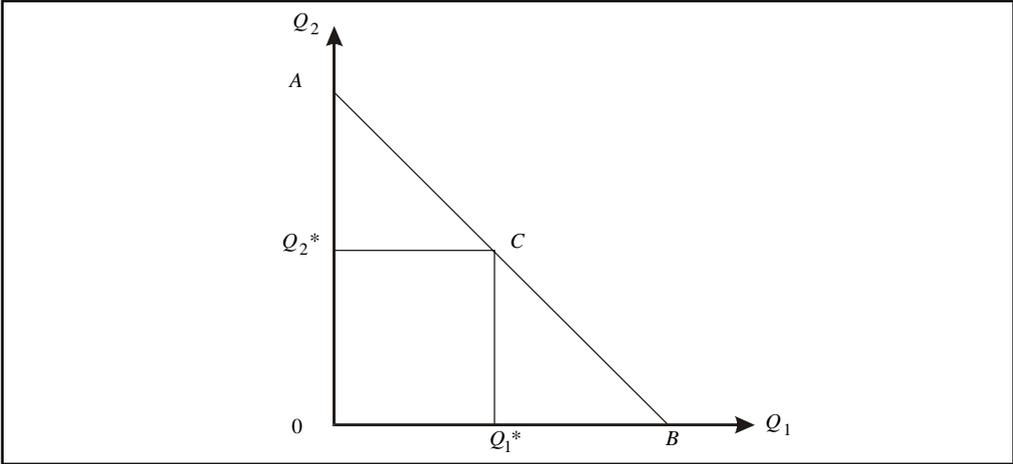
Figure 6.11

6.6 EXPANSION PATH

The case of a firm producing 1000 units of output using 10 units of capital and 10 units of labour (at point *a*) and the input prices are $w=2$ and $r=2$, is shown in Figure 6.12 using isoquants and isocosts.
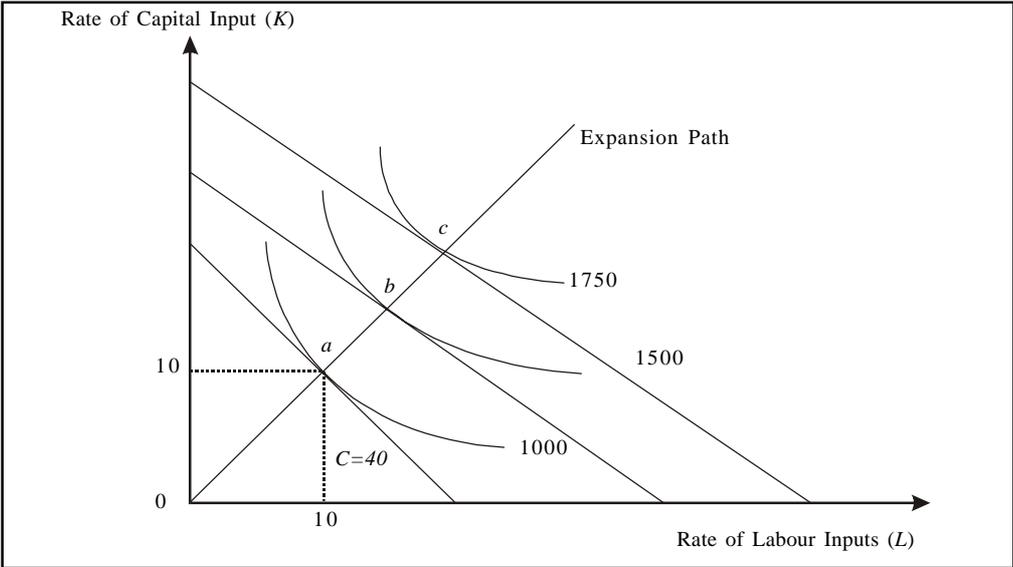
Figure 6.12: The Expansion Path for the Firm

Thus the cost of this input combination is 40 units. At point *a,* the 1000 unit isoquant is tangent to the 40 unit isocost line. If the firm wants to increase its output or expand its production, it will move to point *b* if 1500 units are to be produced and then to point *c* if 1750 units of output are to be produced. In general, the firm expands by moving from

one tangency or efficient production point to another. These efficient points represent the expansion path.

An expansion path is formally defined as the set of combinations of capital and labour that meet the efficiency condition $MP_L/w = MP_K/r$.

An equation for the expansion path can be determined by first substituting the marginal product functions and input prices into the efficiency condition, and then by solving for capital as a function of labour if the production function is $Q = 100 \ K^{1/2} \ L^{1/2}$, the corresponding marginal product function are,

$$MP_L = \frac{dQ}{dL} = \frac{50K^{1/2}}{L^{1/2}}$$

and

$$MP_L = \frac{dQ}{dK} = \frac{50L^{1/2}}{K^{1/2}}$$

Substituting the marginal product equations in the efficiency condition $(MP_L/MP_K = w/r)$ gives,

$$\frac{\dfrac{50K^{1/2}}{L^{1/2}}}{\dfrac{50L^{1/2}}{K^{1/2}}} = w/r$$

Solving for K gives:

$$K = \frac{w}{r} \ L$$

This expression is the equation for the expansion path for the production function $Q = 100 \ K^{1/2}/ \ L^{1/2}$. If w and r are known, equation $K = w/r \ L$ defines the efficient combination of capital and labour for producing any rate of output e.g., the expansion path in the figure given on previous page. If $w=1$, and $r=1$, the expansion path would be,

$K = L$

If $w = 2$ and $r = 1$, the equation for expansion path would be

$K = 2L$

If the expansion path is known, then knowing the isoquant-isocost system is not necessary to determine efficient production points. The firm will only produce at those points on the expansion path.

The expansion path indicates optimal input combinations, but it does not indicate the specific rate of output associated with that rate of input use. The output rate is determined by substituting the equation for the expansion path into the original production function.

Check Your Progress 2

Production manager of a company estimates that their production process is currently characterized by the following production function:

$$Q = 72 \ x + 15 \ x^2 - x^3$$

(a) Determine the equation for the MP and AP of the variable factor.

(b) What is the MP when seven units of the variable input are employed?

6.6.1 Changes in Inputs Prices

If the price of one input, say labour, increases, the firm will adjust the input mix by substituting capital for labour. If the price of labour declines, thus making labour relatively less expensive, labour will be substituted for capital. In general, if the relative prices of inputs change, managers will respond by substituting the input that has become relatively less expensive for the input that has become relatively more expensive.

The isoquant-isocost framework can be used to demonstrate this principle (Fig. 6.13). Let us suppose the firm is currently operating at point a where 100 units of output are produced using the resource combination ($K=10$, $L=2$). This is an efficient resource mix because the 100 unit isoquant is tangent to the isocost line CC. If the firm's goal is to maximize production subject to a cost constraint (i.e., the firm is limited to resource combinations on a given isocost function).

6.6.2 Rate of Capital Input (K)
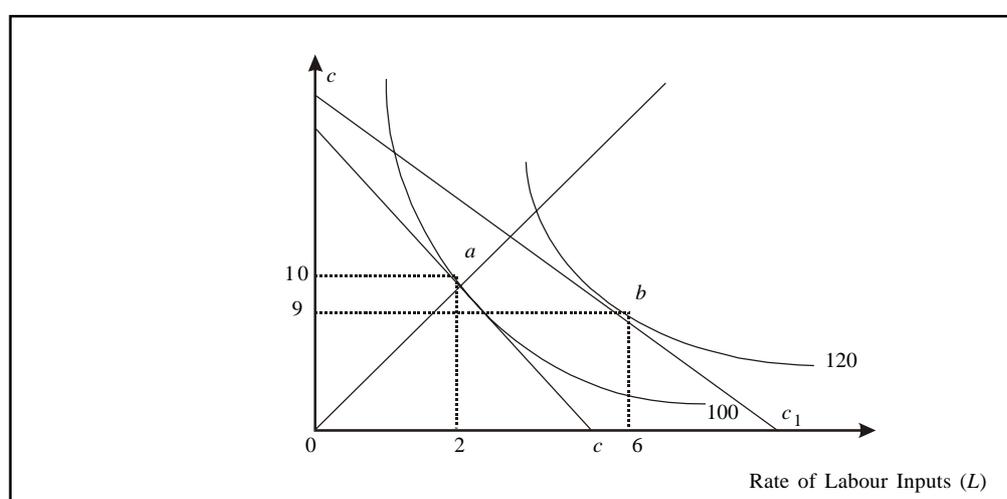
Figure 6.13: Response of the Firm to a Decrease in the Price of Labour

If the price of labour falls while the price of capital remains unchanged (i.e., labour has become relatively less expensive), the isocost curve pivots to the right from CC to the isocost CC_1. The reduction in the price of labour means that the firm is able to increase the rate of production. Hence the firm moves from point a to point b, which is a new efficient resource combination. That is, the new isocost is tangent to the 120-unit isoquant at point b. Now 9 units of capital and 6 units of labour are employed. At point a, the efficient ratio of capital to labour was 5 : 1. Now the efficient ratio of two inputs is 3 : 2. The reduction in the price of labour has caused the firm to substitute that relatively less expensive input for capital.

6.7 RETURNS TO SCALE

If all inputs are changed simultaneously, (possible only in the long-run) i.e., say increased proportionately, then the concept of returns to scale has to be used to understand the behaviour of output. The behaviour of output is studied when all factors of production are changed in the same direction and proportion. Returns to scale are classified as follows:

(a) **Increasing returns to scale:** If output increases more than proportionate to the increase in all inputs.

(b) **Constant returns to scale:** If all inputs are increased by some proportion, output will also increase by the same proportion.

(c) **Decreasing returns to scale:** If increase in output is less than proportionate to the increase in all inputs.

For example, if all factors of production are doubled and output increases by more than two times, then the situation is of increasing returns to scale. On the other hand, if output does not double even after a cent per cent increase in input factors, we have a diminishing returns to scale.

The general production function is

$$Q = F\ (L,\ K)$$

If capital, K and labour, L is multiplied by h, and Q increases by λ, we get,

$$1Q = f(hL,\ hK)$$

We have constant, increasing or decreasing returns to scale, respectively depending upon, whether $1 = h$, $1 > h$ or $1 < h$.

For example, if all inputs are doubled, we have constant, increasing or decreasing returns to scale, respectively, if output doubles, more than doubles or less than doubles. (Fig. 6.14).

The firm increases its inputs from 3 to 6 units (K, L) producing either double (point B), more than double (point C) or less than double (point C) output (Q).
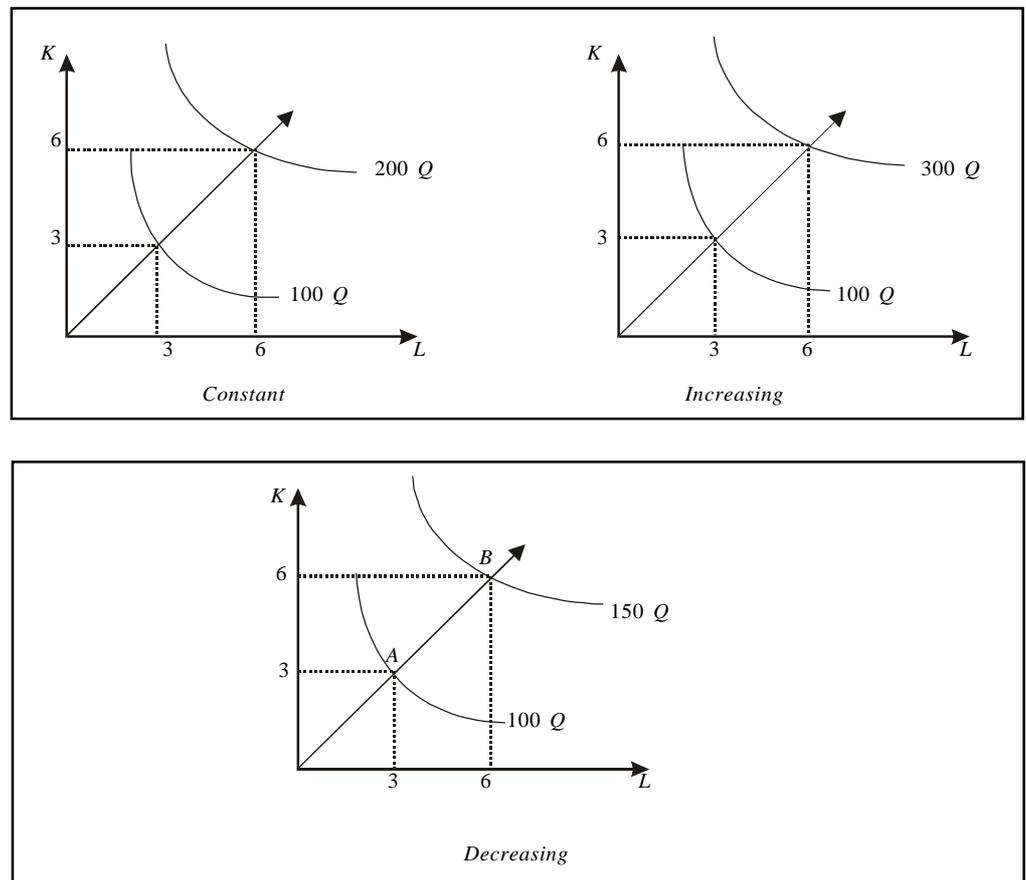
Figure 6.14: Returns to Scale

Increasing returns to scale arise because as the scale of operation increases, a greater division of labour and specialization can take place and more specialized and productive machinery can be used. Decreasing returns to scale arise primarily because as the scale of operation increases, it becomes more difficult to manage the firm. In the real world, the forces for increasing or decreasing returns to scale often operate side by side, with the former usually overwhelming the latter at small levels of output and the reverse occurring at very large levels of output.

6.8 ECONOMIC REGION OF PRODUCTION (RIDGE LINES)

The isoquant map corresponding to three levels of production Q_1, Q_2 and Q_3 is shown in Figure 6.15. All the points on isoquant Q_3 indicate the same level of output. A rational producer will produce only between points E and F because it is only between points E and F that the isoquant is convex to the origin. A tangent drawn on isoquant Q_3 at E is vertical while that drawn at F is horizontal. The producer will not produce at point G on isoquant Q_3 because by moving from point E to G more of each of the two inputs has to be employed to produce the same level of output. The producer will also not produce at point H on isoquant Q_3 due to the same reason. Similarly, the economic range of production along isoquant Q_2 is CD and along isoquant Q_1 is AB. The points joining O, A, C and E form the upper ridge line R_1 and the point joining O, B, D and F form the lower ridge line R_2. The area lying between the two ridge lines is the economic region or technically efficient region.
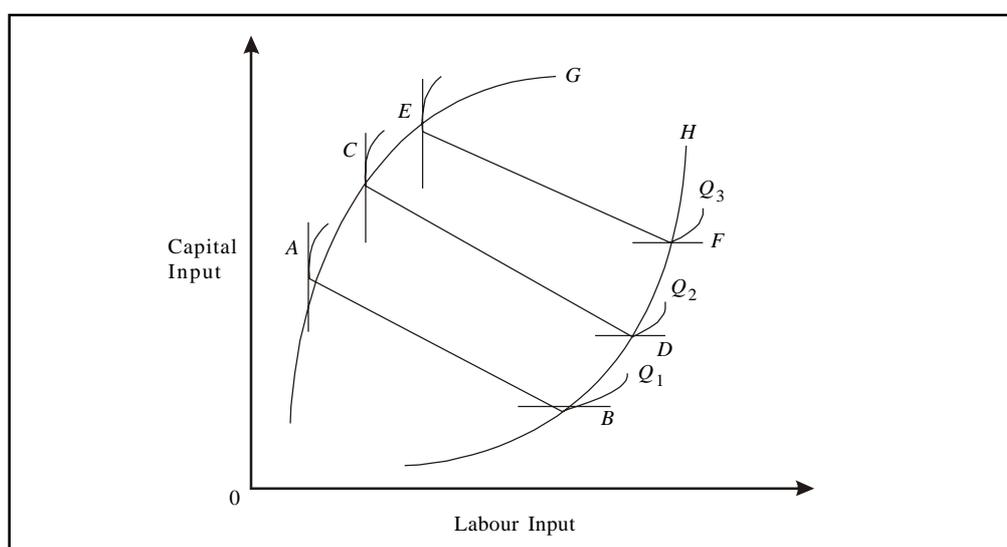
Figure 6.15: Ridge Lines

6.9 EMPIRICAL PRODUCTION FUNCTIONS

The most popular form of production function is the COBB-DOUGLAS FUNCTION

Suppose $Q = Q (L, K)$

This means that the physical output level, Q, depends upon, quantities of Labour (L) and Capital *(K)*. The Cobb-Douglas form is

$Q = L = K^{1-a}$ where $O < a < 1$ and A and a are constants.

Another form is the *Constant Elasticity of Substitution, CES* function,

$Q = B [gL^{-h} + (1 - g) K^{-h}]^{-1/h}$

where $h > -1$ and B, g and h are constant.

If *h is* assumed to be a variable, then the above function may be called the VARIABLE ELASTICITY OF SUBSTITUTION VES (PRODUCTION) FUNCTION.

Still another form is the FIXED PROPORTION PRODUCTION FUNCTION also called the LEONTIEF PRODUCTION FUNCTION. It is represented by

$Q = \text{minimum} \left[\dfrac{K}{a}, \dfrac{L}{b}\right]$ where a and b are constants and 'minimum' means that Q equals the smaller of the two ratios.

Finally, there is a very simple LINEAR PRODUCTION FUNCTION assuming that the inputs are perfect substitutes so that all factors may be reducable to one single factor, say, labour, L. Then the linear production function may be,

$Q = aL$, where a is the constant term and L stands for labour.

Thus there are five different forms of production functions. The particular form of a production function is determined by the elasticity of factor substitution. The ELASTICITY OF FACTOR (INPUT) SUBSTITUTION is a measure of the ease with which the varying factor can be substituted for others. The Cobb-Douglas Function has a unitary elasticity of factor's substitution. The *CES* and *VES* functions do not assume any specific value for the elasticity of the substitution, but, as their names suggest, the former takes the elasticity as a constant, while the latter allows it to vary. Leontif function assumes zero elasticity of substitution i.e., the factors are not substitutable at all, they are to be combined in fixed proportion. On the other extreme, the linear function assumes infinite elasticity of substitution i.e. the factors are perfect substitutes. In reality, factors of production may be substitutes, but they are not perfect substitutes. In the real world, thus, the Leontif and Linear forms of production function can be safely ruled out. A lot of empirical work has been done with reference to the Cobb-Douglas and the *CES* form.

Both have been presented in their linearly homogeneous form. The mathematical term LINEAR HOMOGENEITY means CONSTANT RETURNS TO SCALE i.e., when all inputs are increased together in the same proportion, output is also expanded in the same proportion as discussed in the earlier section.

The other essential feature of the linear homogeneity with regard to the production function is as follows: the AVERAGE AND MARGINAL PRODUCTS depend upon the ratio in which the inputs are combined, but their values are independent of the absolute magnitude of the inputs. Using the Cobb-Douglas function, $Q = AL^a K^{1-a}$
The average product of Labour,

$$AP_L = \frac{AL^\alpha K^{1-\alpha}}{L}$$

$$= AL^{a-1} K^{1-a} = A \frac{K^{1-\alpha}}{L}$$

This shows that the average product of L depends only on the input ratio or factor proportion. If $A = 100$, $a = 1/2$, $K = 4$ and $L = 1$ the average product of L is 200. If $K = 800$ and $L = 200$, the input ratio is the same and so is the magnitude of the average product.

The same relation holds true for the marginal product. Let us consider the marginal product of labour, keeping capital, K constant.

$$MP_L = {}^a AL^{1-a} L^{a-1} = {}^a A \left[\frac{K}{L} \right]^{1-\alpha}$$

This also shows that the marginal product depends on the input-ratio or what is called "factor-intensity". Demand elasticity coefficient always measures the proportional change in an independent variable induced by a given proportional change in an independent variable. This applies to production as well. Given the production function $Q=Q(L, K)$, the labour elasticity of output (e_1) is the proportional change in output, resulting from a given proportional change in labour input, L, the input capital K being held constant. Similarly, the capital elasticity of output (e_2) is the proportional change in output resulting from a given proportional change in capital K, the input labour, L being held constant.

Like demand elasticities, Input Elasticities can be expressed as follows:

$$e_1 = \frac{\P Q}{\P L} \cdot \frac{L}{Q} = \frac{dQ/dL}{Q/L} = \frac{MP_L}{AP_L}$$

$$e_2 = \frac{\P Q}{\P L} \cdot \frac{K}{Q} = \frac{dQ/dL}{Q/K} = \frac{MP_K}{AP_K}$$

Thus the input elasticity of output turns out to be a ratio of the input's marginal product and average product. In general marginal and average products vary as the input ratios change. Hence the input elasticities change as well. However in the special case of Cobb-Douglas functions, the input elasticities are constant.

$$Q = AL^a K^{1-a}$$

$$\frac{\P Q}{\P L} = {}^a AL^{a-1} K^{1-a}$$

$$e_1 = \frac{dQ}{dL} \cdot \frac{L}{Q} = {}^a AL^{a-1} K^{1-a} \cdot \frac{L}{{}^a AL^a K^{1-a}}$$

$$= \frac{{}^a AL^a K^{1-a}}{{}^a AL^a K^{1-a}} = a$$

Similarly,

$$e_2 = \frac{dQ}{dK} \cdot \frac{K}{Q} = (1-a) \, {}^a AL^a K^{a-1} \cdot \frac{K}{{}^a AL^a K^{1-a}}$$

$$= \frac{{}^a (1-a) \, AL^a K^{1-a}}{AL^a k^{1-a}} = (1-a)$$

The elasticity coefficients α and $(1-\alpha)$ are constant. These indicate how much will output change if an input-use is changed by some proportion. Here is a very important tool for production decisions. If average product of a factor is at the maximum, then average and marginal products equal and, therefore, input elasticity becomes unity. Similarly, if marginal product is zero, then the input elasticity will be zero. Under no circumstances, the production manager should consider the employment of all additional factors, if the input elasticity of that factor is zero. For example, in an underdeveloped economy, some labourers do not make any contribution to output (i.e., they are underemployed) and, therefore, their withdrawal from the firm is strongly recommended.

The aggregate of all input elasticities of output is called the FUNCTION COEFFICIENT (e). In other words, the function coefficient shows the proportional change in output, resulting from a given proportional change in all inputs. Referring to the Cobb-Douglas form, $Q = Q (L, K)$, we find,

$$e = e_1 + e_2$$

$$= \frac{dQ}{dN} \cdot \frac{L}{Q} + \frac{dQ}{dK} \cdot \frac{K}{Q}$$

Since the Cobb-Douglas function is homogeneous of degree one, i.e., since it reveals the constant returns to scale, a l per cent increase in all inputs (L, K) increases output, Q by exactly l per cent then $e=l$. Thus the function coefficient provides a test for linear homogeneity of production function.

Check Your Progress 3

1. Determine the returns to scale in each case

    a) $Q = L^{0.60} K^{0.40}$

   b) $Q = 10 K^{0.70} L^{0.20}$

    c) $Q = 5 L^{0.60} K^{0.50}$

6.10 THE IMPORTANCE OF PRODUCTION FUNCTIONS IN MANAGERIAL DECISION-MAKING

For managers, an understanding of the basic concepts of production provides a solid conceptual framework for decisions involving the allocation of a firm's resources both in the short-run and in the long-run. Given below are two such key management principles.

(1) ***Careful planning can help a firm to use its resources in a rational manner:*** In the short-run anlaysis, we found that a firm has three stages of production and the stage II is the only stage for a rational firm to operate. However, the firm may find itself in stage I or III as the production levels do not depend on how much a company wants to produce but on how much its customer wants to buy.

Fig. 6.16 shows a short-run production function where stage II applies to production levels between $Q_1 = 200$ and $Q_2 = 275$. If people want to buy less than 200 units or more than 275 units, for example, then in the short-run the firm would be forced to operate in either stage I or stage III.
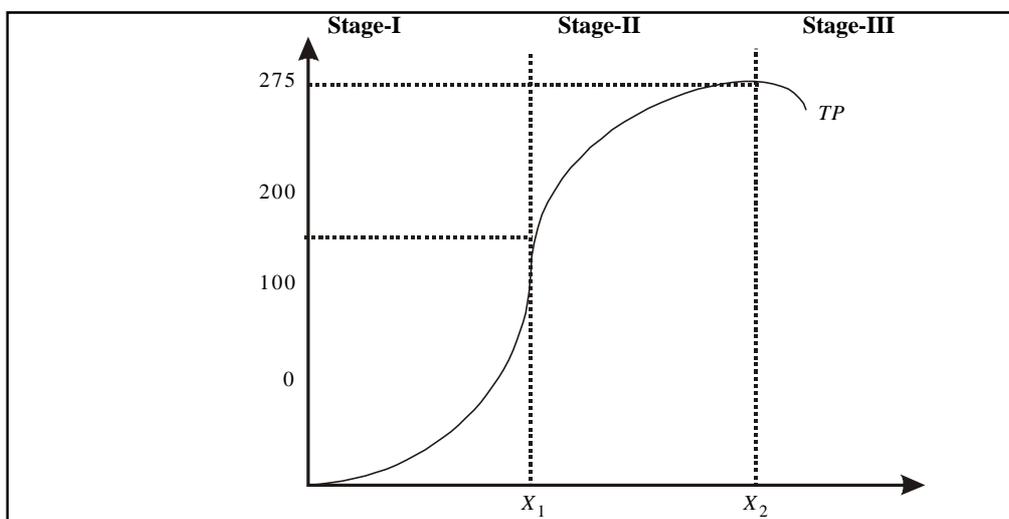
Figure 6.16: Production Stages and Capacity Planning

The information above implies that for a firm to avoid having to operate in either stage I or stage III, there must be careful planning regarding the amount of fixed inputs that will be used along with the variable ones. In business, this is called "Capacity Planning". For example, if the firm anticipated that the demand for its products would be in the range of 200 to 275, then the capacity implied in the Figure 6.16 is perfect for its needs. However, if the firm anticipated the demand to be greater than 275, it would have to consider increasing its capacity so that stage II would include the higher level of output. Similarly, if the firm forecasts a demand less than 200, it would have to consider decreasing its capacity. These alternative capacity levels are shown in Fig. 6.17.
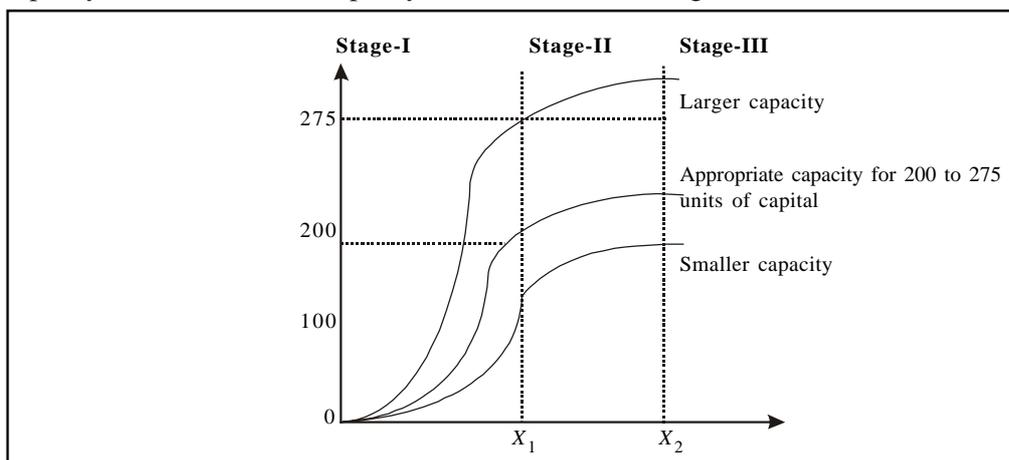
Figure 6.17: Adjusting Capacity based on Demand

Good capacity planning requires two basic elements: (1) accurate forecasts of demand, and (2) effective communication between the production and marketing functions. The first one is rather obvious but the second one is not very easy to achieve.

(2) ***Managers must understand the marginal benefits and cost of each decision involving the allocation of scarce resources:*** One of the most difficult subjects to learn is the use of isoquants and isocosts in production theory as it is far removed from the reality of the "real world" of business. The essence of the model, however, is that it tells managers about allocation of scarce resources; that certain trade-offs in terms of benefits and costs are involved.

In the real world analysis of production, the data on the marginal products of each input may not be known. Thus, a manager may be unable to find the optimal combination of inputs. Nonetheless, managers can utilize the concept of trade-offs in their decision-making regardless of whether detailed quantitative information exists. Few examples are:

(a) ***The capital-labour trade off***—If a company is considering the installation of a new voice-messaging system, it would greatly reduce the need for receptionists, operators or secretaries. The question is whether the cost of installing such a system is outweighed by the cost savings resulting from the elimination of certain support personnel.

Similarly, there exists the following:

(b) ***The labour*** — labour trade off.

(c) ***The raw material*** — raw materials trade off.

(d) ***The capital*** — capital trade off.

These are only a few of the many types of decisions managers must make involving the trading off of benefits and costs.

6.11 LET US SUM UP

This unit presents the production related concepts, and highlights the decisions taken by firms to maximize productivity. The production function is explained with respect to two factors of production. In the short-run, one factor is assumed constant while in the long-run both factors can be changed. The concept of economies of scale is presented incase of two variable inputs. Empirical production functions such as the Cobb-Douglas production function are also discussed in detail.

6.12 LESSON END ACTIVITY

1. Calculate the elasticity of substitution between labour and capital from the following data:

Amount of labour	Amount of capital	Marginal product of labour	Marginal Product of capital
4	5	6	5
5	4	5	6

6.13 KEYWORDS

Production: Transformation of inputs into output.

Inputs: Resources used in the production of goods and services.

Variable inputs: Inputs that can be varied easily and on very short notice.

Fixed inputs: Inputs that cannot be readily changed during the time period under consideration.

Long-run: The time period when all inputs become variable.

Short-run: The time period during which at least one input is fixed.

Production function: A function that states the maximum amount of an output that can be produced with a certain combination of inputs, within a given period of time and with a given level of technology.

Marginal revenue product of labor: Marginal product of labour times the marginal revenue from the sale of extra output produced.

Law of diminishing marginal returns: As more and more of the factor input is employed, all other input quantities constant, a point will eventually be reached where additional quantities of varying input will yield diminishing marginal contributions to total product.

Increasing returns to scale: If output increases more than proportionate to the increase in all inputs.

Decreasing returns to scale: If increase in output is less than proportionate to the increase in all inputs.

Constant returns to scale: If all inputs are increased by some proportion, output will also increase by the same proportion.

Marginal rate of technical substitution: The rate at which one input must be substituted for another as one moves down towards right along an isoquant.

Isoquant: Geometric representation of the production function.

Isocost line: The line representing the total budget of a firm.

Elasticity of factor substitution: A measure of the ease with which the varying factor can be substituted for others.

Function coefficient: The aggregate of all input elasticities of output.

6.14 QUESTIONS FOR DISCUSSION

1. Explain the nature and managerial uses of production function.

2. (a) "There is a difference between technical feasibility and economic feasibility for producing a commodity. Production function provides only technical feasibility."— Comment.

    (b) "If the production function is homogeneous with constant returns to scale everywhere, the returns to a single variable factor will be diminishing."— Explain.

3. How does a least-cost combination arrived at with the help of iso-product and isocost curves? Explain the significance of the tangential point.

4. "Economies of scale may be either internal or external; they may be technical, managerial, financial or risk-bearing."—Elucidate.

5. Write short notes on (draw diagrams where necessary):

    (i) Law of proportions.

    (ii) Cobb-Douglas production function.

    (iii) Isoquant.

(iv) CES production function.

(v) Economies of scale.

(vi) Internalized external economies affecting a firm's costs.

(vii) Expansion path.

6. Peter and John operates on a technology described by the following production function:

$Q = L^2 + 5LK + K^2$

where Q = Quantity of output.

           L = Quantity of labour.

           K = Quantity of capital.

(a) Determine its isoquant for $Q = 100$.

(b) Derive the MPP' function if $K = 10$.

(c) If $K=10$ where do diminishing returns to labour set in?

(d) If the price of labour equals Rs. 5 and that of capital equals Rs. 10 and the company wishes to produce 45,000 units of its production, determine the least-cost-input combination that the company must employ.

7. Fill in the blanks in the following table:

Usage of the Variable Factor (L)	Total Product	Average Product	Marginal Product
1	. . .	20	. . .
2	. . .	. . .	34
3	81	. . .	. . .
4	. . .	26	. . .
5	. . .	. . .	21
6	138	. . .	. . .
7	. . .	21	. . .
8	. . .	. . .	5
9	153	. . .	. . .
10	. . .	15	. . .

8. What are external economies of scale and how are they different from returns to scale?

9. Explain the difference between the long-run and the short-run. Why is the difference important for managerial decision-making?

10. Given the production function,

$Q = 100 + P - 0.01P^2 + 2N - 0.03N^2$

determine the marginal rate of technical substitution.

6.15 MODEL ANSWER TO "CHECK YOUR PROGRESS"

Check Your Progress 1

798 units of the good can be produced by using:

(i) 1L and 4K, and

(ii) 4L and 1K

999 units of the good can be produced by using:

(i) 2 L and 4 K,

(ii) 3 L and 3 K, and

(iii) 4 L and 2 K

This production function shows that when quantity of labour increases initially production increases but ultimately diminishing returns prevailed (after 3 unit of labour).

Check Your Progress 2

(a) Differentiating total product (TP) with respect to x gives us the MP equation

$$MP = \frac{dQ}{dx} \; 72 + 30x - 3x^2$$

The average product (AP) equation is simply derived by dividing the total product by the variable input x. Thus,

$$AP = \frac{72x + 15x^2 - x^3}{x} = 72 + 15x - x^2$$

(b) To find out the marginal product when seven units of the variable input are employed, we substitute the relevant number into the MP equation:

$$MP = 72 + 30x - 3x^2$$
$$= 72 + 30 \times 7 - 3 \times 7^2$$
$$= 135$$

Check Your Progress 3

If L and K are multiplied by h and Q increases by λ, we get

$$Q = f(hl, hk)$$
$$= h^\upsilon f(L, K)$$

If v = 1 we have constant returns to scale

If v < 1 we have decreasing returns to scale

If v > 1 we have increasing returns to scale

(a) $Q = L^{0.60} K^{0.40}$

$$Q* = (hL)^{0.60} (hK)^{0.40}$$
$$= h^1 (L^{0.60} K^{0.40})$$

Thus, constant returns to scale

(b) $Q = 10K^{0.70} L^{0.20}$

$$Q* = 10\left[(hK)^{0.70}(hL)^{0.20}\right]$$
$$= h^{0.90} 10 K^{0.70} L^{0.20}$$
$$= h^{0.9} Q$$

Scale V<1, thus decreasing returns to scale

(c) $Q = 5L^{0.60} K^{0.50}$

$$Q* = 5\left[(hL)^{0.6}(hK)^{0.5}\right]$$
$$= h^{0.10} 5 L^{0.60} K^{0.50}$$

Since v(1.10)>1, thus increasing returns to scale

6.16 SUGGESTED READINGS

Haynes, Mote & Paul. *Managerial Economics*, *Analysis and Cases*.

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

R.L. Varshney, K.L. Maheshwari, *Managerial Economics*, Sultan Chand & Sons Delhi.

LESSON

7

THEORY OF COST

CONTENTS

7.0 AIMS AND OBJECTIVES

This lesson is intended to discuss the meaning, nature and types of cost associated with the production. After studying this lesson you will be able to:

(i)   describe various concepts of costs.

(ii)   differentiate between fixed and variable costs and short-run and long-run costs.

(iii) explain economies and diseconomies of scale and scope.

(iv)   describe application of cost analysis in managerial decision making.

7.1 INTRODUCTION

In Managerial Economics, demand estimation and forecasting demand in the future form a very essential part of decision-making. But there is another area which is of great importance to Managerial Economics viz. the cost of production. The cost which a firm incurs in the process of production of its goods and services is an important variable for decision-making. Total cost together with total revenue determine the profit level of a business concern. In order to maximise profits a firm endeavours to increase its revenue and lower its costs. To this end, managers try to produce optimum levels of output, use the least-cost combination factors of production, increase factor-productivities and improve organizational efficiency.

7.2 NEED AND SIGNIFICANCE OF COST IN MANAGERIAL DECISION-MAKING

The solution of various economic problems needs cost figures different from what are available in the balance sheets, income-statements, etc. of the firm. The accounting cost figures serve the legal, financial and tax needs of the firm but are not directly very helpful for managerial decisions. For, the management needs costs in terms of their source, period, rate of change with respect to output, the degree of their controllability etc.

It must be pointed out that all types of costs do not matter much rather future costs matter most in managerial decision-making.

The other costs are relevant only if the management is to continue with its past or present policies in future too, and if the environment in which the firm operates remains unchanged. Further, only those costs which are affected by the decision of the management need be analyzed; while expenses that remain unchanged should be ignored in the decision-making process.

Cost of production provides the floor to pricing. It provides a basis for managerial decision with respect to the price the firm must quote to its prospective customers; in deciding whether to accept a particular order or not; whether to abandon an old or establish a new product line; whether or not to increase the volume of specific outputs; to use idle capacity or rent facilities to outsiders; and whether to make a particular product or buy it. There are no straight and simple rules for such decisions and it is necessary to study production and cost analysis thoroughly to arrive at these decisions. The costs which firms incur are payments to various factors of production and hence they indicate incomes of these factors also. An understanding of cost thus helps to understand the distribution of factor incomes as well.

We know that a particular cost behaviour is the result of many factors, some controllable while others non-controllable, by the firm. Just like production-function, we can also write a cost function. Cost function can be taken for the enterprise as a whole or for each of its departments, depending upon the requirement of the management using the cost function. Since determinants of cost vary from situation to situation and enterprise to enterprise, it is not possible to state any general set of determinants of costs. Each management must, therefore, have to identify for itself the various determinants relevant to that particular situation. However a few determinants, which seem important in modern business, are plant size, utilization of the plant, technology, prices of the various inputs, size of lot, stability of production level, management and labour-efficiency.

Making of effective and right decisions depends much on the proper calculation of costs. If different types of costs are not properly understood, the managerial decisions are bound to be wrong and misleading.

7.3 COST CONCEPTS

Costs play a very important role in managerial decisions involving a selection between alternative courses of action. It helps in specifying various alternatives in terms of their quantitative values. The kind of cost to be used in a particular situation depends upon the business decisions to be made. Costs enter into almost every business decision and it is important to use the right analysis of cost. Hence it is important to understand what these various concepts of costs are, how these can be defined and operationalized. This requires the understanding of the two things, namely, (i) that cost estimates produced by conventional financial accounting are not appropriate for all managerial uses, and (ii) that different business problems call for different kinds of costs.

7.3.1 Future and Past Costs

Futurity is an important aspect of all business decisions. Future costs, on the other hand, are the estimates of time adjusted past or present costs. Future costs are reasonably expected to be incurred in some future period or periods. Their actual incurrence is a forecast and their management is an estimate. They are the only costs that matter for managerial decisions because they are only subject to management control. The major managerial uses where future costs are relevant are: cost control, projection of future profit and loss statements, appraisal of capital expenditure, introduction of new products, expansion programmes and pricing.

Past costs are actual costs incurred in the past and they are always contained in the income statements. Their measurement is essentially a record keeping activity. These costs can only be observed and evaluated in retrospect. Past costs are, therefore, those unadjusted historical cost data which has been recorded in the books.

7.3.2 Incremental and Sunk Costs

Incremental costs are defined as the change in overall costs that result from particular decision being made. Incremental costs may include both fixed and variable costs. In the short period, incremental cost will consist of variable cost—costs of additional labour, additional raw materials, power, fuel etc., which is the result of a new decision being taken by the firm. Since these costs can be avoided by not bringing about any change in the activity, the incremental costs are also called avoidable costs or escapable costs. Moreover, since incremental costs may also be regarded as the difference in total costs resulting from a contemplated change, they are also called differential costs.

Sunk cost is one which is not affected or altered by a change in the level or nature of business activity. It will remain the same whatever the level of activity. The most important example of sunk cost is the amortization of past expenses, e.g. depreciation. Sunk costs are irrelevant for decision-making as they do not vary with the changes contemplated for future by the management.

7.3.3 Out-of-Pocket and Book Costs

Out-of-pocket costs are those that involve immediate payments to outsiders as opposed to book costs that do not require current cash expenditure. For example, wages and salaries paid to the employees are out-of-pocket costs while salary of the owner manager, if not paid, is a book cost. The interest cost of owner's own fund and depreciation cost are other examples of book cost. Book costs can be converted into out-of-pocket costs by selling assets and leasing them back from the buyer. Thus the difference between these two categories of cost is in terms of whether the company owns it or not. If a factor of production is owned, its cost is a book cost while if it is hired it is an out-of-pocket cost.

7.3.4 Replacement and Historical Costs

Historical cost of an asset states the cost of plant, equipment and materials at the price paid originally for them, while the replacement cost states the cost that the firm would have to incur if it wants to replace or acquire the same asset now. For example, if the price of bronze at the time of purchase, say, in 1974 was Rs. 15 a kg and if the present price is Rs. 18 a kg, the original cost of Rs. 15 is the historical cost while Rs. 18 is the replacement cost. Replacement cost means the price that would have to be paid currently for acquiring the same plant.

7.3.5 Explicit Costs and Implicit or Imputed Costs

(Accounting concept of Cost and Economic concept of cost)

Explicit costs are those expenses which are actually paid by the firm (paid-out-costs). These costs appear in the accounting records of the firm. On the other hand, implicit costs are theoretical costs in the sense that they go unrecognized by the accounting system. These costs may be defined as the earnings of those employed resources which belong to the owner himself. The examples of such costs are opportunity cost of the owner's services, say, as the manager of the firm, opportunity cost of land belonging to the owner of the firm, and normal return equal to the market rate of interest on the owner's own capital invested in the business. These implicit costs are not included by the accountant of the firm in its accounting statements. However, these costs are considered relevant by economists while calculating the economic profits of the firm.

7.3.6 Actual Costs and Opportunity Costs

Actual costs mean the actual expenditure incurred for acquiring or producing a good or service. These costs are the costs that are generally recorded in books of account, for example, actual wages paid, cost of materials purchased, interest paid etc. These costs are also commonly called Absolute Costs or Outlay Costs.

The concept of opportunity cost occupies a very important place in modern economic analysis. The opportunity costs or alternative costs are the return from the second best use of the firm's resources which the firm forgoes in order to avail itself of the return from the best use of the resources. To take an example, a farmer who is producing wheat can also produce potatoes with the same factors. Therefore, the opportunity cost of a quintal of wheat is the amount of the output of potatoes given up. Thus we find that the opportunity cost of anything is the next best alternative that could be produced instead by the same factors or by an equivalent group of factors, costing the same amount of money. Two points must be noted in this definition. Firstly, the opportunity cost of anything is only the next best alternative foregone. Secondly, in the above definition is the addition of the qualification "or by an equivalent group of factors costing the same amount of money".

The alternative or opportunity cost of a good can be given a money value. In order to produce a good the producer has to employ various factors of production and have to pay them sufficient prices to get their services. These factors have alternative uses. The factor must be paid at least the price they are able to obtain in the alternative uses.

Suppose a businessman can buy either a washing machine or a press machine with his limited resources and suppose that he can earn annually Rs. 40,000 and Rs. 60,000 respectively from the two alternatives. A rational businessman will certainly buy a press machine which gives him a higher return. But, in the process of earning Rs. 60,000, he has foregone the opportunity to earn Rs. 40,000 annually from the washing machine. Thus, Rs. 40,000 is his opportunity cost or alternative cost. The difference between actual and opportunity costs is called economic rent or economic profit. For example, economic profit from press machine in the above case is Rs. 60,000—Rs. 40,000 = Rs. 20,000. So long as economic profit is above zero, it is rational to invest resources in press machine.

7.3.7 Direct (Separable or Traceable) Costs and Indirect (or Common Non-traceable) Costs

There are some costs which can be directly attributed to the production of a unit of a given product. Such costs are direct costs and can easily be separated, ascertained and imputed to a unit of output. This is because these costs vary with the output units. However, there are other costs which cannot be separated and clearly attributed to individual units of production. These costs are therefore, classified as indirect costs in the accounting process. For example, electricity charges may not be separable department-wise in a single product firm or even product-wise in a multiple product firm. The cost of raw material may be traceable product-wise even in a multiple product firm. In a university, the salary of a Vice-chancellor is not traceable department-wise while that of a professor may be traceable department-wise.

Since all the direct costs are linked to a particular product/process/department, they vary with changes in them. In other words, all direct costs are variable. On the other hand, indirect costs may or may not be variable. Common costs may or may not change as a result of the proposed changes in production level, production process or marketing process. So, indirect costs are both variable and fixed types.

7.3.8 Shutdown and Abandonment Costs

Shutdown costs are required to be incurred when the production operations are suspended and will not be necessary, if the production operations continue. For example, if the production is suspended, the plant, machinery or equipment will have to be protected by putting up sheds, using tarpauline, plastic sheets etc. Such costs are called shutdown costs.

When any plant is to be permanently closed down, some costs are to be incurred for disposing of the fixed assets. These costs are called abandonment costs.

7.3.9 Private and Social Costs

Economic costs can be calculated at two levels: micro-level and macro-level. The micro-level economic costs relate to functioning of a firm as a production unit, while the macro-level economic costs are the ones that are generated by the decisions of the firm but are paid by the society and not the firm. For example, if the decision of a firm to expand its output leads to increase in its costs, this cost will be of the former type, known as private costs. Whereas, if it also leads to certain costs to the society, maybe in the nature of greater pollution, greater congestion etc., these costs which are external to the firm are social costs from society's point of view. Thus private costs are those which are

actually incurred or provided for by an individual or a firm for its business activity. Social cost, on the other hand, is the total cost to the society on account of production of a good. Thus, the economic costs include both private and social costs.

7.3.10 Fixed and Variable Costs

There are some inputs or factors which can be adjusted with the changes in the output level. Thus a firm can readily employ more workers if it has to increase output. Likewise it can secure and use more raw materials, more chemicals, without much delay, if it has to expand production. Thus, labour, raw materials, chemicals are the factors which can be readily varied with the change in output. Such factors are called variable factors. On the other hand, there are factors such as capital equipment, building, top management personnel which cannot be readily varied. It requires a comparatively long time to make variations in them. It takes time to expand a factory building or to build a new factory building with larger area or capacity. Similarly, it also takes time to order and install new machinery. The factors such as capital, equipment, building, which cannot be readily varied and require comparatively a long time to make adjustment in them are called fixed factors. Therefore, fixed costs are those which are independent of output, i.e., they do not change with changes in output. These costs are a "fixed" amount which must be incurred by a firm in the short-run, whether the output is small or large. Fixed costs are also known as overhead costs and include charges such as contractual rent, insurance fee, maintenance costs, property taxes, interest on the capital invested, minimum administrative expenses such as manager's salary, watchman's wages, etc. Thus, fixed costs are those which are incurred in hiring the fixed factors of production whose amount cannot be altered in the short-run.

Variable costs, on the other hand, are those costs which are incurred on the employment of variable factors of production whose amount can be altered in the short-run. Thus the total variable costs change with changes in output in the short-run. These costs include payments such as wages of labour employed, the price of the raw material, fuel and power used, the expenses incurred on transporting and the like. Variable costs are also called prime costs. Total costs of a business of the sum of its total variable costs and total fixed costs. Thus,

$$TC = TFC + TVC$$

In the following Fig., output is measured on X-axis and cost on Y-axis. Since the total fixed cost remains constant whatever the level of output, the total fixed cost curve (TFC) is parallel to the X-axis. This curve starts from a point on the Y-axis meaning thereby that the total fixed cost will be incurred even if the output is zero. On the other hand, the total variable cost curve (TVC) raises upward showing thereby that as the output is increased, the total variable cost also increases. The total variable cost (TVC) starts from the origin which shows that when output is zero the variable costs are also nil. It should be noted that total cost is function of the total output, the
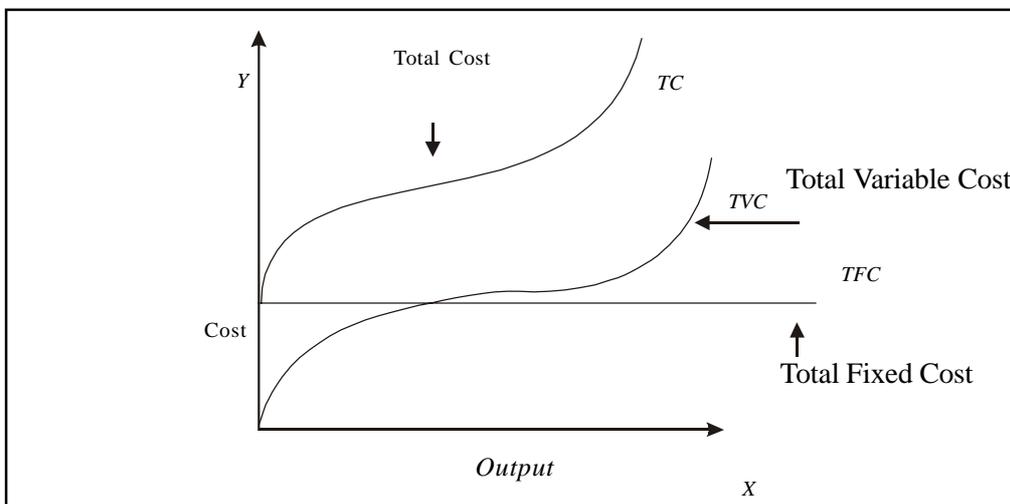

Figure 7.1: Short-run Total Cost Curve

greater the output, the greater will be the total cost. In symbols, we can write

$$TC = f(q)$$

Total cost curve *(TC)* has been obtained by adding up vertically total fixed cost curve and total variable cost curve because the total cost is sum of total fixed cost and total variable cost. The shape of the total cost curve *(TC)* is exactly the same as that of total variable cost curve *(TVC)* because the same vertical distance always separates the two curves.

7.3.11 Short-run and Long-run Costs

The short-run is a period of time in which the output can be increased or decreased by changing only the amount of variable factors such as labour, raw materials, chemicals etc. In the short-run the firm cannot build a new plant or abandon an old one. If the firm wants to increase output in the short-run, it can only do so by using more labour and more raw materials. It cannot increase output in the short-run by expanding the capacity of its existing plant or building a new plant with larger capacity. Long-run, on the other hand, is defined as the period of time in which the quantities of all factors may be varied. All factors being variable in the long-run, the fixed and variable factors dichotomy holds good only in the short-run. In other words, it is that time-span in which all adjustments and changes are possible to realize.

Short-run are the costs that can vary with the degree of utilization of plant and other fixed factors. In other words, these costs relate to the variation in output, given plant capacity. Short-run costs are therefore, of two types: fixed costs and variable costs. In the short-run, fixed costs remain unchanged while variable costs fluctuate with output. Long-run costs in contrast are costs that can vary with the size of plant and with other facilities normally regarded as fixed in the short-run. In fact, in the long-run there are no fixed inputs and therefore, no fixed costs i.e., all costs are variable.

7.3.12 Total Cost, Average Cost and Marginal Cost

Total cost includes all cash payments made to hired factors of production and all cash charges imputed for the use of the owner's factors of production in acquiring or producing a good or service. Thus total cost of a firm is the sum total of the explicit plus implicit expenditures incurred for producing a given level of output. For example, a shoe maker's cost will include the amount he spends on leather, thread, rent for his workshop, wages, interest on borrowed capital and salaries of employees etc. and the amount he charges for his services and his own funds invested in the business.

Average cost is the cost per unit of output. That is, it is obtained by dividing the total cost by the total quantity produced. If, $TC = 100$ and $X = 1$, $AC = 10$.

Marginal cost is the extra cost of producing one additional unit. At a given level of output, one examines the additional costs being incurred in producing one extra unit and this yields the marginal cost. For example, if the total cost of a firm is Rs. 5,000 when it produces 10 units of a good but when 11 units of the good are produced, it increases to Rs. 5,300 then the marginal cost of the eleventh unit is Rs. 5,300-5,000 = Rs. 300. In other words marginal cost of nth units (MC_n) is the difference between total cost of nth unit (TC_n) and total cost of n-1th unit (TC_{n-1}),

$$MC_n = TC_n - TC_{n-1}$$

The relationship between *MC, AC* and *TC* is shown in the following table:

Table 7.1

Units of Goods Produced	Total Cost (TC)	Average Cost AC = Total Cost/ No. of Units Produced	Marginal Cost $(TC_n - TC_{n-1})$
1	2	Col 2 /Col. 1 =Col.3	4
10	5,000	500	—
11	5,300	481.82	300

Contd...

12	5,550	462.5	250
13	5,700	438.46	150
14	5,950	425.00	250
15	6,350	423.33	400

The total cost concept is useful in break-even analysis and in finding out whether a firm is making profits or not. The average cost concept is significant for calculating the per unit profit of a business concern. The marginal and incremental cost concepts are needed in deciding whether a firm needs to expand its production or not. In fact, the relevant costs to be considered will differ from one situation to the other depending on the problem faced by the manager.

Managerial Economics devotes a great deal of attention to the behaviour of costs. Total cost varies directly with output. The more output a firm produces, the higher will be its production cost and *vice-versa*. This is because increased production requires increased use of raw materials, labour, etc., and if the increase is substantial even fixed inputs like plant and equipments and managerial staff may have to be increased. The relationship between cost and output is rather important.

Check Your Progress 1

1. Identify the type of costs in each case.

   a) Payment for office stationary

   b) Interest cost of owner's capital

   c) Machinery bought for Rs 2 lakh in1980 while its current market price is Rs 15 lakh

   d) Salaries of administrative personnel

   e) Salary of the owner of the company

7.4 COST-OUTPUT RELATIONSHIP

Production theory shows how to determine the least cost method of producing a given output with a specific set of input prices. The production process is a system of transforming inputs into outputs. Production cost is the evolution of this transformation. Obviously, a firm would need to have knowledge of its production cost for various levels of output (cost-output functions) for managerial planning. "A cost output function is a relationship between the value of production-inputs that are used by the firm in each period and the corresponding rates of output attained." Cost functions are derived functions. They are derived from the production function, which describes the available efficient methods of production at any one time.

Of all the relationships between cost and its individual determinants the cost-output relationship is the most important one. Its significance is so great that in economic analysis the cost function usually refers to the relationship between cost and rate of output alone, and thus assumes that all of the other independent variables are kept constant. Economist's emphasis on this relationship is reasonable because it is subject to faster and more frequent changes. It should be understood that cost-output relationship is however, a partial relationship.

Economic theory distinguishes between the short-run and the long-run and has tried to analyze the relationship between cost and output in these two periods. The short-run is a period which does not permit alternations in the fixed equipment (machinery, buildings, etc.) and in the size of the organization. As such, if any increase in output is desired, it is possible within the range permitted by the existing fixed factors of production. The long-run is a period in which there is sufficient time to alter the equipment and the size of

organization. As such, in the long-run output can be increased without any limits being placed by the fixed factors of production, as they themselves are capable of being changed. The long-run is the period over which all factors become variable.

7.5 COSTS IN THE SHORT-RUN

The short-run cost-output relationship refers to a particular scale of operation or to a fixed plant. That is, it indicates variations in cost over output for the plant of a given capacity and their relationship will vary with plants of varying capacity.

For decision-making, one needs to know not only the relationship between total cost and output but also separately between various types of costs and output. Thus, the short-run cost-output relationship needs to be discussed in terms of:

Total cost and output;

Average costs and output; and

Marginal cost and output.

7.5.1 Short-Run Total Cost and Output

Once the firm has invested resources into the factors such as capital equipment, building, top management personnel and other fixed assets, their amounts cannot be so easily changed. Thus, in the short-run there are certain resources whose amount cannot be changed when the desired rate of output changes (called fixed factors), while there are other resources whose quantity used can be changed almost instantaneously with output change (called variable factors). Since certain factors do not change with the change in output, the cost to the firm of these resources is also fixed. Hence fixed cost does not vary with output. Thus, the larger the quantity produced, the lower will be the fixed cost per unit and marginal fixed cost will always be zero. On the other hand, those factors whose quantity can be changed in the short-run their cost is known as variable cost. Thus, the total cost of a business is the sum of its total variable costs *(TVC)* and total fixed cost *(TFC)*. This is,

$$TC = TFC + TVC$$

The total fixed costs include:

(a) Salaries of administrative staff.

(b) Depreciation (wear and tear) of machinery.

(c) Expenses for building depreciation and repairs.

(d) Expenses for land maintenance and depreciation (if any).

Another element that may be treated as fixed costs is the normal profit, which is a lumpsum including a percentage return on fixed capital and allowance for risk.

The total variable costs include:

(a) The raw materials.

(b) The cost of direct labour.

(c) The running expenses of fixed capital, such as full, ordinary repairs and routine maintenance.

The total fixed cost is graphically denoted by a straight line parallel to the output axis. It will be seen in the Fig. 7.2 that total fixed cost curve *(TFC)* starts from a point on the *Y*-axis meaning thereby that the total fixed cost will be incurred even if the output is zero.
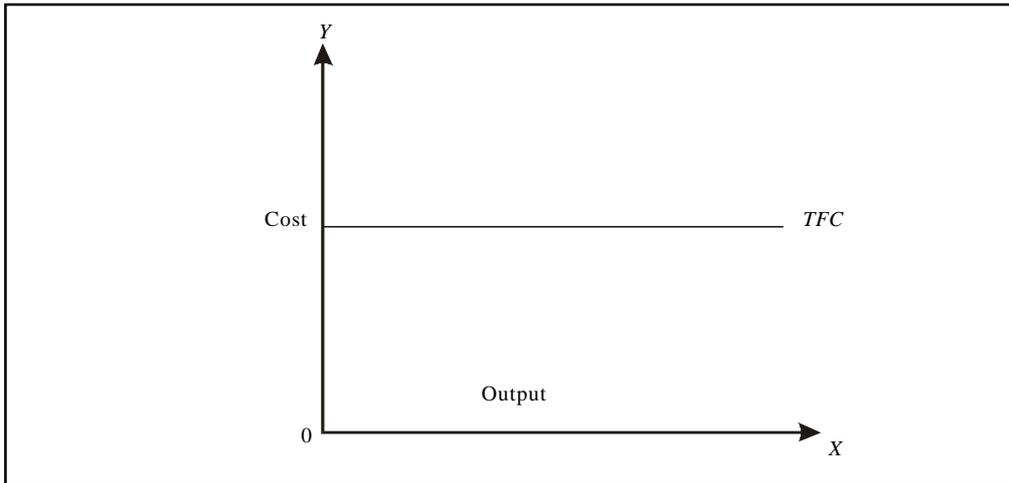
Figure 7.2

The total variable cost in the traditional theory of the firm has broadly an inverse S shape which reflects the law of variable proportions. According to this law, at the initial stages of production with a given plant as more of the variable factor(s) is employed its productivity increases and the average variable cost falls.
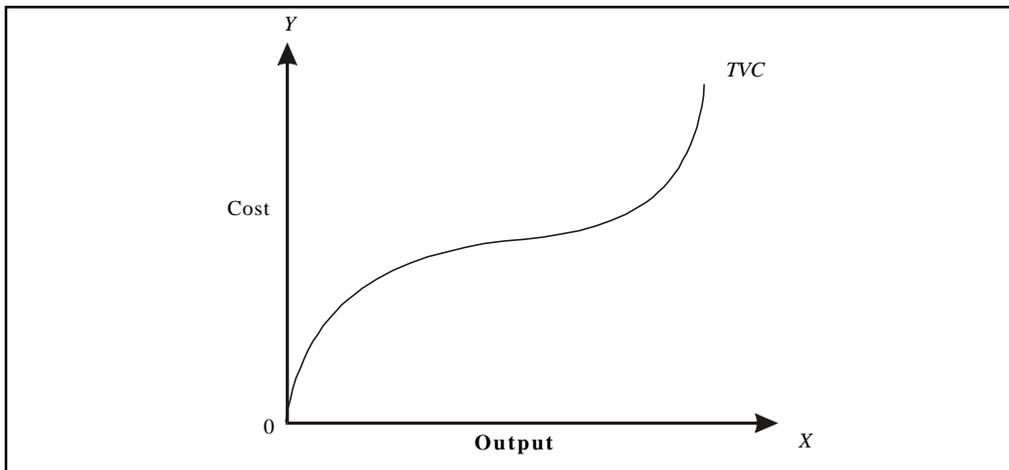
Figure 7.3

As per economic theory, the nature of total variable cost is such that in the beginning as output increases, total variable cost increases at a decreasing rate, then at a constant rate and eventually at an increasing rate. Thus the increase in total variable cost goes on diminishing up to a certain level of output, then remains constant for some range of output, and then it starts rising. This is so because the need for the variable factor inputs for increased output behaves in a similar fashion and there is the operation of the law of diminishing return. It may be recalled that according to this law as more and more units of a variable factor of production are used along with a fixed factor of production the marginal product of that variable factor first increases, then remains constant and finally starts diminishing. Thus, given the factor prices, the increment in total variable cost first falls as output increases, then remains constant and eventually increases as output increases. It should be noted that though the general behaviour of the variable cost function is of the nature described above, its exact behaviour may vary from product to product and will have to be verified empirically.

In the following Fig. the shape of the total variable cost curve *(TVC)* is principle determined by the productivity of the variable input. Up to Q_1 level of output, *TVC* increases at a decreasing rate. After Q_1, *TVC* increases at an increasing rate. This increase in rate is due to fixity of supply of the other inputs. Below Q_1 output level, the variable inputs cannot fully utilize the capacity inherent in fixed input. So, output can be increased

proportionately more than the increases in variable inputs. Beyond Q_1 output level, the diminishing returns to the fixed inputs set in. As a result the increase in variable inputs can add proportionately less to output.

As stated above that total fixed costs remain unchanged with output, the *TFC* curve remains horizontal line at all levels.

TC curve has been obtained by adding up vertically total fixed cost curve and total variable cost curve because the total cost is the lateral summation of the *TFC* and *TVC* curves as seen in the diagram. It will be seen that the vertical distance between the *TVC* curve and *TC* curve is constant throughout. This is because the vertical distance between the *TVC* and *TC* curve represents the amount of total fixed cost which remains unchanged as output is increased in the short-run.
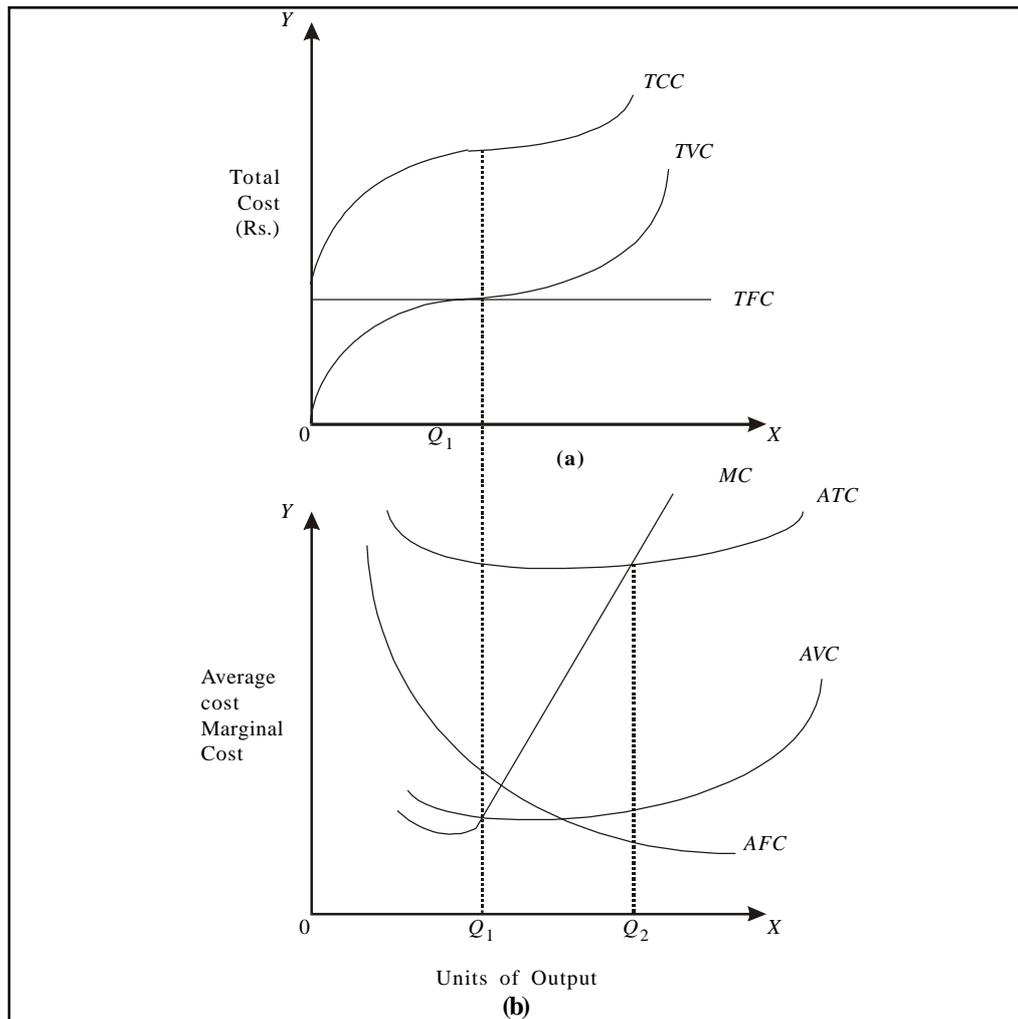
Figure 7.4

7.5.2 Short-Run Average Costs and Output

We have explained above the short-run total cost curves. However, the cost concept is more frequently used both by businessmen and economists in the form of cost per unit or average cost rather than as totals. We, therefore, pass on to the study of short-run average cost curves.

(i) *Average Fixed Cost (AFC):* Average fixed cost is the total fixed cost divided by the number of units of output produced. Therefore,

$$AFC = \frac{TFC}{Q}$$

where Q represents the number of units of output produced.

Thus, average fixed cost is the fixed cost per unit of output. Since total fixed cost is a constant quantity, average fixed cost will steadily fall as output increases. Therefore, average fixed cost curve slopes downward throughout its length. As output increases, the total fixed cost spreads over more and more units and therefore average fixed cost becomes less and less. When output becomes very large, average fixed cost approaches zero. Average fixed cost curve, which is a rectangular hyperbola, showing at all its points, the same magnitude, is shown in the Fig. 7.4 (b).

(ii) *Average Variable Cost (AVC):* Average variable cost is the total variable cost divided by the number of units of output produced. Therefore,

$$AVC = \frac{TVC}{Q}$$

Thus average variable cost is variable cost per unit of output.

We know that the total variable cost *(TVC)* at any output level consists of the payments to the variable factors used to produce that output. Therefore *TVC* $= P_1V_1 + P_2 V_2 + ...P_nV_n$ where *P* is the unit price and *V* is the amount of the variable input. Average variable cost for a level of output (*Q*), given *P* is

$$AVC = \frac{TVC}{Q} = \frac{PV}{Q} = \left[\frac{V}{Q} \right]$$

The term *V* is the number of units of input divided by the number of units of output. Since the Average Product *(AP)* of an input is the total output divided by the number of units of input (*V*). So we can write,

$$\frac{V}{Q} = \frac{1}{Q/V} = \frac{1}{AP}$$

$$AVC = P \left[\frac{V}{Q} \right] = P \left[\frac{1}{AP} \right]$$

That is, average variable cost is the price of the input multiplied by the reciprocal of the average product of the input. We know that due to first increasing and then decreasing marginal returns to the variable input, average product initially rises, reaches a maximum and then declines. Since average variable cost is 1/ *AP*, the average variable cost normally falls, reaches a minimum and then rises. It first declines and then rises for reasons similar to those operating in case of *TVC*. This is shown in the Fig. 7.4 (b).

(iii) *Average Total Cost (ATC):* The average total cost or what is called simply average cost is the total cost divided by the number of units output produced. Therefore,

$$ATC = \frac{TC}{Q}$$

Since the total cost is the sum of total variable cost and total fixed cost, the average total cost is also the sum of average variable cost and average fixed cost.

This can be proved as follows:

$$ATC = \frac{TC}{Q}$$

Since *TC = TVC + TFC*

Therefore, $ATC = \frac{TVC + TFC}{Q}$

$$= \frac{TVC}{Q} + \frac{TFC}{Q}$$

$$= AVC + AFC$$

Average total cost is also known as unit cost, since it is cost per unit of output produced.

The behaviour of the average total cost curve will depend on the behaviour of the average variable cost curve and average fixed cost curve. In the beginning both *AVC* and *AFC* curves fall. The *ATC* curve therefore falls sharply in the beginning. When *AVC* curve begins rising, but *AFC* curve is falling steadily, the *ATC* curve continues to fall. But as output increases, there is a sharp rise in *AVC* which more than offsets the fall in *AFC*. Therefore, the *ATC* curve rises after a point. This is shown in the Figure 4.4 (b).

7.5.3 Marginal Cost (MC)

Marginal cost is the addition to the total cost caused by producing one more unit of output. In other words, marginal cost is the addition to the total cost of producing n units instead of $n-1$ units. In symbols, since, marginal cost is

$$MC_n = TC_n - TC_{n-1}$$

rate of change in total cost with respect to a unit change in output i.e.,

$$MC = \frac{d(TC)}{dQ}$$

where d in the numerator and denominator indicates the change in *TC* and *Q* respectively.

It is worth pointing out that marginal cost is independent of the fixed cost. Since fixed costs do not change with output, there are no marginal fixed costs when output increases in the short-run. It is only the variable costs that vary with output in the short-run. Therefore, marginal costs are in fact due to the changes in variable costs.

$$MC = \frac{d(TVC)}{dQ}$$

The independence of the marginal cost from the fixed cost can be proved algebraically as follows:

$$
\begin{aligned}
MC_n &= TC_n - TC_{n-1} \\
&= (TVC_n + TFC) - (TVC_{n-1} + TFC) \\
&= TVC_n + TFC - TVC_{n-1} - TFC \\
&= TVC_n - TVC_{n-1}
\end{aligned}
$$

Hence, marginal cost is the addition to the total variable costs when output is increased from $n-1$ units to n units of output. It follows therefore that the marginal cost is independent of the amount of the fixed costs.

In the given Figure, *MC* is the slope of the *TC* curve. As *TC* curve first rises at a decreasing rate and later on at an increasing rate, *MC* curve will also, therefore, first decline and then rise.

The properties of the average cost (*AVC, AFC, ATC*) and marginal cost can briefly be described as follows:

1. *AFC* declines continuously, approaching both axes asymptotically.

2. *AVC* first declines, reaches a minimum and rises thereafter when *AVC* attains its minimum, *MC* equals *AVC*.

3. As *AFC* approaches asymptotically the horizontal axis, *AVC* approaches *ATC* asymptotically.

4. *ATC* first declines, reaches a minimum and rises thereafter. When *ATC* attains its minimum, *MC* equals *ATC*.

5. *MC* first declines, reaches a minimum and rises thereafter. *MC* equals *AVC* and *ATC* when these curves attain their minimum values. Furthermore, *MC* lies below both *AVC* and *ATC* over the ranges in which *AVC* and *ATC* decline; it lies above them when they are rising.

Check Your Progress 2

Explain why in the short run, cost curves are U-shaped?

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7.6 COSTS IN THE LONG-RUN

The long-run is a period of time during which the firm can vary all its inputs. None of the factors is fixed and all can be varied to expand output. Long-run is a period of time sufficiently long to permit the changes in plant, that is, in capital equipment, machinery, land etc. in order to expand or contract output. The long-run cost of production is the least possible cost of production of producing any given level of output when all inputs are variable including the size of the plant. In the long-run there is no fixed factor of production and hence there is no fixed cost.

$$\text{If } Q = f(L, K)$$

$$TC = L.P_L + K.P_K$$

Given factor prices and a specific production function one can draw an expansion path which gives the least costs associated with various levels of output which in fact yields the long-run total cost schedule/curve. *LTC* is an increasing function of output. The rates of change in these two variables are not known unless the qualitative relationship is quantified. If one recalls the concepts of returns to scale and assumes fixed factor prices, one could see three things:

(1) When returns to scale are increasing, inputs are increasing less than in proportion to increases in output. It follows that total cost also must be increasing less than in proportion to output. This relationship is shown in the Fig. 7.5 (a).

(2) When returns to scale are decreasing, total cost increases at a faster rate than does output. This relationship is shown in the Fig. 7.5 (b).

(3) When returns to scale are constant, total cost and output move in the same direction and same proportion. This is also shown in the Fig. 7.5 (c).

Thus, depending upon nature of returns to scale, there will be a relationship between *LTC* and output, given factor prices. It is generally found that most industries and firms reap increasing returns to scale to start with which are followed up by constant returns to scale which give place to decreasing returns to scale eventually. In this case, the

long-run total cost function first would increase at a decreasing rate and then increase at an increasing rate as shown in Fig. 7.5. Such a total cost function would be associated with a U-shaped long-run average cost function.
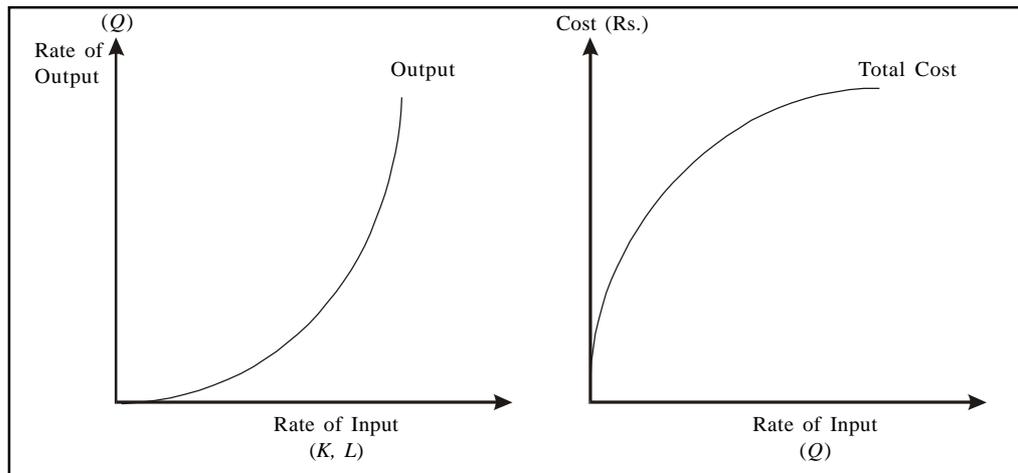
Figure 7.5 (a): Increasing Returns to Scale
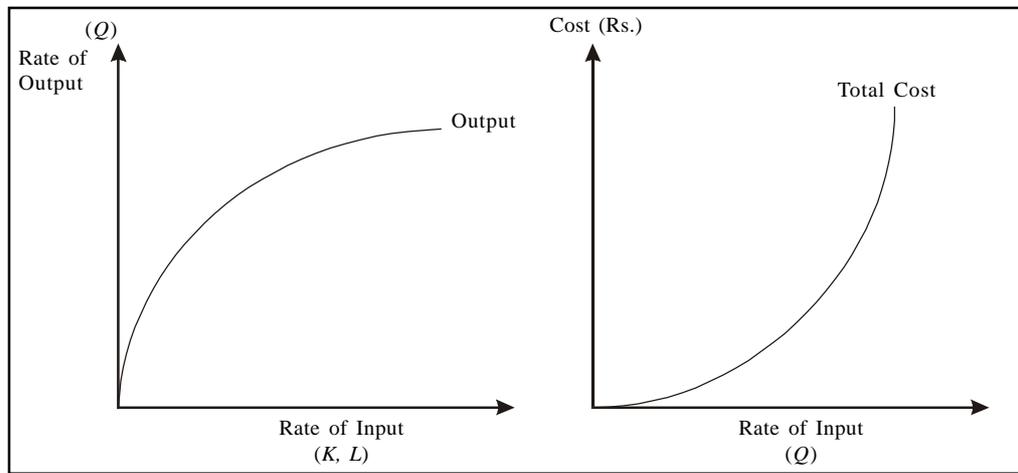
Figure 7.5 (b): Decreasing to Scale
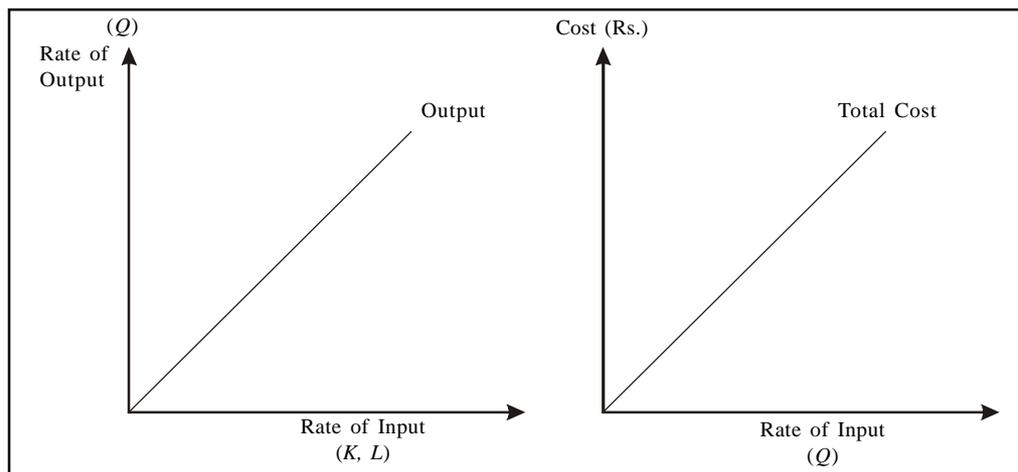
Figure 7.5 (c): Constant Returns to Scale
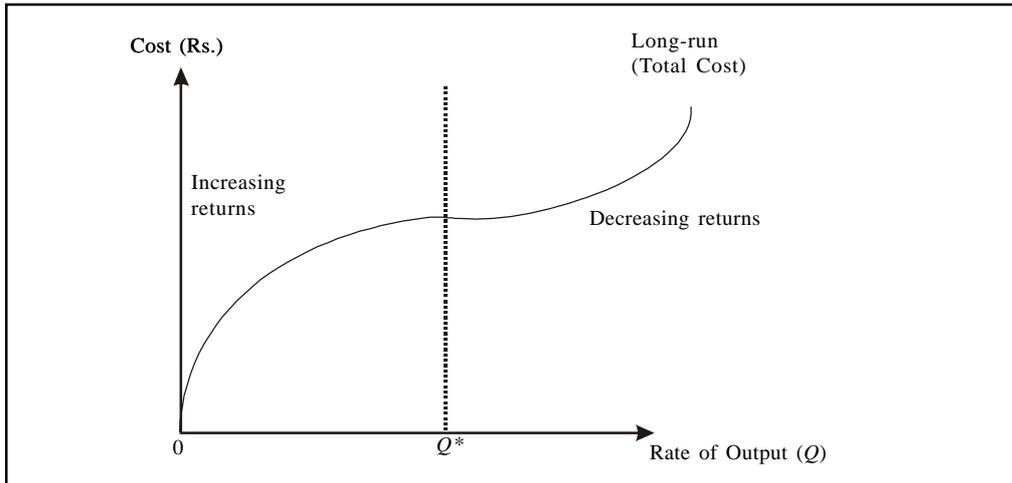
Figure 7.6

From the *LTC* curve we can derive the firm's long-run average cost *(LAC)* curve. *LAC* is the long-run total cost *(LTC)* divided by the level of the output (*Q*). This is,

$$LAC = \frac{LTC}{Q}$$

Similarly, from the *LTC* curve we can also derive the long-run marginal cost *(LMC)* curve. This measures the change in *LTC* per unit change in output and is given by the slope of the *LTC* curve. This is,

$$LMC = \frac{DTC}{DQ}$$

The relationships among the long-run total cost, long-run average cost and long-run marginal cost with respect to output are explained in the following table and the Fig. 4.7.

LAC	LMC		
0	0	—	—
5	25	5.00	5
10	45	4.50	4
15	60	4.00	3
20	85	4.25	5
25	120	4.85	7
30	180	6.00	12

The graphs of above relationships are provided in the Fig. 7.7.

The *LTC* curve gives the least total cost for various levels of output when all the factors of production are variable. Its shape is such that the curve is first concave and then convex as looked from the output axis. As seen above its shape follows from the operations of the varying degrees of returns of scale, given the factor prices.

The relationship between *LAC* and *LMC* follow from that of *LTC* curve. Both *LAC* and *LMC* are U-shaped. Further the following relationships hold good:

(a) At the point of inflection on *LTC* curve *(A),* *LMC* takes the minimum value.

(b) At the point of Kink of *LTC* curve *(B)*—where the slope of the straight line from origin to the *LTC* curve is the minimum—*LAC* assumes the minimum value.

(c) *LAC* is the least when *LMC=LAC.*

(d) *LAC* curve is falling when *LMC < LAC.*

(e) *LAC* curve is rising when *LMC > LAC.*
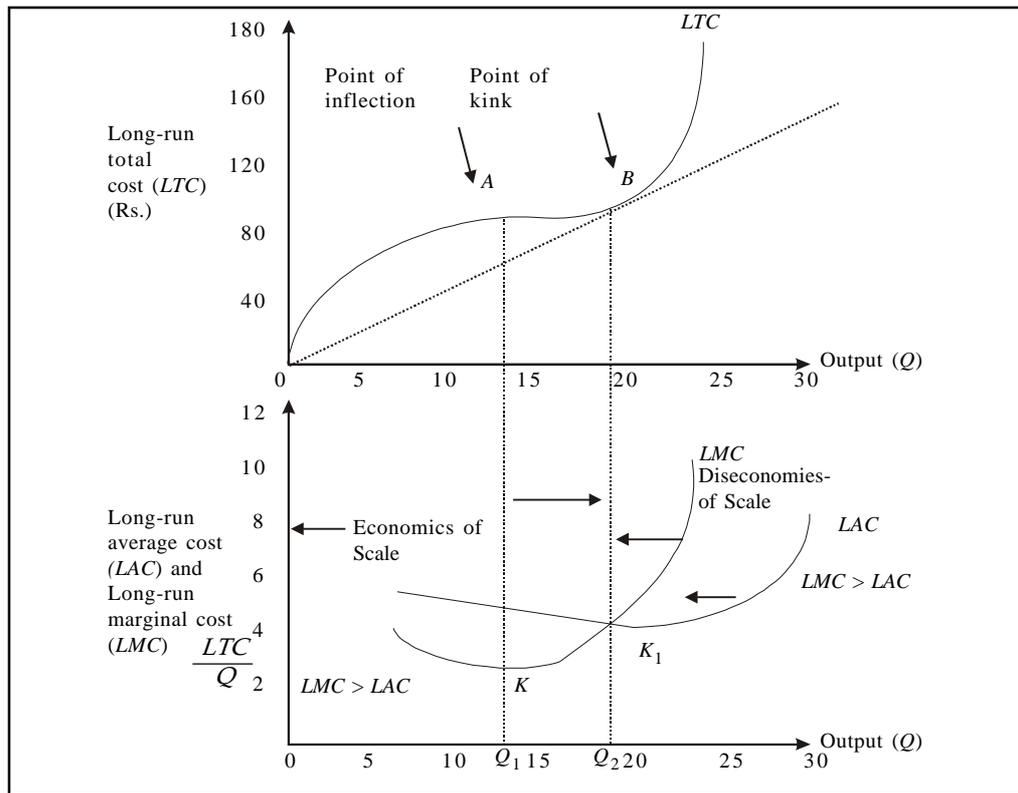
Figure 7.7

7.6.1 The Long-run Average Cost Curve is Derived from Short-run Cost Curves

Each point on the long-run average cost curve corresponds to a point on a short-run cost curve, which is tangent to the long-run curve at that point. Let us suppose that there are three plants which operate with the average costs SAC_1, SAC_2 and SAC_3 respectively as shown in the Fig. 7.8. If the firm plans to produce X_1 output, it will choose the smallest of these plants. It will choose the medium size plant if it plans to produce X_2, and will choose the largest size plant if it prefers to produce X_3 output. Now if the firm starts with a small plant and faces a gradually increasing demand, it will increase its output. Given small size plant, the firm's lowest cost output level is X_1^1, beyond which average cost starts rising. But it will continue producing with small plant even beyond X_1^1, as average cost for these levels of output on the small plant is still lower than that on the medium plant. It is only when the demand for its product reaches the level X_1^{11}, the firm has a choice to either continue producing with a small plant or install the medium size plant. If the firm expects demand to increase beyond X_1^{11} in future it will install the medium size plant because this plant will produce outputs larger than X_1^{11} at lower average cost than that of the small plant. The firm will face the similar decision problem when it reaches the level X_2^{11}. If it expects the demand to stay constant at level X_2^{11}, the firm will not install the large plant because it involves a larger investment which is profitable only if demand expands beyond X_2^{11}.

Now consider the Fig. 7.8 and assume that there are many plant sizes each suitable for a certain level of output we will get as many *SAC* curves, intersecting each other. The intersection points will be so close to each other that we get almost a continuous curve. It is known as the "long-run average cost curve" or the "Envelope Curve". The *LAC* curve is a U-shaped curve—which reflects the laws of returns to scale. The economies

of scale exist only up to a certain size of plant, known as the "Optimum size plant" where all possible economies of scale are fully exploited. Beyond the optimum plant size diseconomies of scale arise due to managerial inefficiencies. This makes the *LAC* curve turn upward. In the Fig. 7.9 the point X^* is the point of optimum output and the corresponding plant size 4 is the optimum plant size.
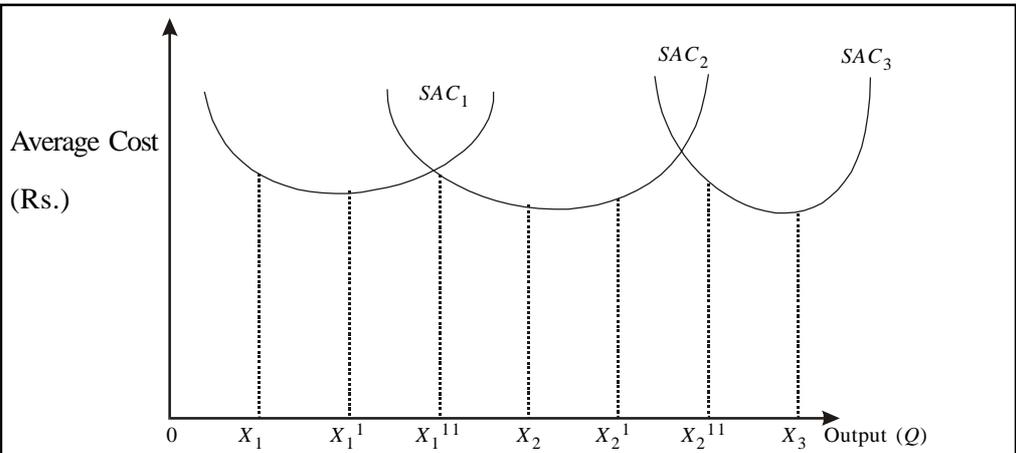

Figure 7.8
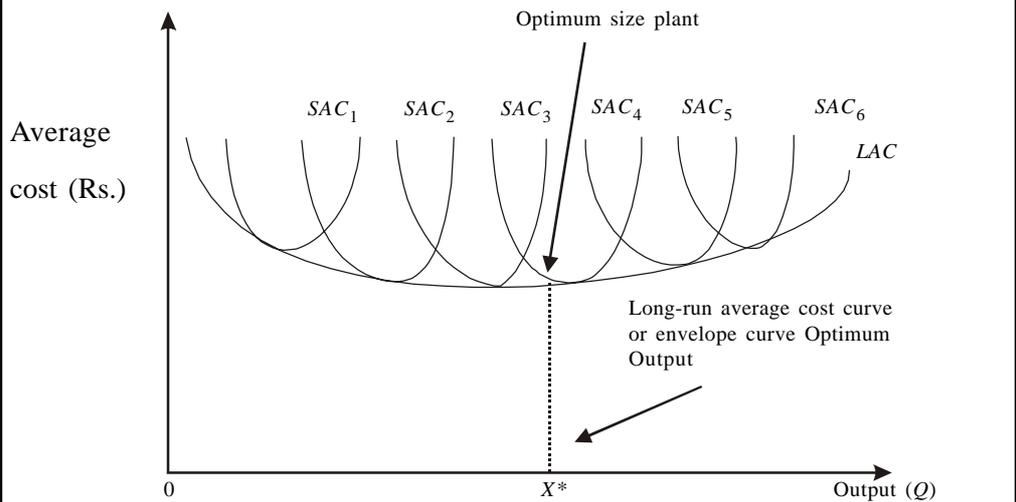
Figure 7.9
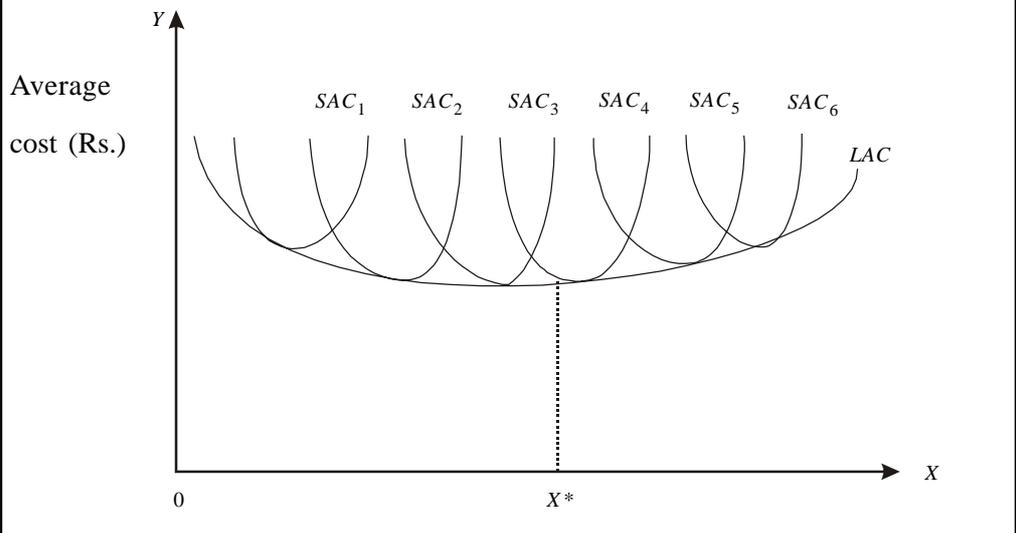
Figure 7.10

7.6.2 Explanation of the U-shape of the Long-run Average Cost Curve

In the Figures shown on previous page we have drawn the *LRAC* curve as having an approximately U-shape. It is generally believed by economists that the *LRAC* curve is normally U-shaped, that is, the long-run average cost first declines as output is increased and then beyond a certain point it rises. Now, what is the proper explanation for such a behaviour of the long-run average cost?

U-shape of the *SRAC* curve is explained with the law of variable proportions. But the *LRAC* curve depends upon the returns to scale. In the long-run all inputs including the capital equipment can be altered. Therefore the relevant concept governing the shape of the *LRAC* curve is that of returns to scale. Returns to scale increase at the initial increases in output and after remaining constant for a while, the returns to scale decrease. It is because of the increasing returns to scale in the beginning that the long-run average cost of production falls as output is increased and likewise, it is because of the decreasing returns to scale that the long-run average cost of production rises beyond a certain point.

But what are the reasons that the firm first enjoys internal economies of scale and then beyond a certain point it has to suffer internal diseconomies of scale. Two main reasons have been given for the economies of scale which accrue to the firm and due to which cost per unit falls. First, as the firm increases its scale of operations, it becomes possible to use more specialized and efficient form of all factors, especially capital equipment and machinery. Secondly, when the scale of operation is increased and the amount of labour and other factors become larger, introduction of a greater degree of division of labour or specialization becomes possible and as a result the long-run cost per unit declines.

Some economists as Nicholas Kaldor and Joan Robinson explain economies of scale as arising from the "imperfect divisibility of factors". In other words, they think that the economies of scale occur and therefore the *LRAC* falls because of the "indivisibility" of factors. They argue that most of the factors are "lumpy" that is, they are available in "large indivisible units" and which can therefore yield lower cost of production when they are used to produce a large output. If a small output is produced with these costly indivisible units of the factors, the average cost of production will naturally be high. If the factors of production were perfectly divisible, they say, then suitable adjustment in the factors could be made so that the optimum proportions between the factors were maintained even for producing small output and hence the average cost of production could not have been higher. Thus, according to them if the factors were perfectly divisible the small scale production would be as good and efficient as the large scale production and the economies of scale would be non-existent.

As noted above, beyond a certain point the long-run average cost curve rises which means that the long-run average cost increases as output exceeds beyond a certain point. In other words, beyond a certain point a firm experiences "net diseconomies of scale". There is also divergence of views about the proper explanation for this upward sloping segment of the long-run average cost curve.

The first view, as held by Chamberlain and others, is that with too large a scale of operation it becomes difficult for the top management to exercise control and to bring about proper coordination. When the scale of operations is enlarged, it ordinarily becomes necessary to employ more assistants and supervisors and to effect more delegation of powers. Thus, increase in the firm's plant beyond a certain size involves more bureaucracy, more red tape and lengthens the chain of communication and command between the top management and the men on the production line. Thus further enlargement in the plant beyond a certain sufficiently large size makes the managerial structure more cumbersome and reduces the overall efficiency of management. Thus inefficiencies of management more than offset the economies of scale and thereby bring about the rise in *LRAC* curve and make the *LAC* curve upward sloping after a point.

The second view regards the entrepreneur to be fixed and indivisible factor. In this view though all other factors can be increased, the entrepreneur cannot be. The entrepreneur and his functions of decision-making and ultimate control are indivisible and cannot be increased. Therefore, when a point is reached where the abilities of the fixed and indivisible entrepreneur are best utilized, further increases in the scale of operations by increasing other inputs cause increases in the cost per unit of output.

Check Your Progress 3

Explain why the cost curves depict the following relationships:

a)   The minimum point of LMC is reached before the minimum point of LAC.

b)   LAC is the least when LMC=LAC.

7.7 ECONOMIES OF SCALE

Now we will answer the question, why a large plant initially experiences decrease in per unit costs and after a certain point, production results in higher average costs. We are aware that in the long run, the law of diminishing returns is not applicable as it assumes only one input as variable. The economies and diseconomies of scale explain the U–shape of the LAC curve.

Economies of scale refer to a situation where output grows proportionately faster than the use of inputs. With prices remaining constant, this leads to lower costs per unit. Thus, the primary reason for scale economies, in the long run, is the increasing returns to scale in the firm's long run production function. This is reflected in the declining portion of the LAC. While under decreasing returns to scale, output increases at a proportionately slower rate than the increase in inputs. With input prices constant, this leads to higher costs per unit. The rising portion of LAC depicts this change. The lowest point on the LAC curve occurs at the output level at which the forces for increasing returns to scale are just balanced by the forces of decreasing to scale.

Economies of scale arise because of technological and financial reasons, also referred as economies at plant level and firm level respectively. Following chart depicts the major factors that give rise to economies of scale.

Types of Scale Economies

Plant Economies
1. Division and specialisation of labour
2. Superior technology
3. Better productivity per price
4. Low equipment maintenance

Firm economies
1. Quantity discounts
2. Low cost fund - raising
3. Sales promotion
4. Managerial efficiencies
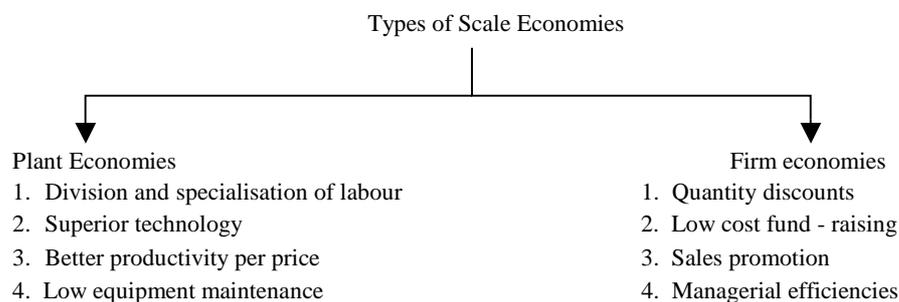
Chart 7.1: Economies of Scale

Scale economies at the plant level arise because of increase in the scale of operations. Greater division and specialisation of labour can take place with more specialised and productive machinery. Each worker is assigned task in accordance to his skill and qualification. This division of labour leads to specialisation in a task due to repetitive work, which increases his proficiency. As Prof. Marshall has stated 'learning by doing' saves time lost in moving from one activity to another.

It has been observed that per unit costs decline with large plant size. Certain plants and equipment are indivisible in smaller units/sizes, like tractors and computers. Small firms cannot employ such sophisticated machines and are, therefore unable to earn benefits of updated technology. Thus, by increasing scale, the firm may be able to use new production methods that are not feasible in smaller outputs. It is also regarded that a machine that costs twice as much as a smaller one will typically produce more output i.e., its productivity/price is more. Large firms need fewer supervisors and spare parts and smaller inventories per unit of output as the scale of operation increases.

Case Study: 1: Cost Saving deal by Chemical Companies

Stop cribbing about cheap imports and start teaming up, seems to be the motto of Indian chemical companies. Faced with common problem like falling import duties and high energy tariffs, the domestic industry is displaying ripples of solidarity.

Chemical companies Deepak Nitrite Ltd. and Dharamsi Morarjee Chemical Company are striking a production sharing agreement for the manufacture of their major product resorcinol in an attempt to rationalise costs. In a first-of-its-kind arrangement, both companies have agreed to split the production process for the manufacture of resorcinol based on their relative strengths. Resorcinol is a high-value additive used in the manufacture of tyres. Out of the total domestic capacity of 600 tpa, Deepak Nitrite manufactures 350 tpa and Dharamsi has a capacity of 250 tpa. Says Deepak Nitrite managing director Deepak Mehta: "Import duties on chemical products including resorcinol has come down to a level of 35% from 135% five years ago. With the duties expected to reach 15% in another two years, joint efforts are the only way to become cost competitive."

The arrangement works as follows: the final product resorcinol comes out of a combination of two stages, namely, sulfonation (combining benzene and sulphuric acid) and fusion (process of mixing the sulfonated product with caustic soda to form resorcinol). With Dharamsi having the capacity to manufacture sulphuric acid, it will be involved in the first stage and sell the sulfonated mixture to Deepak Nitrite for the manufacture of the final product.

Both companies will share the final product depending on the current production status. Dharamsi will shut down its existing fusion process unit and concentrate only on sulfonation. Similarly, Deepak Nitrite will stop its sulfonation facility. And, R and D activities will be focused on the respective areas. Deepak Nitrite's manufacturing facility is located at Pune and Dharamsi's plant is at Roha.

Analysts said the arrangement would enable both players to sell products at cheapest prices. Resorcinol, which costs about Rs 300 per kgs. currently faces threat from cheaper imports.

Source: The Economic Times, 23 January, 2001.

At the firm level the economies of scale arise due to financial reasons. Due to bulk purchases large, firms receive quantity discounts for raw materials and components that result in lower average cost. The cost of capital per unit of output is often found to vary inversely with the size of firm. Large firms are able to raise funds in the capital markets at lower costs than smaller firms. Large firms usually sell bonds and stocks more favourably and receive bank loans at lower interest rates than smaller firms.

Large firms are able to secure quantity discounts even in securing space and time in various advertising media. They can afford to initiate promotional schemes to increase sales. Besides, the promotional cost is spread out, which decreases the burden per unit of output on larger firms, than smaller ones. For instance, a 30–second television advertisement represents the same fixed cost to a large fast food chain and a small chain alike. But this expense comprises a much lower cost "per" burger for the large chain. The same can be said about innovations. Large firms are in a better position to carry out R and D and thereby adopt latest methods of production and sales, and material

procurement, than their small counterparts. Large firms enjoy benefits of top caliber management personnel.

Diseconomies of scale arise primarily due to decreasing returns to management. As the size of the firm increases, firms' planning and coordinating activities become difficult. Additional bureaucratic layers separate managers from the market and their customers. If the consumers' preferences change rapidly or if rivals introduce a new product, larger firms may be disadvantaged by their lack of flexibility and slow adjustment to market. An interesting example has been the reorganisation of IBM. In early years of computer industry, there were no independent suppliers of computer chips and peripherals. Computer manufacturers had to be vertically produce those inputs. But as the industry grew, so did independent suppliers who could specialise in product components efficiently. As this occurred, change in technology, and factor costs decreased the minimum efficient scale for computer manufacturing. Even though IBM's separate divisions were as efficient as their competitors, the internal pricing and cost information did not reflect the efficiency. The organisation had to be restructured so that divisions could operate as separate companies to be closer to the market.

Per unit transportation costs rise as a firm increases the production capacity. These involve delivery of goods, handling expenses, insurance and security expenses, and inventory costs. Thus, managerial inefficiencies and transportation costs more than offset the fall in per unit costs due to economies of scale.

Till now we discussed factors that give rise to internal economies and diseconomies of scale, which are a result of expansion of the firm. External economies may arise due to the expansion of the industry as a whole. Provision of training facilities and skill formation, improved transportation and communication facilities, and lateral and vertical integration may result in a reduction in per unit costs of industry as a whole. Excessive expansion may give rise to external diseconomies, like environmental pollution.

LAC Curves and Empirical Studies

Many studies have been conducted to investigate the shape of long run average cost curve. One general finding is that for most goods and services, there are significant economies of scale at low levels of output, followed by a wide region of constant returns at higher levels. In short, for many industries, the long run average cost curve tends to be L–shaped as shown by Fig. 7.11 (a). This case is usually found under natural monopoly and includes many (but not all) local utilities, local telephone service, and cable television. It is observed that in these industries, economies of scale outstrip diseconomies of scale as a firm expands leading to no net economies or diseconomies rather efficient scale. Minimum efficient scale (MES) is defined as the lowest level of output at which long run average cost is minimum. In Fig 7.11 (a), the LAC declines continuously as output expands till Q and then average cost remains constant at OP. Thus, the output Q shows the MES while any level of output greater than Q gives the optimum level of output.
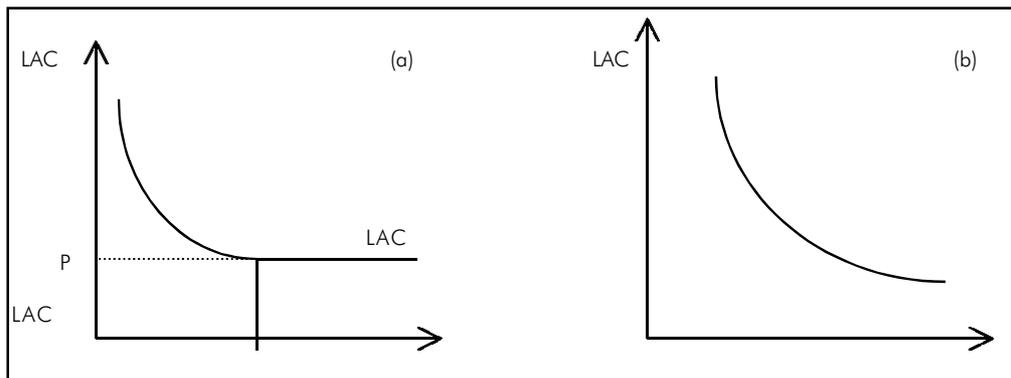

Figure 7.11: Long Run Average Cost Curves

Minimum efficient scale is helpful in determining the number of firms a particular market can support. For instance, in the production of sulphuric acid (a standard chemical), the MES for the plant is about 4 per cent of total US consumption. The average cost disadvantage of producing one-half of MES is only one per cent. The implication is clear that there is ample room in the market for as many as 25 (1/.04) firms. By comparison, the MES for electric motors is about 15 per cent of US consumption and the cost disadvantage at one-half of MES is about 15 per cent. For production of commercial aircraft, MES is 10 per cent of the US market and the cost disadvantage at one-half of MES is 20 per cent. This suggests that the industry could support as many as 10 manufacturers.

In some other cases it has been observed that there is no MES because LAC declines continuously The LAC falls monotonically as output expands because economies of scale outweigh the diseconomies of scale at all levels of output. However, the rate of fall in LAC declines as output expands. Therefore, the LAC is convex from below.

7.8 ECONOMIES OF SCOPE

Per unit costs depend on: (a) changes in factor input or returns to scale, and (b) number of goods produced by a firm or economies of scope. Returns to scale and economies arising from them have already been discussed in the previous section. Economies of scope are defined as the reduction of a firms' per unit cost by producing two or more goods jointly rather than separately. The scope economies can be measured with the following formula:

$$SC = \frac{C(Q_1) + C(Q_2) - C(Q_1, Q_2)}{C(Q_1) + C(Q_2)}$$

Here, $C(Q_1, Q_2)$ denotes the firm's cost of jointly producing the goods in the respective quantities, $C(Q_1)$ denotes the cost of producing good 1 alone and $C(Q_2)$ for good 2. For instance, suppose producing the goods separately means incurring costs of Rs 12 million and Rs 8 million respectively. The total cost of producing the goods in the same quantities is Rs 17 million. It follows that SC = (12 + 8 − 17) / (12 + 8) = .15. Joint production implies 15 per cent cost savings in comparison to separate production.

Many firms produce a variety of goods. Computer firms such as IBM and Digital Equipment Corporation produce a wide variety of computers from mainframe to personal computers. Consumer product firms such as Proctor and Gamble and Hindustan Levers Ltd. offer a myriad of personal, grocery, and household items. The brand portfolio of P and G is around 300 with 10 of them (Pampers, Tide, Ariel, Pantene, Always, Bounty, Charmin, Pringles, Folger's and Downy) making half of the company's sales growth in the 1990s. Similarly, HLL has 110 brands in its basket.

Product diversification within the given scale of plant results in economies of scope that decreases cost in production. Firms often find that per unit costs are lower when two or more products are produced. Excess capacity of the firm can be used to produce additional products with little or no increase in total costs. An airline that carries passengers may find itself with unused cargo space. Thus, it contracts to carry cargo as well as passengers. In recent years, many public schools have made their classrooms available after school hours for day care and community programmes.

An important source of economies of scope is transferable know-how. Soft drink companies produce many types of carbonated drinks, fruit juices, sparkling waters, and the like. Presumably, experience of producing beverages confers cost advantages in producing related drinks. Brokerage houses provide not only trading services but investment advising and many bank like facilities such as mutual funds with check writing privileges.

Scope economies can be demand related. Firms can also take benefit of their unique skills or comparative advantage in marketing to develop products that are complementary with the firm's existing products. For example, Proctor and Gamble sells numerous cleaning products. Some of these products are complementary (like detergent bleach and fabric softeners), whereas other products are specialised substitutes.

An important source of economies of scope is the relatively recent development of computer-aided design and computer-aided manufacturing systems, known as CAD/CAM. These automated systems can quickly switch from one product to another, allowing the production of many products and designs, all using similar inputs. Items ranging from microchips to aircraft are now engineered and manufactured with CAD/CAM.

7.9 APPLICATION OF COST ANALYSIS

Cost concepts and analysis have a wide range of application for managerial uses. Few of these are illustrated below.

7.9.1 Optimum Output Level

Optimum output has reference to that level (size) of output which minimizes the average cost of production or, for which average cost equals marginal costs. For example,

$TC = 128 + 6Q + 2Q^2$

Þ $AC = \dfrac{128}{Q} + 6 + 2Q$

$$\frac{d(AC)}{dQ} = -\left[\frac{128}{Q^2} + 2\right] = 0 \text{ Þ } Q = 8$$

or $MC = 6 + 4Q$

setting $AC = MC$

$$\left[\frac{128}{dQ} + 6 + 2Q\right] = [6 + 4Q] \text{ Þ } Q = 8$$

Thus $[Q = 8]$ is the optimum level of output (for the short-run, because $TFC = 128$).

7.9.2 Optimum Inventory Level

All productions are not immediately sold. Sometimes an inventory or stock of saleable items has to be build up. The Optimum Inventory Level is defined as that size of stock for which the average cost of inventory held is at the minimum. In this there are two types of costs involved: **Carrying Costs** and **Reorder Costs**. The inventory carrying costs include storage costs, interest costs on borrowed capital to finance stock etc. On the other hand the reorder costs include book keeping costs and telephone charges (i.e. fixed costs); some of the reorder costs also vary with the size of the order placed (i.e., variable costs).

The average costs of inventory held can be stated explicitly as:

$$AC = \left[K \cdot \frac{d}{2}\right] + [F, V, D]\frac{S}{D}$$

Carrying Costs + Reorder Costs

where,

S = Expected sale.

D = Order quantity to be delivered.

S/D = Number of orders delivered.

F = Average Fixed Costs of delivery.

V = Coefficient of Average Variable Cost of reorder.

K = Average carrying costs.

D/2 = Average inventory held between initial and terminal periods and it is assumed that the demand is spread evenly.

For deciding an optimum inventory held,

$$\frac{d(AC)}{dD}\left[\frac{K}{2} - \frac{FS}{D^2}\right] = 0 \ ⊅ \quad D = \sqrt{\frac{2FS}{K}}$$

This formula gives us the optimum size of stock or what is called Economic Order Quantity *(EOQ)*.

This is a simple inventory model which brings some interesting results. For example, inventory should increase in proportion to the square root of expected sales. It is to be noted that variable costs have no impact on inventory decisions.

7.9.3 Optimum Scale

The optimum scale is given by that value of *K* (plant size) at which the total cost is the least. The necessary and sufficient conditions for that are following

Necessary Condition: $dC/dK = 0$

Sufficient Condition: $d^2C/dK^2 > 0$

Applying these conditions to the cost function ($C = 0.04\ Q^3 - 0.9\ Q^2 + (11-K)Q + 5K^2$), we get,

$$= 0 - 0 + 0 - Q + 10K = 0$$

or, $K = 0.1\ Q$

and $d^2 C/dK^2 = 10 > 0$

Thus at $K = 0.1Q$, total cost is the least. If the firm wished to produce 10 units of output, its optimum scale equals 1, if it wants to produce 50 units, the optimum plant size is 5 and so on.

7.10 LET US SUM UP

This chapter presents the concept of cost and defines the various types of costs. It brings out the relevance of cost output relationship which forms the very basis of efficient production operations. It distinguishes the behavior of costs in the short-run and the long run and depicts in detail the cost curves in both conditions. The study of cost leads to the analysis of economies and diseconomies of scale and scope under which benefits of expansion and diversification are discussed. Lastly, the concept of supply is presented which enumerates the law of supply, and the various factors affecting supply function.

7.11 LESSON END ACTIVITY

A automobile company recently expanded its annual production from 100 units to 150 units and also diversified its activity. Highlight the economies and diseconomies which the company may incur due to such expansion and diversification.

7.12 KEYWORDS

Future costs: Costs that are reasonably expected to be incurred in some future period or periods.

Past costs: Costs that are actually incurred in the past and they are always contained in the income statements.

Incremental costs: Costs that are defined as the change in overall costs that result from particular decision being made.

Sunk costs: Costs that are not affected or altered by a change in the level or nature of business activity.

Out-of-pocket costs: Costs that involve immediate payments to outsiders.

Book costs: Costs that do not require current cash expenditure.

Historical cost: The cost of plant, equipment and materials at the price paid originally for them.

Replacement cost: The cost that the firm would have to incur if it wants to replace or acquire the same asset now.

Explicit costs: Expenses which are actually paid by the firm (paid-out-costs).

Implicit costs: Theoretical costs which go unrecognized by the accounting system.

Actual costs: Actual expenditure incurred for acquiring or producing a good or service.

Opportunity costs: The return from the second best use of the firm's resources which the firm forgoes in order to avail itself of the return from the best use of the resources.

Direct costs: Costs which can be directly attributed to the production of a unit of a given product.

Indirect costs: Costs which cannot be separated and clearly attributed to individual units of production.

Shut-down costs: Costs incurred when the production operations are suspended and will not be incurred, if the production operations continue.

Abandonment costs: Costs incurred for disposing of the fixed assets, when any plant is to be permanently closed down.

Private costs: Costs actually incurred or provided for by an individual or a firm for its business activity.

Social cost: The total cost to the society on account of production of a good.

Variable factors: Factors such as labour, raw materials, chemicals which can be readily varied with the change in output.

Fixed factors: Factors such as capital equipment, building, top management personnel which cannot be readily varied with the change in output.

Variable costs: Costs which are incurred on the employment of variable factors of production whose amount can be altered in the short-run.

Fixed costs: Costs which are independent of output, i.e., they do not change with changes in output.

Short-run : A period of time in which the output can be increased or decreased by changing only the amount of variable factors such as labour, raw materials, chemicals etc.

Long-run: A period of time in which the quantities of all factors may be varied.

Total cost: All cash payments made to hired factors of production and all cash charges imputed for the use of the owner's factors of production in acquiring or producing a good or service.

Average cost: The cost per unit of output assuming that production of each unit of output incurs the same cost.

Marginal cost: The extra cost of producing one additional unit.

Production process: A system of transforming inputs into outputs.

Cost output function: A relationship between the value of production-inputs that are used by the firm in each period and the corresponding rates of output attained.

Production function: Function which describes the available efficient methods of production at any one time.

Increasing returns to scale: When inputs are increasing less than in proportion to increases in output.

Decreasing returns to scale: When inputs are increasing more than in proportion to increases in output.

Constant returns to scale: When inputs are increasing in constant proportion to increases in output.

Economies of scale: Cost advantages which follow from the increase in volume of production.

Economies of scope: Cost advantages that follow from variety of output-product diversification within the given scale of plant.

7.13 QUESTIONS FOR DISCUSSION

1. Consider the given table. Total product is given and you have to compute average and marginal product.

Units of Variable Marginal Input	Product			Cost		
	Total	Average	Marginal	Total	Fixed	Variable
1	100					
2	250					
3	410					
4	560					
5	700					
6	830					
7	945					
8	1050					
9	1146					
10	1234					
11	1314					
12	1384					

Contd...

13	1444
14	1494
15	1534
16	1564
17	1584
18	1594

You are now given the following information:

(a) Total Fixed Cost (total price of fixed inputs) is Rs. 220 per period.

(b) Units of the variable input cost Rs. 100 per unit per period. Using this information complete the following table.

(c) Graph the total cost curves on one sheet and the average and marginal curves on another.

(d) By reference to table and graph, answer the following questions:

(i) When marginal product is increasing, what is happening to:

   1. Marginal Cost.

   2. Average Variable Cost.

(ii) When marginal cost first begins to fall, does average variable cost begin to rise?

(iii) What is the relation between marginal cost and average variable cost when marginal and average products are equal.

(iv) What happens to marginal cost after the point where it equals average variable cost?

2. Suppose that, labour costs Rs. 10 per unit and capital costs Rs. 5 per unit. The least cost combination of capital and labour are as follows:

Output	Labour	Capital
100	5	10
200	6	12
300	8	14
400	10	20
500	13	28
600	18	38
700	24	54

(a) Prepare the table showing long-run total cost, long-run average cost and long-run marginal cost.

(b) Graph these cost functions.

(c) Over what range of output do economies of scale exist? Over what range are diseconomies of scale indicated?

3. Explain why long-run average cost first falls, then rises. Why does short-run average variable cost first falls, then rises?

4. Examine the factors which explain why the average cost of producing a commodity declines with an expansion in the scale of production.

5. Show the relation between short-run average cost and long-run average cost.

7.14 MODEL ANSWERS TO "CHECK YOUR PROGRESS"

Check Your Progress 1

(a) Variable cost

(b) Implicit cost

(c) Rs. 2 lakh – historical cost

Rs. 15 lakh – replacement cost

(d) Fixed cost

(e) Book costs

Check Your Progress 2

In the short run with a fixed plant there is a phase of increasing productivity (falling unit costs) and a phase of decreasing productivity (increasing unit cost) of the variable factor(s). Between these two phases of plant operation there is a single point at which unit costs are at a minimum. When this point on the SATC is reached the plant is utilised optimally. That is why the traditional theory of costs postulates that in the short run the cost curves are U-shaped.

Check Your Progress 3

(a) If the LMC of the $(n + 1)^{th}$ unit is less than LAC_n, the LAC_{n+1} will be smaller than the LAC_n and LMC will be below the LAC. So lon as the LMC lies below the LAC curve, it pulls the letter downward and reaches its minimum point before the minimum point of LAC.

(b) If the cost function is given by

$$c = ze$$

$$\text{where } z = AC$$

$$MC = \frac{\partial c}{\partial q} = z\frac{\partial q}{\partial q} + q\frac{\partial z}{\partial q}$$

$$\text{or } MC = AC + Q.\text{slope of } AC$$

If slope of AC = 0, then MC = AC

The slope of AC becomes zero at minimum point of this curve. Hence MC = AC at the minimum point of AC.

7.15 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Curwen, *Managerial Economics*, Macmillan.

Earl Heady, *Economics of Agricultural Production and Resource Use*, Prentice-Hall, Inc.

J.K. Eastham, *An Introduction to Economic Analysis*, Universities Press.

Nemmers, E.E., *Managerial Economics: Test and Cases*, John Wiley & Sons, Inc.

UNIT-III

LESSON

8

MARKET STRUCTURE & PRICING AND OUTPUT DECISIONS

CONTENTS

8.0 AIMS AND OBJECTIVES

The main objective of this lesson is to discuss about various forms of market and basic method of price determination. After study this lesson you will be able to:

(i) know the meaning and classification of market

(ii) describe meaning and features of various forms of market

(iii) understand procedure of price determination

8.1 INTRODUCTION

Price determination is one of the most crucial aspects in micro-economics. Business managers are expected to make perfect decision based on their knowledge and judgment. Since every economic activity in the market is measured as per price, it is important to know the concepts and theories related to pricing.

8.2 MARKET AND CRITERIA FOR MARKET CLASSIFICATION

8.2.1 Market

The function of a market is to enable an exchange of goods and services to take place. A market is that area which brings buyers and sellers into contact with one another. According to Frederic Bentham, "A market is any area over which buyers and sellers are in such close touch with one another, either directly or through dealers, that the prices obtainable in one part of the market affect the prices paid in other parts." Thus it is not necessary that a market should be in a building or at a particular place; it is also not necessary that buyers and sellers should be physically close to each other. According to Sidgwick, "A market is a body of persons in such commercial relations that each can easily acquaint himself with the rates at which certain kinds of exchanges of goods or services are from time to time made by the others." In the words of Jevons, "The word market has been generalized so as to mean any body of persons who are in intimate business relations and carry on extensive transactions in any commodity."

The main feature of a market is that sellers and buyers should be able to get in close contact with each other—may be through telephonic conversation or tele-printer or any such modern device. What is required is that those dealing with each other (buying and selling) should be well informed about prices prevailing and other conditions.

Thus, a market is any organization whereby buyers and sellers of a good are kept in close touch with each other. It is precisely in this context that a market has four basic components: 1. consumers, 2. sellers, 3. a commodity, 4. a price.

8.2.2 Criteria for Market Classification

By categorizing markets in terms of their basic characteristics, it may be possible to identify a limited number of market structures that can be used to analyze decision-making. Although there are many possible ways of categorizing market structures, the following characteristics are frequently employed:

1. *Classification by the area:* When area is used as a basis of market classification, we categorize markets into local markets, regional markets, national markets and international markets. It depends on the manner in which the buyers and sellers are located in a particular place.

2. *Classification by the nature of transactions:* We can classify the market on the basis of nature of transactions into two broad categories: The spot market and the future market.

3. *Classification by the volume of business:* On the basis of the volume of business, the markets are broadly classified into wholesale and retail markets.

4. *Classification on the basis of time:* Some time the time element is used to classify the market. The time is classified as very short period, short period and long period. Accordingly we have very short period markets, short period markets, and long period markets.

5. *Classification by the status of sellers:* On the basis of the status of sellers the markets are broadly classified into three categories: Primary, Secondary and Terminal markets.

6. ***Classification by the nature of competition:*** The most important form of market classification is based on the nature of competition i.e., the buyer-seller interaction. The competition in the market depends upon three main factors:

(a) Substitutability factor;

(b) Interdependence factor; and

(c) Ease of entry factor.

8.3 VARIOUS FORMS OF MARKET

The popular basis of classifying market structures rests on two crucial elements, (1) the number of firms producing a product and (2) the nature of product produced by the firms that is whether it is homogeneous or differentiated. The price elasticity of demand for a firm's product depends upon the number of competitive firms producing the same or similar product as well as on the degree of substitution which is possible between the product of a firm and other products produced by rival firms. Therefore, a distinguishing feature of different market categories is the degree of price elasticity of the demand faced by an individual firm.

We present in the Table 8.1 the classification of market forms based on the number of firms and the nature of product produced by them.

Table 8.1: A Classification of market forms

Form of Market Structure	Number of Firms	Nature of Product	Price elasticity of demand	Degree of Control
1	2	3	4	5
(a) Perfect competition	A large no. of firms	Homogeneous Product	Infinite	None
(b) Imperfect competition	A large no. of firms	Differentiated products (but) they are close substitutes of each other	Large	Some
(i) Monopolistic competition	A large no. of firms	Product differentiation by each firm	Large	Some
(ii) Pure oligopoly	Few firms	Homogeneous Product	Small	Some
(iii) Differentiated oligopoly	Few firms	Differentiated products	Small	Some
(c) Monopoly	One	Unique product without close substitutes	Very Small	Considerable

8.3.1 Perfect Competition

As is evident from the above Table, Perfect Competition is said to prevail where there is a large number of producers (firms) producing a homogeneous product. The maximum output which an individual firm can produce is relatively very small to the total demand of the industry product so that a firm cannot affect the price by varying its supply or output. With many firms and homogeneous product under perfect, competition no individual firm is in a position to influence the price of the product and therefore the demand curve facing it will be a horizontal straight line at this level of the prevailing price of the product in the market, that is price elasticity of demand for a single firm will be infinite.

8.3.2 Imperfect Competition

Imperfect competition is an important market category wherein individual firms exercise control over the price to a smaller or larger degree depending upon the degree of

imperfection present in a case. Control over price of a product by a firm and so the existence of imperfect competition can be caused either by the fewness of the firms or by the product differentiation. Therefore, imperfect competition has several sub-categories. The first important sub-category of imperfect competition is Monopolistic competition. In monopolistic competition a large number of firms produce somewhat different products which are close substitutes of each other. The second sub-category is oligopoly without product differentiation which is also known as pure oligopoly. Under it there is competition among the few firms producing homogeneous or identical products. The fewness of the firms ensures that each of them will have some control over the price of the product and the demand curve facing each firm will be downward sloping which indicates that the price elasticity of demand for each firm will not be infinite. The third sub-category is called differentiated oligopoly. It is characterized by competition among the few firms producing differentiated products which are close substitutes of each other. The demand curve under this kind of oligopoly is downward sloping and so firms would have control over the price of their individual products.

8.3.3 Monopoly

Monopoly means the existence of a single producer or seller which is producing or selling a product which has no close substitutes. And as such it is an extreme form of imperfect competition. Since a monopoly firm wields a sole control over the supply of product, which can have only remote substitutes, the expansion and contraction in its output will affect the price of the product. Therefore, the demand curve facing a monopolist is downward sloping and has a steep slope.

Check Your Progress 1

1. Give an example of each of the type of market discussed above.

2. Identify the kind of market that exists in each case. Give reason for your answer.

   a) The market for mineral water

   b) The market for toothpaste

   c) The market for biscuits

   d) The market for butter

   e) The automobile market

   f) The textile market

8.4 EQUILIBRIUM OF A FIRM

Firm is said to be in equilibrium when it has no tendency either to increase or to contract its output. Firm's equilibrium level of output will lie where its money profits are maximum. Now profits are the difference between total revenue and total cost. So in order to be in equilibrium, the firm will attempt to maximise the difference between total revenue and total cost.

An old method of explaining the equilibrium of the firm is to draw the total revenue and total cost curves of the firm and locate the maximum profit point. But, with the appearance of Marginalist Revolution, equilibrium of the firm is explained with the aid of marginal revenue and marginal cost curves.

8.4.1 Equilibrium of the Firm by Curves of Total Revenue and Total Cost

Profit is the difference between total revenue and total cost. Thus the firm will be in equilibrium at the level of output where the difference between total revenue and total cost is the greatest. Figure 8.1 depicts short-run total revenue and total cost curves of the firm. As a firm starts from zero output and increases its production of the good, in the

very initial stages, total cost is greater than total revenue and the firm is not making any profit at all. When it is producing *OL* level of output, total revenue just equals total cost and the firm is therefore making neither profits, nor loss, that is, the firm is only breaking even. Thus the point *S* corresponding to *OL* output is called break-even point.

When the firm increases its output beyond *OL*, total revenue becomes larger than total cost and profits begin to accrue to the firm. It will be seen that profits are rising as the firm increases production up to output *OM*. At *OM* output, the distance between *TR* and *TC* is the greatest and so the profits will be the maximum. Thus the firm will be in equilibrium at the *OM* level of output. The firm will not produce any output larger than *OM* since after it the gap between *TR* and *TC* curves goes on narrowing down and therefore, the total profits will be declining. At *OH* level of output *TR* and *TC* curves again intersect each other, which means that total revenue is equal to total cost at output *OH*. Thus point *Q* is again a breakeven point.
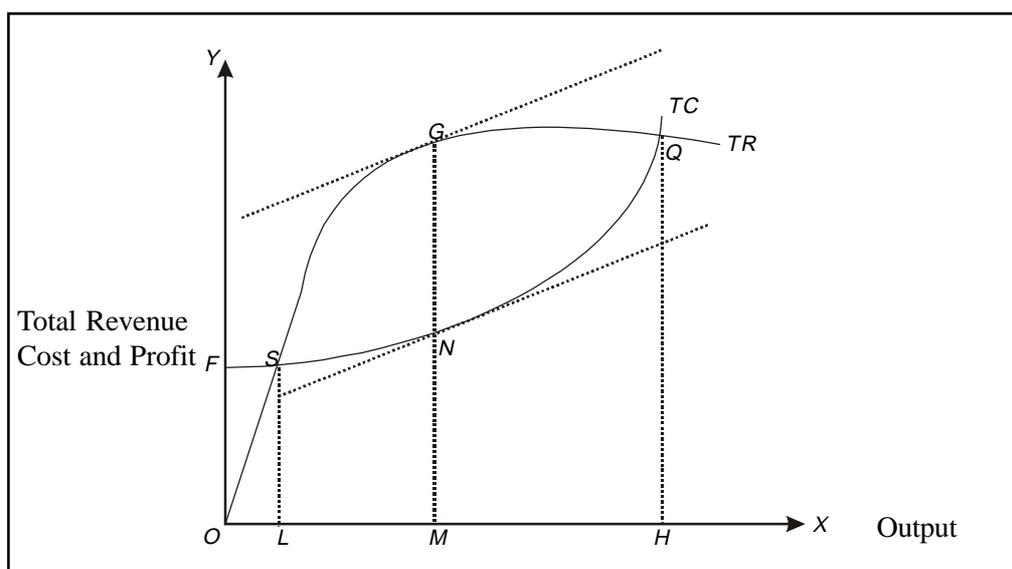
Figure 8.1

8.4.2 Equilibrium of the Firm by Marginal Revenue and Marginal Cost

The firm will be making maximum profits by expanding output to the level where marginal revenue is equal to marginal cost. If it goes beyond the point of equality between marginal revenue and marginal cost, it will be incurring losses on the extra units of output and therefore will be reducing its total profits. Thus, the firm will be in equilibrium when it is producing the amount of output at which marginal revenue equals marginal cost. It will be earning maximum profit at the point of equality between marginal revenue and marginal cost. Therefore, the condition for the equilibrium of the firm is that the marginal revenue should be equal to the marginal cost. In Fig. 8.2 firm's marginal revenue curve *MR is* sloping downward and firm's marginal cost curve *MC* is sloping upward and they cut each other at point *E* which corresponds to output *OM*. Up to *OM* level of output *MR* (Marginal Revenue) exceeds *MC* (Marginal Cost) and at *OM* the two are just equal to each other. The firm will be maximizing its profits by producing *OM* output.

Figure 8.2

The equality between marginal revenue and marginal cost is a necessary but not a sufficient condition of firm's equilibrium. The second order condition requires that for a firm to be in equilibrium marginal cost curve most cut marginal revenue curve from below at the point of equilibrium.

8.5 PRICE DETERMINATION: EQUILIBRIUM BETWEEN DEMAND AND SUPPLY

According to the law of demand the demand curve of a commodity normally slopes downward. In other words, with the fall in price, quantity demanded rises and *vice-versa.* In the theory of firm we studied that the supply curve of a commodity usually slopes upward. In other words, an industry will offer to sell more quantity of a good at a higher price than at a lower one. The level price at which demand and supply curve intersect each other will finally come to stay in the market. And at this price quantity demanded equals quantity supplied and it is called equilibrium price.

Only at the equilibrium price, wishes of both the buyers and sellers are satisfied. If prices were greater or less than the equilibrium price the buyers, and sellers wishes would be inconsistent. If prices were greater than the equilibrium price, quantity supplied would exceed quantity demanded. It means some of the sellers will not be able to sell the amount of the goods they wanted to supply. These sellers would try to dispose of the unsold goods by bidding price down. The price will go on declining till the quantity demanded equals quantity supplied. On the other hand, if prices were lower than the equilibrium price, the quantity demanded would exceed quantity supplied. Some buyers would not be able to obtain the amount of the goods they wanted to purchase at the prevailing price. They will therefore bid price up in their effort to get all that they desired to buy. The price will go on rising till the quantity demanded and quantity supplied are again equal.

Let us explain the above facts through the schedule and diagram.

In the Table below are given demand and supply schedules relating to a woollen cloth. It will be seen that only at a price Rs. 40 quantity demanded is equal to quantity supplied. Therefore, price of Rs. 40 will settle down in the market. Only at this price are all buyers and sellers satisfied. Thus, price of Rs. 40 is the equilibrium price and quantity exchanged at this price is 120 thousand yards. 120 thousand yards is the equilibrium amount. If price is greater or lower than Rs. 40 in the Table, then it will tend to change and come to the level of Rs. 40.

Table 8.2: Equilibrium between Demand and Supply

Price Rs.	Quantity Demanded (In thousand Yards)	Quantity Supplied (In thousand Yards)	Pressure on Price
10	240	20	–
20	200	40	–
30	160	80	–
40	120	120	Equilibrium
50	80	160	–
60	40	200	–
70	20	240	–

In graphical terms, the equilibrium between demand and supply is depicted in Fig. 8.3, where *DD* is the demand curve sloping downward and *SS* is the supply curve sloping upward.
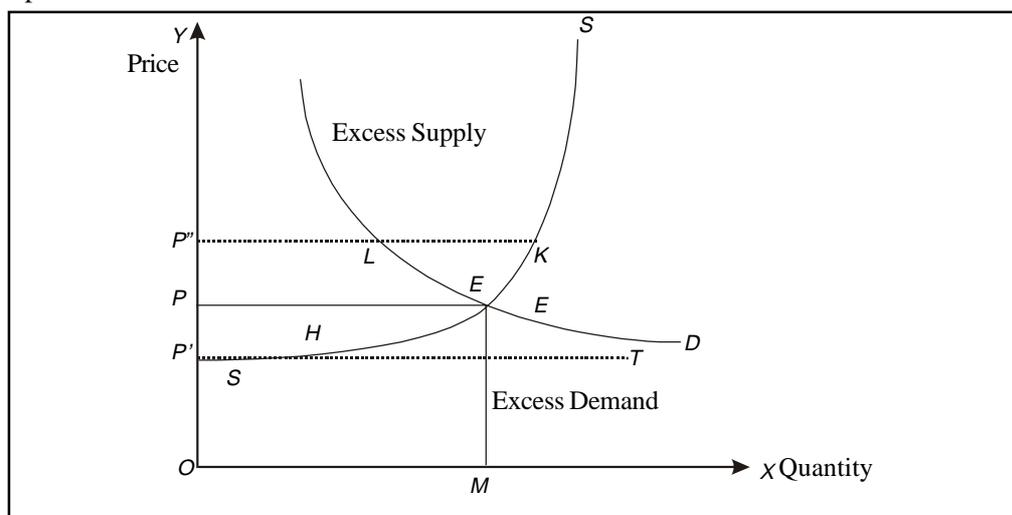
Figure 8.3

Demand and supply are in equilibrium at point *E* where two curves intersect each other. It means that only at price of the quantity demanded is equal to quantity supplied. *OM* is the equilibrium quantity which is exchanged at price *OP*. If the price is greater than the equilibrium price say *OP"*, the quantity demanded by the buyers is *P"L,* while the quantity offered to supply is *P"K*. Thus *LK* is the excess supply which the buyers will not take at the price *OP"*. Thus there will be a tendency for the price to fall to the level of equilibrium price *OP*.

At price *OP',* which is less than the equilibrium price, the buyers demand *P'T,* the sellers are prepared to supply only *P'H. HT* represents excess demand. The unsatisfied buyers will compete with each other to obtain the limited supply of cloth and in this effort they will bid up the price.

Thus, we see that price is determined by the equilibrium between demand and supply.

8.6 TIME ELEMENT IN THE THEORY OF PRICE

Marshall, who propounded the theory that price is determined by both demand and supply, also gave a great importance to the time element in the determination of price. Time element is of great relevance in the theory of value since one of the two determinants of price, namely supply depends on the time allowed to it for adjustment. The reason why supply takes time to adjust itself to a change in the demand condition is that the nature of technical conditions of production is such as to prohibit instantaneous adjustment of supply to changed demand conditions. Marshall divides time periods into four categories: market-period, short-period, long-period and secular-period.

8.6.1 Determination of Market Price

The market period is a very short period in which the supply is fixed, that is no adjustment can take place in supply conditions. In other words, supply in the market period is limited by the existing stock of the goods. In this period more goods cannot be produced in response to an increase in demand.

The price prevailing in the market period is called market price which changes with the nature of the commodity many a time within a day or a week or a month. In reality, market price is that price which is determined by the forces of demand and supply in the market at a point of time. The determination of market price can be explained separately for the perishable and the durable goods.

(i) *Perishable goods:* The perishable goods like fish, milk cannot be stored or kept back; they will go waste if stored. Therefore, the whole of the given stock of a perishable good has to be supplied in the market, whatever the price of the good. As a result, the market period supply curve of a perishable commodity is perfectly inelastic or a vertical straight line.

Fig. 8.4 illustrates the determination of market price of perishable goods. *OM* is the given stock of goods and *MPS* is the market period supply curve. *DD* is the demand curve of the commodity. Demand and supply are in equilibrium at price *OP*. So *OP* is the equilibrium market price. Now if demand increases from *DD* to *D'D'*, the market price will rise from *OP* to *OP'*, the supply of the goods remaining fixed at *OM*. On the contrary if the demand decreases from *DD* to *D"D"* the market price will fall from *OP* to *OP"*, the supply again remaining constant at *OM*. We thus see that changes in demand produce changes in price in the market period, supply being constant during this period.
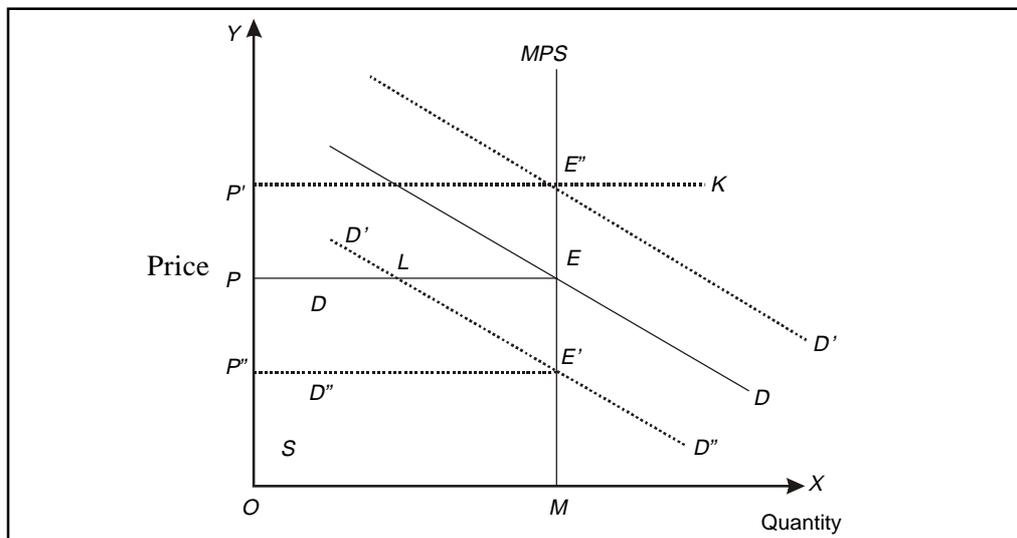
Figure 8.4

(ii) *Durable goods:* Most commodities which are durable can be kept in stock. When the price of durable goods decreases with decrease in its demand, its supply can be decreased by keeping source quantity in the inventory. On the other hand, supply can be increased out of the given stock if its demand and price increases.

Fig. 8.5 illustrates the determination of market price of a durable non-perishable commodity. As pointed out above, the market oriented supply curve of a durable good is not a vertical straight line throughout its length. In this connection it is essential to note two important price levels. Firstly, there is a price level which is sufficiently high so that the sellers will be prepared to supply the whole stock of the goods. Secondly, there is a minimum price at

which the sellers will not be prepared to sell at all, instead they will hold back the whole stock of the goods. This minimum price at which the sellers refuse to supply the goods at all and store it with themselves is known as "reserve price". At a reserve price the quantity supplied of the goods will be zero, and as the price rises the quantity supplied will increase till a price is reached at which the whole stock of the goods will be offered for sale. So, the supply curve of a durable commodity slopes upward to a point and then it becomes a vertical straight line. This is shown in Fig. 8.5 where *SES* is the supply curve of the seller whose reserve price is *OS* and the maximum price *is OP"*. The supply curve becomes vertical after *E*. Within lower part of the supply curve both the price and supply are increasing, but beyond *E* only demand is increasing, supply remaining fixed at *OQ"*.

8.6.2 Determination of Short-run Price

In the short period, price is determined by the forces of demand and supply. The point of equilibrium is located where demand and supply curves intersect. In the short period the firms will keep on producing even if they are not able to cover the average total cost but are able to cover only the average variable cost. If they stop production they will be losing their fixed costs. It is only when these firms do not get the price sufficient enough to cover their variable costs that these firms stop production. The equilibrium price in the short period is called the short period normal price, which is determined by the intersection of the short period normal supply and normal demand curves.
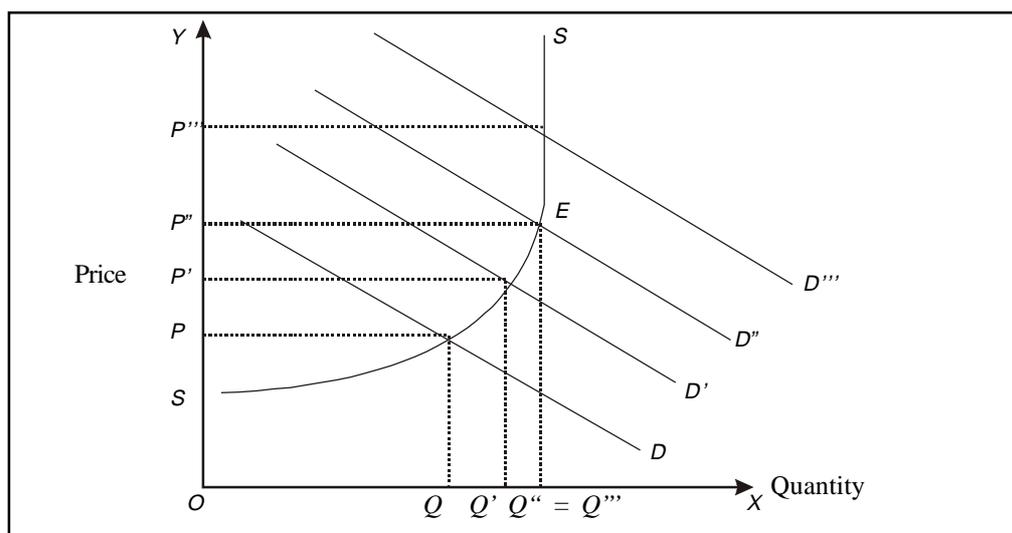
Figure 8.5

Figure 8.6 illustrates the process of the price determination in the short-run. In the Fig. *DD* represents the demand curve. *MPS* is the market period supply curve and *SRS* is the short-run supply curve of the industry. *OP* is both the market price as well as the short-run price since the given demand curve *DD* intersects both the market period supply curve *MPS* and the short-run supply curve *SRS* at point *E*. With shifts in the demand curves from *DD* to *D' D'* or *D" D"* both the price and the quantity supplied of the product change.
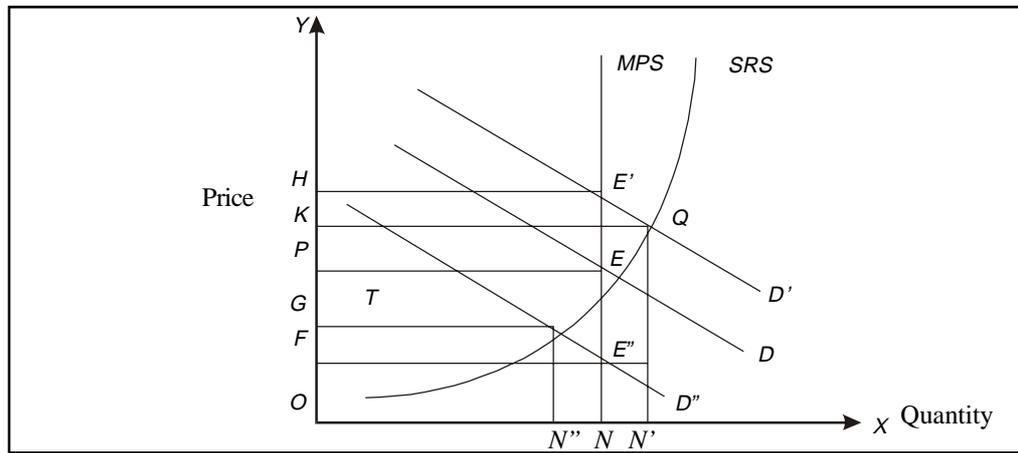
Figure 8.6

8.6.3 Determination of Long-run Normal Price

Long-run price is also known as normal price. Long-run price or normal price is determined by long-run equilibrium between demand and supply when the supply conditions have fully adjusted to the given demand conditions. Given the demand, a price will tend to prevail in the long-run when supply has fully adjusted and that price is known as long-run price or normal price.

Long-run normal price is fixed by the long-run equilibrium between demand and supply. This long-run price under perfect competition cannot be above or below the long-run average cost. A firm under perfect competition is in long-run equilibrium at the output whose price is equal to both marginal cost and average cost. When price is either above or below the long-run average cost certain forces in the system operate as to bring the long-run normal price to the level of long-run average cost. It will be seen in Fig. 8.7 that long-run equilibrium is established at the minimum point of the long-run average cost and long-run price OP is established which is equal to minimum long-run average cost.

Long-run Price $= SMC = SAC = LAC = LMC$
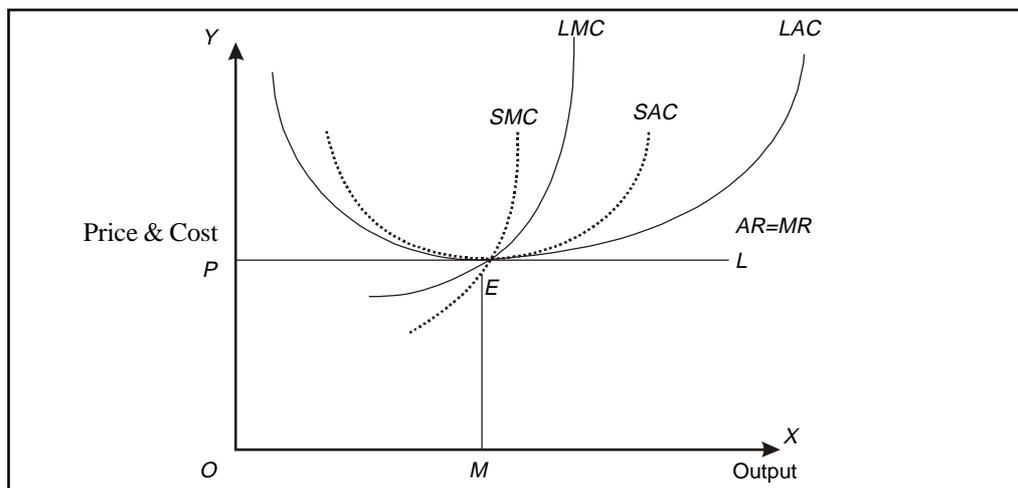
Figure 8.7

8.7 LET US SUM UP

This lesson presents the theory of pricing in various market structures. It discusses the rationale and assumptions behind pricing decisions. It analyses unique market needs and discusses how business managers reach upon final pricing decisions. It explains the equilibrium of a firm is the interaction of the demand faced by the firm and its supply curve. The equilibrium condition differs under perfect competition, monopoly, monopolistic

competition, oligopoly as described in the unit. Time element is of great relevance in the theory of pricing since one of the two determinants of price, namely supply depends on the time allowed to it for adjustment.

8.8 LESSON END ACTIVITY

Comment on the following statements. Give reason if you agree/do not agree.

a)   In the short-run, the equilibrium price is determined at the point MPS=SRS.

b)   In the short-run, the firm cannot have a reserve price.

c)   In the market period, the supply curve is perfectly inelastic.

d)   The long-term equilibrium condition is SMC = SAC = LAC = LMC.

e)   In the long run, only normal prices will exist.

8.9 KEYWORDS

Market: Any area over which buyers and sellers are in such close touch with one another, either directly or through dealers that the prices obtainable in one part of the market affect the prices paid in other parts.

Perfect competition: A market structure characterized by a complete absence of rivalry among the individual firms.

Imperfect competition: A market structure wherein individual firms exercise control over the price to a smaller or larger degree depending upon the degree of imperfection present in a case.

Monopoly: Existence of a single producer or seller which is producing or selling a product which has no close substitutes.

Equilibrium: Condition when the firm has no tendency either to increase or to contract its output.

Profit: Difference between total revenue and total cost.

Market period: A very short period in which the supply is fixed, that is no adjustment can take place in supply conditions.

Minimum price: Price at which the sellers refuse to supply the goods at all and store it with themselves.

8.10 QUESTIONS FOR DISCUSSION

1.   Discuss the concept of market.

2.   What are the criteria for market classification?

3.   Differentiate between perfect competition and monopoly.

8.11 MODEL ANSWER TO "CHECK YOUR PROGRESS"

1.   Perfect Competition   :   Agriculture

     Monopoly   :   Railway

     Imperfect Competition   :   Automobile Industry

2.

(a) Monopolistic Competition

(b) Oligopoly

(c) Oligopoly

(d) Oligopoly

(e) Monopolistic Competition

(f) Monopolistic Competition

8.12 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

LESSON

9

PERFECT COMPETITION

CONTENTS

9.0 AIMS AND OBJECTIVES

This lesson is intended to discuss equilibrium condition and price-output determination under perfect competition. After studying this lesson you will be able to:

(i)   describe meaning and features of perfect competition

(ii)   differentiate perfect competition from pure competition

(iii)   understand equilibrium of a competitive firm in the short-run

(iv)   describe price and output determination of a competitive firm in the long-run.

9.1 INTRODUCTION

Perfect competition is said to prevail where there is a large number firms producing a homogeneous product. Competition is perfect in the sense that every firm considers that it can sell any amount of output it wishes at the prevailing market price, which cannot be affected by the individual producer whose share in the market is very small. With many firms and homogenous product under perfect competition, no individual firm is in a portion

to influence the price of the product and therefore the demand curve facing it will be a horizontal straight line at this level of the prevailing price.

9.2 MEANING OF PERFECT COMPETITION

Perfect competition is a market structure characterized by a complete absence of rivalry among the individual firms. Thus, perfect competition in economic theory has a meaning diametrically opposite to the everyday use of this term. In practice, businessmen use the word competition as synonymous to rivalry. In theory, perfect competition implies no rivalry among firms.

The perfect competition is defined as the form of market organization in which (1) There are many buyers and sellers of a product, each too small to affect the price of the product; (2) the product is homogeneous; (3) there is perfect mobility of resources; and (4) economic agents have perfect knowledge of market conditions.

9.3 FEATURES OF PERFECT COMPETITION

Following are the main features of Perfect Competition:

9.3.1 Large Numbers of Sellers and Buyers

The industry or market includes a large number of firms (and buyers) so that each individual firm, however large supplies only a small part of the total quantity offered in the market. The buyers are also numerous so that no monopolistic power can affect the working of the market. Under these conditions each firm alone cannot affect the price in the market by changing its output.

9.3.2 Product Homogeneity

The technical characteristics of the product as well as the services associated with its sale and delivery are identical. There is no way in which a buyer could differentiate among the products of different firms. If the product were differentiated the firm would have some discretion in setting its price. This is ruled out in perfect competition.

The assumptions of large number of sellers and of product homogeneity imply that the individual firm in pure competition is a **price-taker:** its demand curve is infinitely elastic, indicating that the firm can sell any amount of output at the prevailing market price (Figure 9.1).
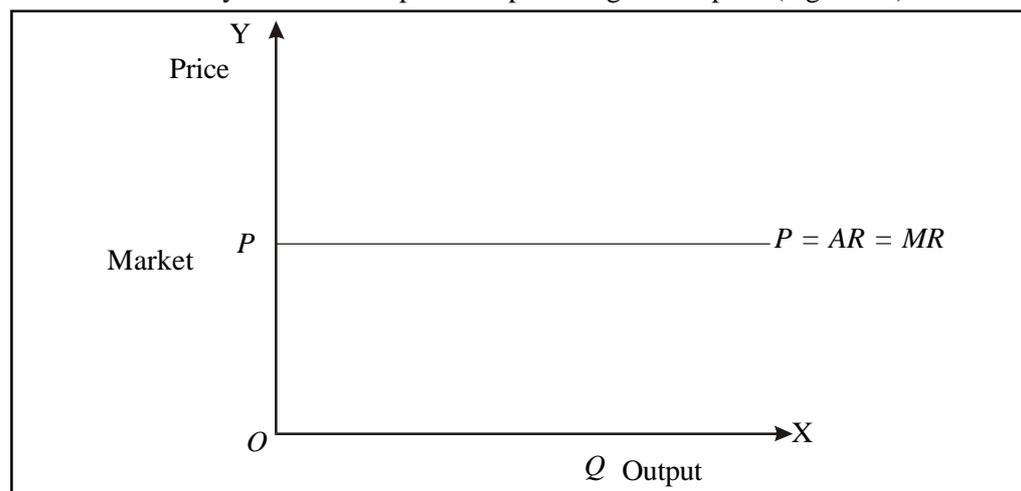

Figure 9.1

9.3.3 Free Entry and Exit of Firms

There is no barrier to entry or exit from the industry. Entry or exit may take time but firms have freedom of movement in and out of the industry. If barriers exist the number

of firms in the industry may be reduced so that each one of them may acquire power to affect the price in the market.

9.3.4 Profit Maximization

The goal of all firms is profit maximization. No other goals are pursued.

9.3.5 No Government Regulation

There is no government intervention in the market (tariffs, subsidies, rationing of production or demand and so on are ruled out).

The above assumptions are sufficient for the firm to be a price-taker and have an infinitely elastic demand curve. The market structure in which the above assumptions are fulfilled is called **pure competition**. It is different from **perfect competition**, which requires the fulfillment of the following additional assumptions.

9.3.6 Perfect Mobility of Factors of Production

The factors of production are free to move from one firm to another throughout the economy. It is also assumed that workers can move between different jobs. Finally, raw materials and other factors are not monopolized and labour is not unionized.

9.3.7 Perfect Knowledge

It is assumed that all the sellers and buyers have complete knowledge of the conditions of the market. This knowledge refers not only to the prevailing conditions in the current period but in all future periods as well. Information is free and costless.

9.4 SHORT-RUN ANALYSIS OF A PERFECTLY COMPETITIVE FIRM

The aim of a firm is to maximise profits. In the short-run some inputs are fixed and these give rise to fixed costs, which go on whether the firm produces or not. Thus, it pays for the firm to stay in business in the short-run even if it incurs losses. Thus, the best level of output of the firm in the short-run is the one at which the firm maximizes profits or minimizes losses.

The best level of output of the firm in the short-run is the one at which the marginal revenue *(MR)* of the firm equals its short-run marginal cost *(MC)*. As long as *MR* exceeds *MC*, it pays for the firm to expand output because by doing so the firm would add more to its total revenue than to its total costs. On the other hand, as long as *MC* exceeds *MR,* it pays for the firm to reduce output because by doing so the firm will reduce its total cost more than its total revenue. Thus, the best level of output of any firm is the one at which *MR=MC*. Since a perfectly competitive firm faces a horizontal or infinitely elastic demand curve, *P=MR* so that the condition for the best level of output can be restated as one at which *P=MR=MC*. This can be seen in Fig. 5.12. This can be shown with calculus as follows:

A firm usually wants to produce the output that maximizes its total profits. Total profits *(T)* are equal to total revenue *(TR)* minus total costs *(TC)*. That is,

$$p = TR - TC \qquad\qquad (A)$$

where p, *TR* and *TC* are all functions of output *(Q)*

Taking the first derivative of $\dfrac{\pi}{\Lambda}$ with respect to *Q* and setting it equal to zero gives

$$\frac{d^2 \text{p}}{dQ^2} = \frac{d^2(TC)}{dQ^2} - \frac{d^2(TC)}{dQ^2} = 0 \tag{B}$$

so that

$$\frac{d^2(TR)}{dQ^2} = \frac{d^2(TC)}{dQ^2} \tag{C}$$

Equation (C) indicates that in order to maximise profits, a firm must produce where marginal revenue (MR) equals marginal cost (MC). Since for a perfectly competitive firm P is constant and TR = (P) . (Q) so that

$$\frac{d(TR)}{dQ} = MR = P$$

the first order condition for profit maximisation for a perfectly competitive firm becomes P = MR = MC.

The second order condition for profit maximization requires that the second derivative of p with respect to Q be negative. That is,

$$\frac{d\text{p}}{dQ} = \frac{d(TR)}{dQ} - \frac{d(TC)}{dQ} < 0 \tag{D}$$

so that,

$$\frac{d(TR)}{dQ} < \frac{d(TC)}{dQ} \tag{E}$$

According to equation (E) the algebraic value of the slope of the MC function must be greater than the algebraic value of the MR function. Under perfect competition, MR is constant (MR curve is horizontal). So that equation (E) requires that the MC curve be rising at the point where MR=MC for the firm to maximise its total profits.

The top panel of Figure 9.2 indicates d is the demand curve for the output of the perfectly competitive firm. The marginal cost curve cuts the SATC at its minimum point. The firm is in equilibrium (maximizes its profits) at the level of output defined by the intersection of the MC and the MR curves (point e in Figure 9.5). To the left of e profit has not reached its maximum level because each unit of output to the left of X_e brings a revenue, greater than its marginal cost. To the right of X_e each additional unit of output costs more than the revenue earned by its sale so that a loss is made and total profit is reduced.
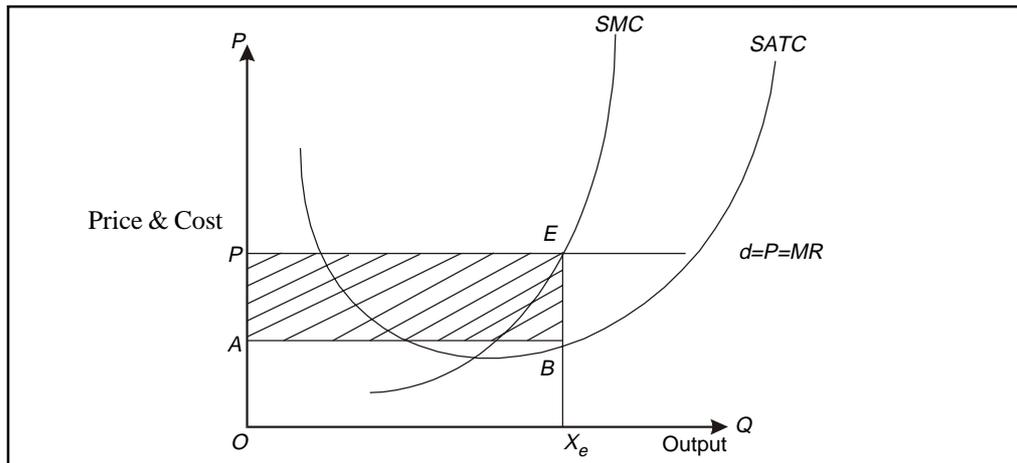
Figure 9.2

The fact that a firm is in short-run equilibrium does not necessarily mean that it makes excess profits. Whether the firm makes excess profits or losses depends on the level of the ATC at the short-run equilibrium. If the ATC is below the price at equilibrium (Figure 9.3) the firm earns excess profits (equal to the area PABe). If, however, the ATC is above the price (Figure 9.4) the firm makes a loss (equal to the area FPeC). In the latter case the firm will continue to produce only if it covers its variable costs. Otherwise it will close

down, since by discontinuing its operations the firm is better off: it minimizes its losses. The point at which the firm covers its variable costs is called "the closing down point." In Figure 9.5 the closing down point of the firm is denoted by point w. If price falls below P_w the firm does not cover its variable costs and is better off if it closes down.

Figure 9.3

Figure 9.4

Figure 9.5
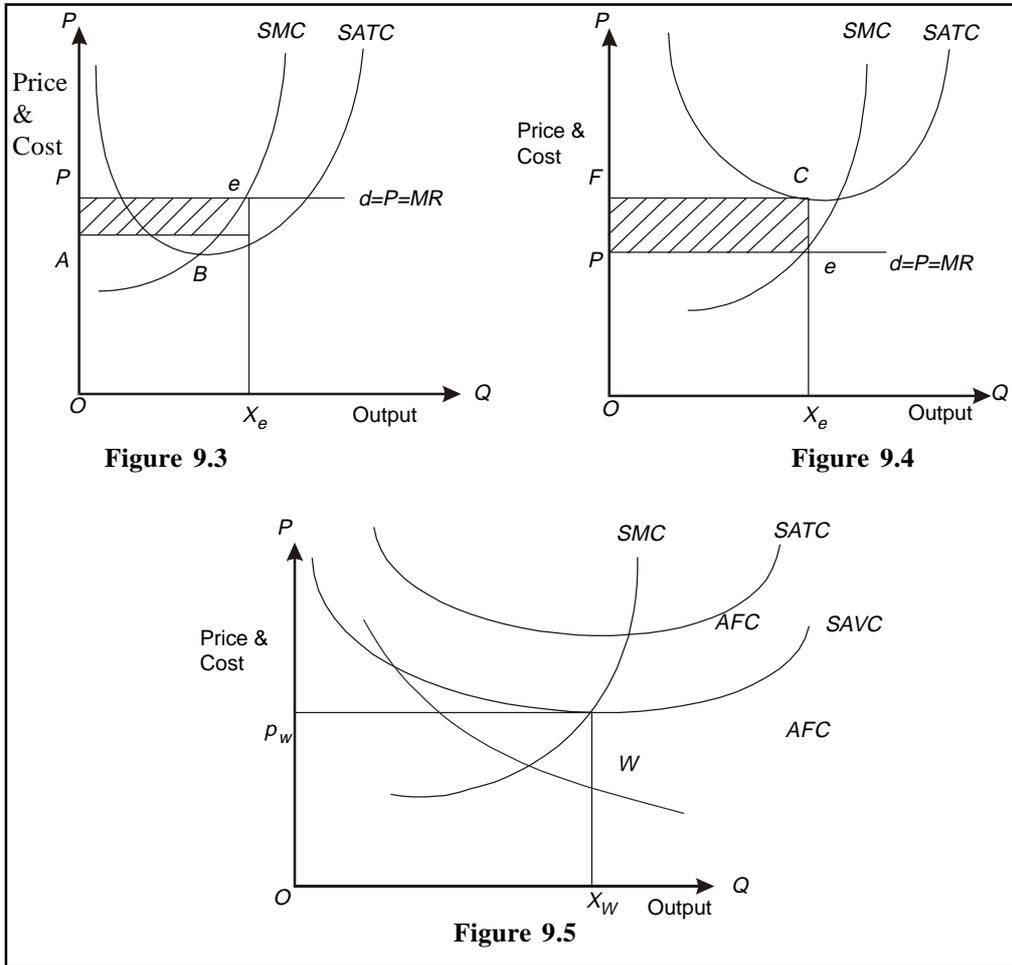
Check Your Progress 1

Draw a diagram depicting loss to a competitive firm in the short-run

9.5   LONG-RUN ANALYSIS OF A PERFECTLY COMPETITIVE FIRM

In the long-run all inputs and costs of production are variable and the firm can construct the optimum or most appropriate scale of plant to produce the best level of output. The best level of the output is one at which price $P=LMC$ equals the long-run marginal cost (LMC) of the firm. The optimum scale of the plant is the one with short-run average total cost $(SATC)$ curve tangent to the long-run average cost of the firm at the best level of output. If existing firms earn profits, however, more firms enter the market in the long-run. This increases the market supply of the product and results in a lower product price until all profits are squeezed out. On the other hand, if firms in the market incur losses, some firms will leave the market in the long-run. This reduces the market supply of the product until all firms remaining in the market just break-even.

Thus, when a competitive market is in long-run equilibrium all firms produce at the lowest point on their long-run average cost *(LAC)* curve and breakeven. This is shown by point *E* in Fig. 9.6.

In Fig. 9.6 we show how firms adjust to their long-run equilibrium position. If the price is *P*, the firm is making excess profits working with the plant whose cost is denoted by *SACS*. It will therefore have an incentive to build new capacity and it will move along its *LAC*. At the same time new firms will be entering the industry attracted by the excess profits. As the quantity supplied in the market increases the supply curve in the market will shift to the right and price will fall until it reaches the level P_1 at which the firms and industry are in long-run equilibrium. The *LAC* in the Figure 9.6 is the final cost curve.
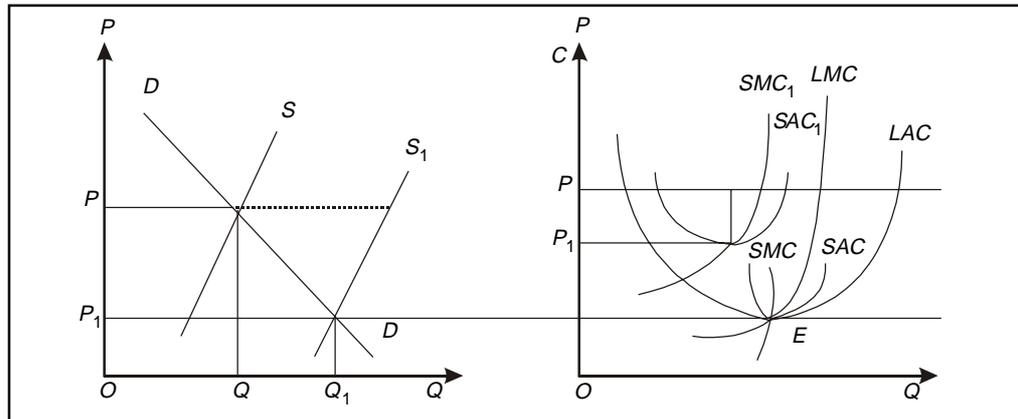
Figure 9.6

The condition for the long-run equilibrium of the firm is that the marginal cost be equal to the price and to the long-run average cost.

$$LMC = LAC = P$$

At equilibrium the short-run marginal cost is equal to the long-run marginal cost and the short-run average cost is equal to the long-run average cost. Thus, given the above equilibrium condition, we have,

$$SMC = LMC = LAC = SAC = P = MR$$

This implies that at the minimum point of the *LAC* the corresponding (short-run) plant is worked at its optimal capacity so that minima of *LAC* and *SAC* coincide. On the other hand, the *LMC* cuts the *LAC* at its minimum point and the *SMC* cuts the *SAC* at its minimum point.

9.6 LET US SUM UP

In this lesson we have studied the price and output determination under perfect competition. Perfectly competitive market is characterised by large number of sellers and buyers. In the short run a competitive firm may earn abnormal profit, normal profit or may incur losses. But in the long run firms earn only normal profit.

9.7 LESSON END ACTIVITY

Imagine your textile firm is operating in a perfectly competitive market, and has been incurring losses for the past two months. Would you recommend that the firm should stop production? What would be your recommendation if it continues to make losses for continuous two years? Give reasons for your answer.

9.8 KEYWORDS

Pure Competition

Normal Profit

Supernormal Profit

Free Entry and exit

Break even point

Shut down point

9.9 QUESTIONS FOR DISCUSSION

1. What are the characteristics of perfect competition?

2. Explain the equilibrium of a competitive firm incurring losses.

3. Discuss price and output determination of a firm under perfect competition in the short run.

4. Show the long run equilibrium of a competitive firm.

9.10 MODEL ANSWER TO "CHECK YOUR PROGRESS"
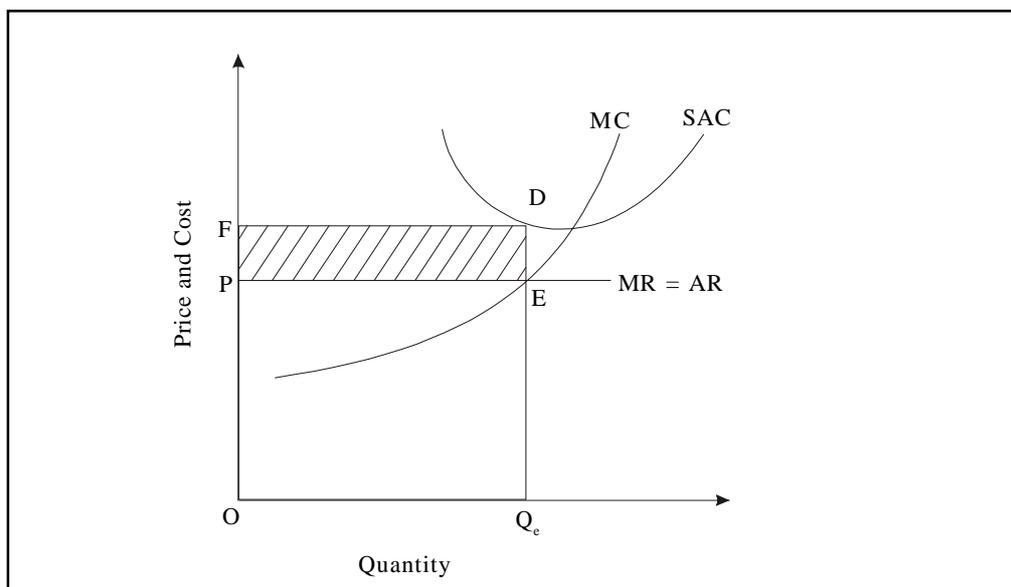
Area PF DE shows the amount of loss.

9.11 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

LESSON
10

MONOPOLY

CONTENTS

10.0 AIMS AND OBJECTIVES

In this lesson we will study the equilibrium conditions and price-output determination under monopoly form of market. After studying this lesson you will be able to:

(i)   know the meaning and features of monopoly

(ii)   describe price and output determination in the short-run as well as in the long-run

(iii)   differentiate between perfect competition and monopoly

(iv)   understand various degrees of price discrimination

(v)   describe price and output determination under discriminating monopoly.

10.1 INTRODUCTION

Monoply is said to exist when one firm is the sole producer or seller of a product which has no close substitutes. According to this definition, there must be a single producer or seller of a product. If there are many producers producing a product, either perfect competition or monopolistic competition will prevail depending upon whether the product is homogeneous or differentiated. On the other hand, when there are few producers, oligopoly is said to exist. A second condition which is essential for a firm to be called monopolist is that no close substitutes for the product of that firm should be available.

10.2 FEATURES OF MONOPOLY

From above it follows that for the monopoly to exist, following things are essential:

1. One and only one firm produces and sells a particular commodity or a service.

2. There are no rivals or direct competitors of the firm.

3. No other seller can enter the market for whatever reasons legal, technical or economic.

4. Monopolist is a price maker. He tries to take the best of whatever demand and cost conditions exist without the fear of new firms entering to compete away his profits.

In the case of monopoly one firm constitutes the whole industry. Therefore, the entire demand of the consumers for a product faces the monopolist; which slopes downward. Monopolist can lower the price by increasing his level of sales and output and he can raise the price by reducing his level of sales. Demand curve facing the monopolist will be his average revenue curve, which also slopes downward. Since average revenue curve slopes downward, marginal revenue curve will be below it.
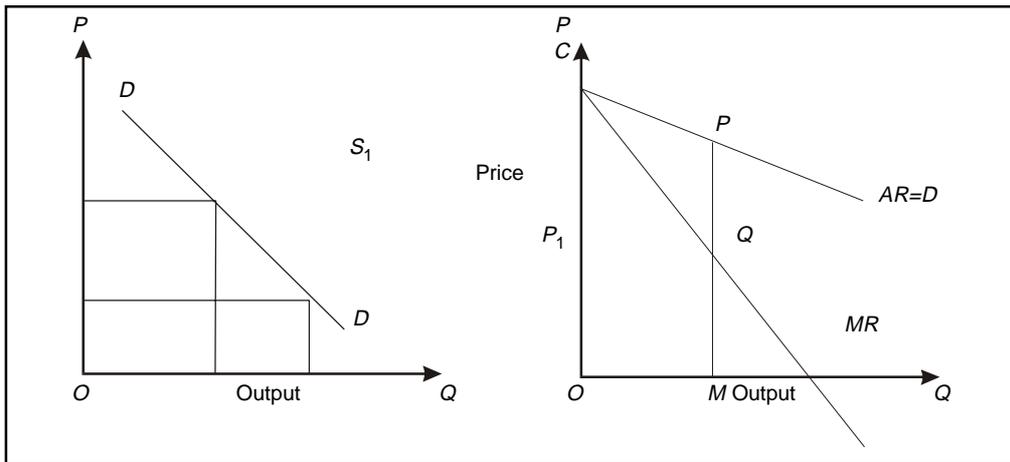
Figure 10.1

10.3 SHORT-RUN EQUILIBRIUM

In the short-run the monopolist maximizes his short-run profits or minimizes his short-run losses if the following two conditions are satisfied:

(i) $MC = MR$ and

(ii) The slope of MC is greater than the slope of MR at the point of their intersection (i.e. MC cuts the MR curve from below).

In the short-run a monopolist has to work with a given existing plant. He can expand or contract output by varying the amount of variable factors but working with a given existing plant. Maximisation of profits in the short-run requires the fixation of output at a level at which marginal cost with a given existing plant is equal to marginal revenue. In Fig. 10.2 *SAC* and *SMC* are short-run average and marginal cost curves. Monopolist is in equilibrium at *E* where marginal revenue is equal to marginal cost. Price set by him is *SQ* or *OP*. He is making profits equal to *TRQP*.
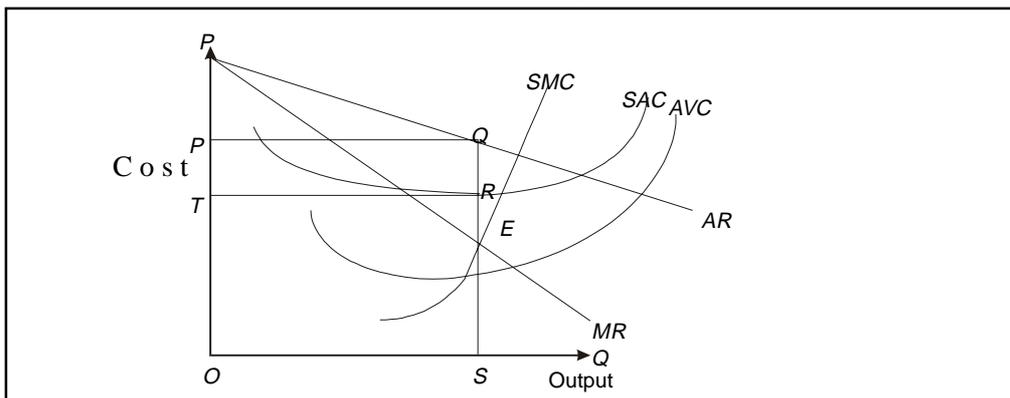
Figure 10.2

But in the short-run he will continue working so long as price is above the average variable cost. If the price falls below average variable cost the monopolist would shut down even in the short-run. In case of losses, monopoly equilibrium is shown in Figure 10.3. The monopolist is in equilibrium at *OS* level of output with price *OP*. Since the price (or *AR)* is smaller than average cost, he is making losses which are equal to area of the rectangle *PQGH*.
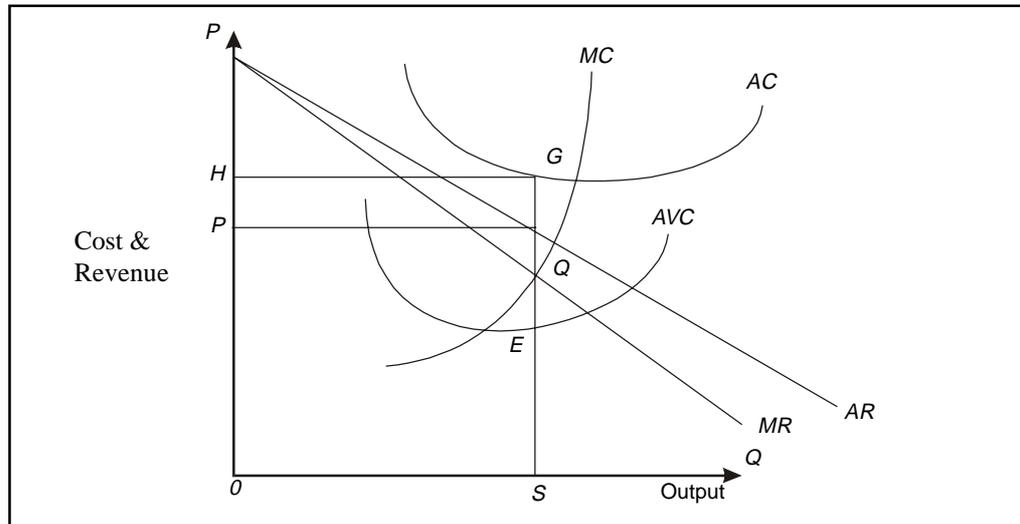
Figure 10.3

10.4 LONG-RUN EQUILIBRIUM

In the long-run the monopolist has the time to expand his plant or to intensively use his existing plant which will maximise his profits. Since there is no entry, it is not necessary for the monopolist to reach an optimal scale. It means that monopolist will not stay in business if he makes losses in the long-run. The size of his plant and the degree of utilization of any given plant size depend entirely on the market demand. He may reach the minimum point of *LAC* or remain at falling part of his *LAC* and expand beyond the minimum *LAC* depending on the market conditions. In Figure 10.4 we depict the case in which the market size does not permit the monopolist to expand to the minimum point of *LAC*. This is because to the left of the minimum point of the *LAC* the *SRAC* is tangent to the *LAC* at its falling part and also because the short-run *MC* must be equal to the *LRMC*. This occurs at *E,* while the minimum *LAC* at 'b' and the optimal use of the existing plant is at *a*: Since it is utilised at the level *E',* there is excess capacity.
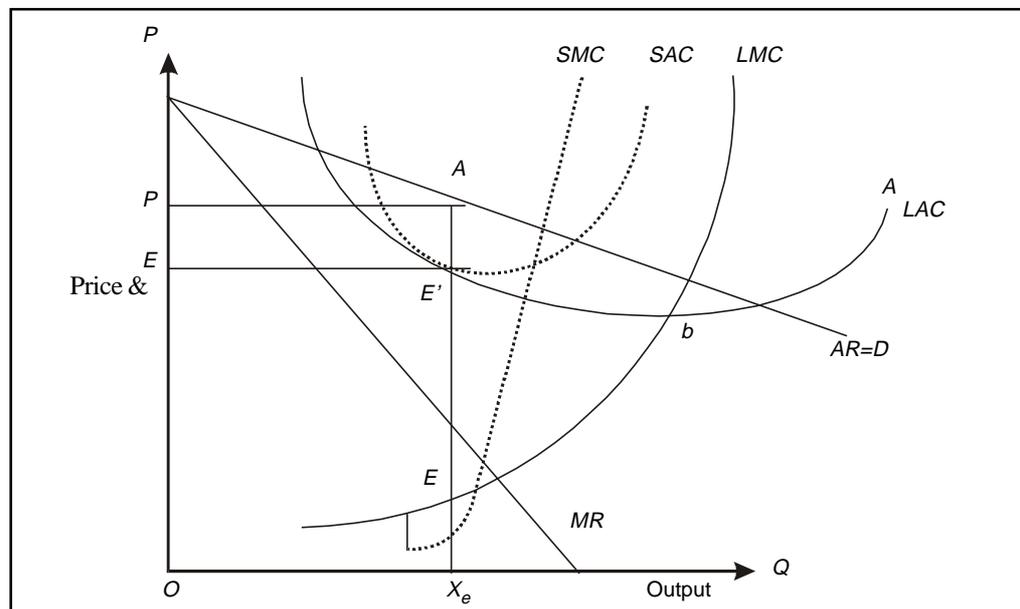
Figure 10.4

In Fig. 10.5 we depict the case where the size of the market is so large that the monopolist, in order to maximise his output, must build a plant larger than the optimal and over utilize it. This is because to the right of the minimum point of the *LAC* the *SRAC* and the *LAC* are tangent at a point of their positive slope and also because the *SRMC* must be equal to the *LAC*. Thus, the plant that maximizes the monopolist's profits leads to higher costs for two reasons: firstly because it is larger than the optimal size and secondly because it is over utilised.
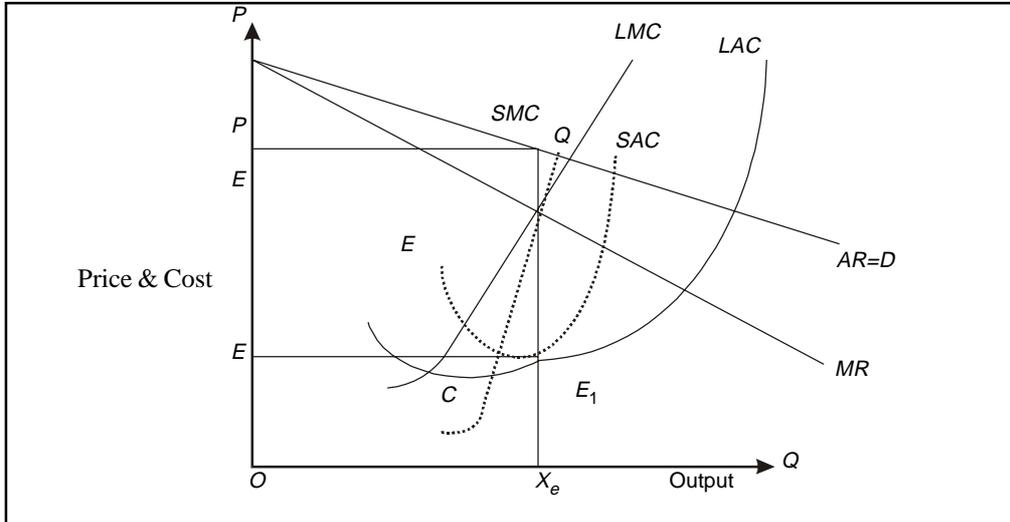
Figure 10.5

Finally in Figure 10.6 we show the case in which the market size is just large enough to permit the monopolist to build the optimal plant and use it at full capacity.

It should be clear as to which of the above situations will emerge in any particular case depends on the size of the market (given the technology of the monopolist).
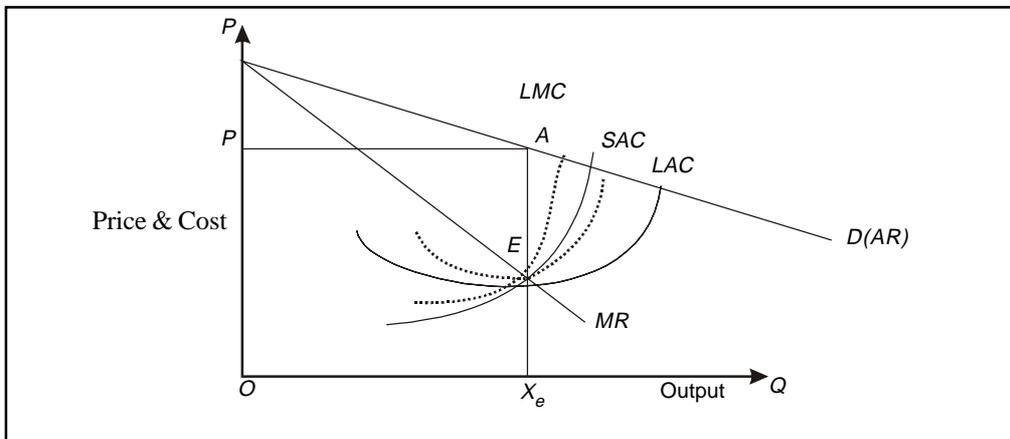
Figure 10.6

Check Your Progress 1

Comment on the following statements, giving logical reasoning.

a) The cross-elasticity of demand between the product of the monopolist and the product of any other producer must be very high.

b) In case of monopoly, the marginal revenue is less than the price.

c) In the short-run, a monopolist cannot be in equilibrium if MC cuts the MR curve from below, even if MC=MR.

Contd...

> d) Monopoly represents an inefficient use of resources at the macro level.

10.5 MONOPOLY AND PERFECT COMPETITION COMPARED

In general, monopoly price is higher than competitive price and monopoly output lower than competitive output. Monopoly and perfect competition are antipoles of each other and they differ in following ways:

(1) Under competition, variation in output has no effect on price and thus, marginal revenue is equal to price. But if the monopolist wants to sell more, he must reduce price and, therefore, $MR < P$ for every output level.

(2) Under competition a firm can sell as much as it likes at the current price. Therefore, the average revenue curve of the firm is a straight line parallel to the horizontal axis and it is perfectly elastic. But under monopoly the average revenue or demand curve is downward sloping and we have elastic demand $(e_p > 1)$. Equilibrium can occur with $ep = 1$, when total cost is constant and $MC = 0$.

(3) Monopoly price is higher than competitive price.

(4) Monopoly output is lower than competitive output.

(5) For competitive equilibrium the marginal cost curve must be strictly upward sloping. But monopoly equilibrium is possible with any shape of MC curve since demand curve is not horizontal. However, we cannot have any equilibrium when MC curve falls more steeply relative to MR curve (i.e. second order condition).

(6) Under perfect competition the firm in the long-run makes only normal profits but under monopoly the firm can get super normal profits even in the long-run.

(7) Since, even in the long-run, the monopolist's demand curve remains sloping downward, it cannot be tangent to average cost curve at of AC minimum. It implies that the firm will produce less than its optimum output level in the long-run.

(8) Monopolies are also likely to be inefficient and slow to introduce technological change. Pure competition forces each firm to be either efficient or perish.

Thus, the monopolist leads to an inefficient allocation of resources from the consumer's point of view. The monopolist restricts price to maximise his profit and holds price above marginal cost.

10.6 PRICE DISCRIMINATION

Price discrimination occurs when the same product or service is sold at more than one price that does not reflect a proportional difference in costs. An airline may sell tickets on a particular flight at a higher price to businessmen than to college students. Companies engage in such practice to enhance profits.

A firm can engage in price discrimination, when following conditions are fulfilled.

1. The firm must have some control over the supply of the product or service. A perfectly competitive seller has no control over price, therefore, he cannot discriminate between different classes of buyers and charge different prices.

2. The different segments of buyers are separable at moderate cost and are unable to transfer products easily from one class to another.

3. The different markets/buyers should have different price elasticity of demand. This may be due to difference in income levels, tastes or availability of products.

From, consumers, viewpoint those in lower price market may benefit compared to situations where a uniform price is charged. However, consumers in the higher-price markets are at a disadvantage. The extent to which a seller can separate the market and discriminate between buyers, gives rise to three types of price discrimination.

First Degree Discrimination

It is assumed that the firm is aware of each consumer's demand curve for the commodity and fixes the price accordingly. The curve indicates the maximum price that can be charged for successive units of output. Fig. 10.7 shows that Q_1 can be sold for a maximum price of P_1, the second could be offered for a maximum of price P_2 and so on. The profit maximising output is Q_D where maximum price obtained for the product is equal to the marginal cost of production. Any attempt to offer more will reduce the profits because price would be less than the marginal cost. A lawyer or doctor may charge different fees based on the income of the clients and patients respectively. Different rates are taken for electricity services for industrial use and residential demand.
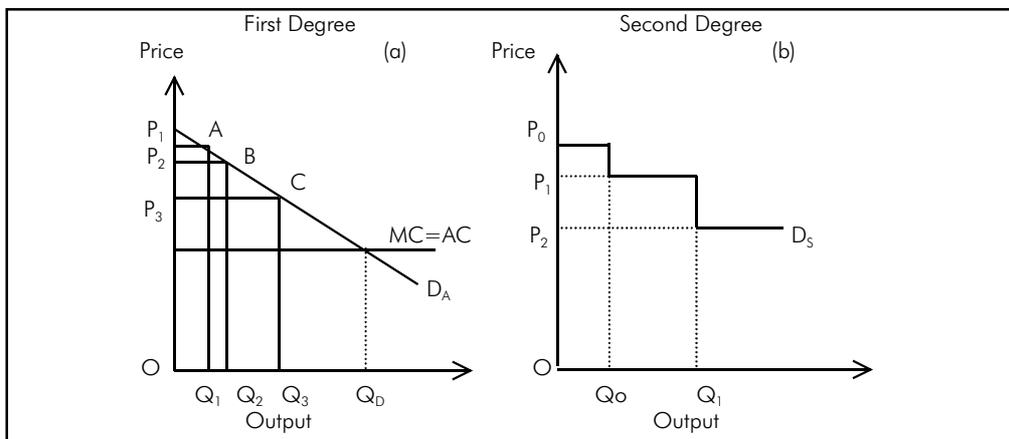
Figure 10.7: Price Discrimination

Second Degree Discrimination

Under this type of price discrimination, differential prices are charged for different amounts of goods and services. The second degree price discrimination is mostly applicable to the goods and services whose consumption is metered like electricity. In Fig. 10.7 (b) for output less than Qo, price Po is charged. Medium price P_1 is charged for quantities purchased between Q_0 and Q_1 and a low price P_2 for purchases beyond Q_1.

Third Degree Discrimination

This type of discrimination is most common. The monopolist segregates the customers into different markets and charges different prices in each segment. Market segmentation can be based on location, age, product use or income. Different locations are priced differently even though the cost of offering in each location is same. A theatre varies its seat prices according to audience preferences for different locations. Railways and buses charge half-ticket for children below 14 years.
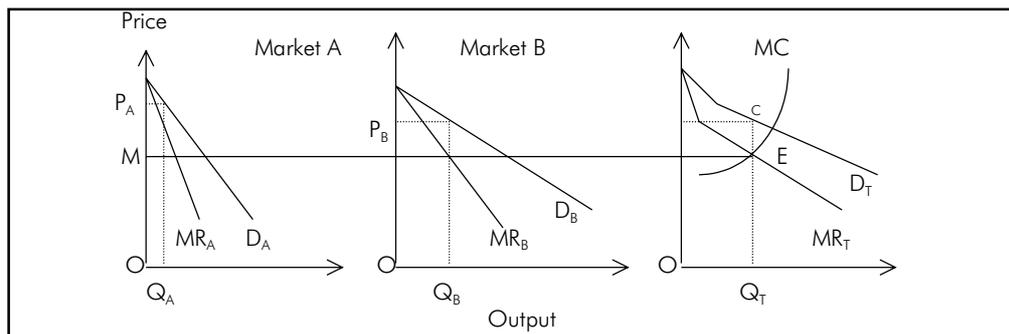
Figure 10.8: Third degree Price Discrimination

Suppose a company operates in two markets A and B. Demand is less elastic in market A and more elastic in B as shown in the Figure 6.2. Combined marginal cost curve MC is drawn for the firm as a whole because the product sold is considered to be homogenous. Optimal combined output will take place where $MC = MR_T$. The firm could have charged uniform price C, but it increases profit by differentiating prices in the two markets. Next, the firm allocates output in two markets which is maximised by equating MC to corresponding MR of each market i.e., $MC = MR_A = MR_B$. This is done by drawing a horizontal line from the point of intersection (MR = MC) in the two markets. The price charged in each market is found by drawing a vertical line at the corresponding quantity to the demand curve. It indicates that Q_A will be sold in market A at price P_A and Q_B in market B at price P_B. Note that the discriminating monopolist charges a higher price in market A where demand is less elastic.

International Price Discrimination

Very often products going to the export market are priced lower than those sold domestically, as the price elasticity of demand is greater in the foreign market. This is often referred to as international price discrimination or dumping. The price elasticity of demand for the product of the monopolist is higher abroad because of competition from other nations in the foreign market. In the domestic, market import tariff and other trade barriers restrict foreign competition. Import restrictions separate the foreign market from the domestic market. In the last decade, Japan was accused of dumping steel, television and computer chips in the United States.

10.7 LET US SUM UP

This lesson discussed various aspects of price and output determination under monopoly. Monopoly is a market structure in which there is only single producer or seller of a product which has no close substitute. Contrary to perfect competition, monopolist is a price maker. Under monopoly the firm can earn supernormal profit even in the long run. A monopolist can practice price discrimination to enhance profits.

10.8 LESSON END ACTIVITY

Compare the long-run equilibrium conditions under monopoly and perfectly competitive markets.

10.9 KEYWORDS

Monopolist: Single seller of a product.

Price Discrimination: It occurs when the same product is sold at more than one price that does not reflect a proportional difference in costs.

First Degree of Price Discrimination: Firm is aware of each consumer's demand curve for the commodity and fixes the price accordingly.

Second Degree Discrimination: Under this type of discrimination, differential prices are charged for different amount of goods and services.

Third Degree Discrimination: The monopolist segregates the customers into different markets and charges different prices in each segment.

10.10 QUESTIONS FOR DISCUSSION

1. Explain with diagrams price determination under perfect competition.

2. Suppose a monopolistic firm has the average revenue functions in three markets as follows:

   $p_1 = 63 - 4\,Q_1$ where Q_1, Q_2 and Q_3 are quantities

$p_2 = 105 - 5\,Q_2$ sold in three markets.

$p_3 = 75 - 6\,Q_2$

The total cost function is $C = 20 + 5\,Q$, where $Q = Q_1 + Q_2 + Q_3$.

Find out the profit maximizing output and price in the three markets. Also estimate demand elasticities.

3.   Consider the following table and locate the profit maximizing level of output. Also estimate the "degree of monopoly" corresponding to that level of output.

Output	Price	Average Costs
1	5	3
2	4	3
3	3	3
4	2	3
5	1	3

4.   Explain the efficiency of monopoly and competition in terms of price, output and cost. Should monopolies be controlled?

5.   Show graphically the price-output determination in case of discriminating monopoly.

6.   Show that under monopoly $P > MC$ at equilibrium.

10.11 MODEL ANSWER TO "CHECK YOUR PROGRESS"

(a)   The statement is not correct. The monopolist maximises his profits if the following two conditions are fulfilled:

(i)   MC = MR

(ii)   The slope of MC is greater than the slope of MR, i.e., MC must cuts MR from below.

(b)   In monopoly there is no certainty that the monopolist will produce at minimum long-run costs. He may never reach the lowest point of the LAC. Thus, monopoly, generally represents an inefficient use of resources.

10.12 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

LESSON

11

MONOPOLISTIC COMPETITION

CONTENTS

11.0 AIMS AND OBJECTIVES

In previous two lessons we have studied price and output determination under perfect competition and monopoly. Here we will study the equilibrium condition under monopolistic competition. After studying this lesson you will be able to:

(i)   know meaning and features of monopolistic competition

(ii)   describe assumptions made by chamberlin in analysing firm's behaviour

(iii) differentiate the concept of 'industry' and the concept 'product group'

(iv)   describe price and output determination under monopolistic competition

11.1 INTRODUCTION

Monopolistic competition is a form of market structure in which a large number of independent firms are supplying products that are *slightly differentiated* from the point of view of buyers. Thus, the products of the competing firms are close but not perfect substitutes because buyers do not regard them as identical. This situation arises when the same commodity is being sold under different *brand names,* each brand being slightly different from the others. For example, Lux, Lyril, Rexona, Hamam, Glory, etc. brands of toilet soap, or Colgate, Cibaca, Prudent, Promise, etc. brands of toothpaste.

Each firm is therefore the sole producer of a particular brand or "product". It is monopolist as far as a particular brand is concerned. However, since the various brands are close substitutes, a large number of "monopoly" producers of these brands are involved in keen competition with one another. This type of market structure, where there is competition among a large number of "monopolists" is called monopolistic competition.

11.2 FEATURES OF MONOPOLISTIC COMPETITION

Firms Produce Somewhat Differentiated Products. The differentiation among competing products or brands may be based on real or imaginary differences in quality. Real differences among brands refer to palpable differences in quality such as shape, flavour, colour, packing, after sale service, warranty period, etc. In contrast, imaginary differences mean quality differences which are not really palpable but buyers are made to imagine or are "conditioned" to believe that such differences exist and are important. Advertising often has the effect of making buyers imagine or believe that the advertised brand has different qualities.

When there is product differentiation, each firm has some degree of control over price. Since products are sold under brand names, the buyers become attached to particular brands. Consequently, a commodity is known and bought on the basis of its brand name rather than its commodity or generic name. The customer asks the shopkeeper for Lux or Hamam and not just for a toilet soap. If, therefore, there is a slight increase in the price of a particular brand of soap, say, Lux then the demand for it will not decline to zero because other brands are only close substitutes and not perfect substitutes. The buyers whose most preferred brand is Lux would rather pay a slightly higher price for Lux than buy another brand they prefer less. The same is true for the other brands of soap.

The producer of each competing brand has, some control over the price of his product and the extent of his power to control price depends upon how strongly the buyers are attached to his brand.

As a result, under monopolistic competition, the demand or average revenue curve of an individual firm is a gradually falling curve. It is highly elastic but not perfectly so. Therefore, the marginal revenue curve of the firm is also falling and lies below the average revenue curve at all levels of output. It is in this respect that monopolistic competition differs from perfect competition.

In addition to product differentiation, the other three basic characteristics of monopolistic competition are:

1. There are a large number of independent sellers (and buyers) in the market.

2. The relative (proportionate) market shares of all sellers are insignificant and more or less equal. That is, seller-concentration in the market is almost non-existent.

3. There are neither any legal nor any economic barriers against the entry of new firms into the market. New firms are free to enter the market and existing firms are free to leave the market.

In other words, product differentiation is the only characteristic that distinguishes monopolistic competition from perfect competition.

Firms selling slightly differentiated products under different brand names compete not only through variations in price but also through variations in *product quality (product variation)* and *changes* in advertising or *selling costs.* Thus, under monopolistic competition, an individual firm has to maximize profits in relation to variations is *three policy variables,* namely, price, product quality, and selling costs. (In contrast, under perfect competition there is competition only through price variation).

11.3 ASSUMPTIONS IN ANALYZING FIRM BEHAVIOUR

We analyze the conditions and process of long-run equilibrium under monopolistic competition with the assumption that competing firms keep their selling costs and product quality constant and compete only through price variation. We then assume that:

(a)   The demand curve of each individual firm has the same shape (elasticity) and position (distance from the *y*-axis). That is, we assume the demand curves of all firms to be symmetrical. This assumption implies that market share of every firm is the same and equal to a constant proportion of total market demand. That is, if total market demand is *Q* and an individual firm's demand is *q* then *q=KQ,* where *K* is a constant fraction for all firms.

(b)   The cost curves, both average and marginal, are symmetrical for each firm.

These two assumptions are 'heroic' or unrealistic but we need to make them for logical convenience in order to analyze the long-run equilibrium of a typical firm under monopolistic competition.

11.4 EQUILIBRIUM OF THE FIRM

Chamberlin develops three distinct model of equilibrium under monopolistic competition.

When competition takes place only through the entry of new firms.

When competition takes place only through price variation (price cutting).

When competition arises through price variation and new entry.

11.4.1 Long-run equilibrium through new entry competition

Under monopolistic competition, the number of independent firms selling differentiated products or brands of a given commodity is large and the relative market share of every firm is insignificant. Therefore, the entry of a new firm into the market will not have any noticeable adverse effect on the sales (or demand) of any of the established firms. Established firms will have no reason to react to new entry by adopting practices to discourage this. Moreover, there are no legal or non-legal (economic) barriers against new entry. Hence, when high profits of the existing firms attract new entry, new firms will in fact enter the market.
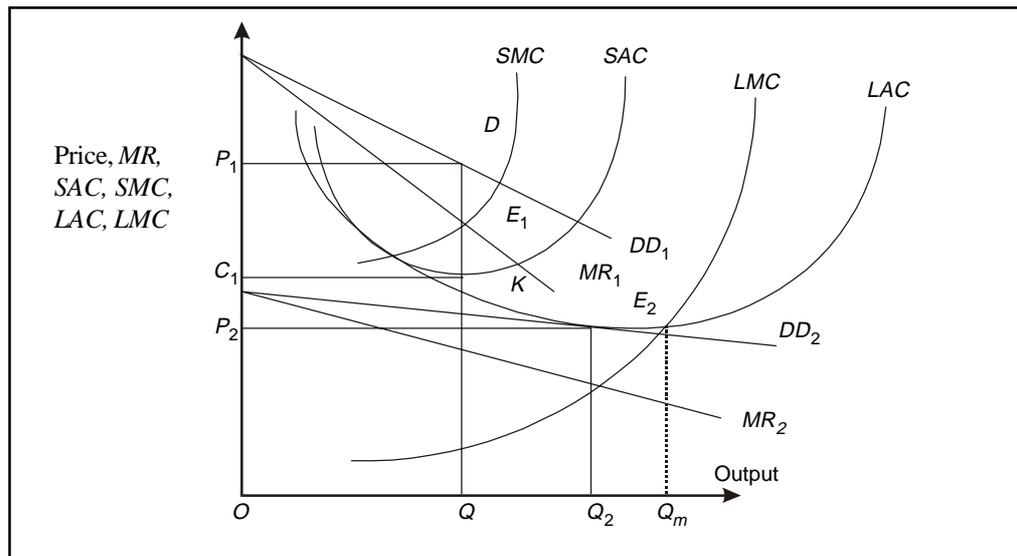
Figure 11.1

The process by which competition from the entry of new firms leads an individual firm's long-run equilibrium is explained with the aid of Fig. 11.1.

The initial downward sloping demand curve of the firm is DD_1 and MR_1 is the corresponding marginal revenue curve. SMC and SAC are the short-run marginal cost and short-run average cost curves. We see that the SMC curve cuts ME from below at point E_1. The firm maximizes profits at output Q_1 and charges price OP or Q_1D. At Q_1 output $SAC=OC_1$. It makes super-normal profits = area P_1DKC_1. The super-normal profits of existing firms induce new firms to enter this market. As the number of firms and brands increases, the market share of each firm declines and each firm is able to sell less at the same price. Hence, the demand curve of every individual firm slides downwards, remaining parallel to itself.

This process of competition from new entry continues so long as the profits earned by a typical firm are more than normal, i e. so long as the demand curve lies above the AC curve.

The competition from new entry will stop and every firm will reach its long-run equilibrium output when profits are only normal and price is just equal to long-run average cost. This happens when the demand curve of an individual firm becomes DD_2, which is at a tangent to the LAC curve at point E_2. The marginal revenue curve MR_2 corresponds to demand curve DD_2. Here LMC cuts MR_2 from below at point G at output Q_2. Thus, the maximum profit that each firm can earn is only normal profit which is included in LAC. The point of tangency E_2, is therefore the position of the long-run equilibrium of a firm where output is Q_2 and price is P_2.

When there is competition only from new entry, the long-run equilibrium of the firm under monopolistic competition is reached under the following conditions:

(a)   Price $= AR = LAC = OP_2$

(b) $MR = LMC = GQ_2$

(c)   Maximum Profit = Normal Profits.

However, because the firm's demand or average revenue curve is falling, the price is higher than marginal revenue. Hence, under monopolistic competition, even though the long-run equilibrium price is $= LAC$, it is greater than LMC. This is because, at equilibrium, $MR = LMC$ but price is $> MR$. (Under perfect competition Price = Minimum $LAC = LMC$).

Moreover, since the firm's demand or average revenue DD_2 is falling on account of product differentiation, it can be a tangent to the U-shaped LAC curve only when LAC is also falling. As shown in Fig. 11.1, the long-run equilibrium position E_2 will be at a point which is to the left of the minimum LAC. Thus, the long-run equilibrium output Q_2 is less than optimum output, Q_m (where LAC is at its minimum). The difference between Q_m and $Q_2 = (OQ_m - OQ_2)$ shows the extent of excess or underutilised capacity. Equilibrium with excess capacity is therefore the necessary consequence of product differentiation and monopolistic competition.

11.4.2 Long-run equilibrium when competition is through price variation

For the purpose of explaining the process of competition through price changes, two demand curves for every individual firm are used.

The changes in demand resulting from the changes in price undertaken on the basic assumption that its competitors will not follow suit when it reduces its price leads the firm to expect that the increase in its demand will be proportionately greater than the reduction in its price. The perceived demand curve is highly elastic though not perfectly elastic. It falls, but fails very gradually, shows why a firm is induced to cut its price. It is the decision-making demand curve because the firm decides to cut price on the basis of the change in demand it perceives or assumes to occur as the result of the change in price.

However, because every firm's market share is equally insignificant, each firm acts on the assumption that when it lowers it price, the prices of its competing firms will remain constant. Each firm therefore reduces its price on the basis of the same assumption, and consequently all firms in the market reduce their prices simultaneously but independently (i.e. not in retaliation). Each firm acts on the basis of its perceived demand curve. As a result, the actual increase in demand resulting from a reduction in price is much less than has been 'imagined' by each firm. The actual changes in demand arising from such simultaneous reduction in price by all firms is shown by what is called the actual demand of an individual firm.
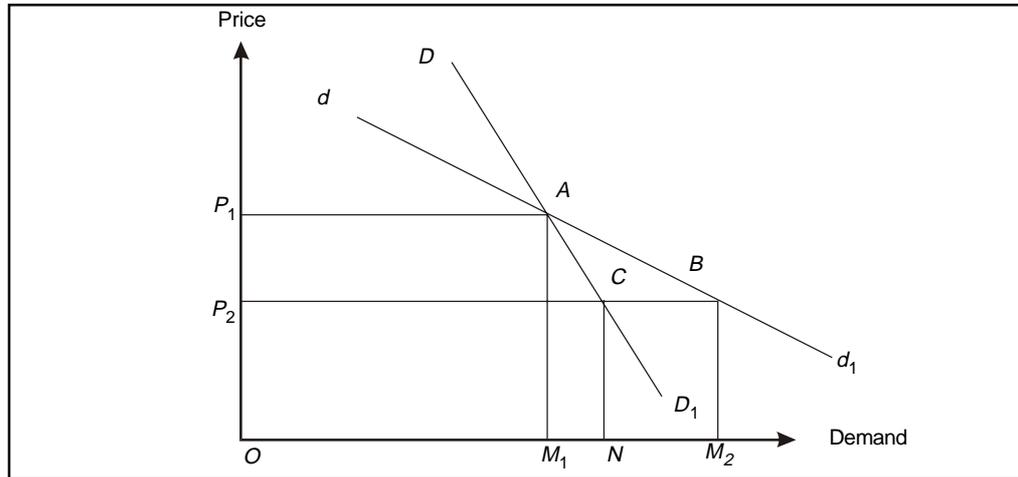
Figure 11.2

Figure 11.2 shows dd_1 as the assumed or perceived demand curve and DD_1 as the actual demand curve. When price is lowered from P_1 to P_2 the firm assumes the demand to increase from M_1 to M_2, but as is shown by DD_1 it actually increases only to M_1N.

The assumed demand curve is much more elastic than the 'actual' demand curve. This is because the former "assumed" or "perceived" changes in demand based on the assumption that only one firm changes its price, while its competitors keep their prices constant. The actual demand curve, however, shows the real changes in demand when all firms simultaneously but independently change their prices acting on the basis of same assumption.

11.4.3 Competition through price variation and new entry

We have seen that the actual demand curve DD shows the absolute market share of an individual firm. Because we assume that the position and shape of demand curve are symmetrical for every firm, the market shares of all firms are assumed to be equal in terms of absolute quantity or size of output. It is given by a ratio of total market demand divided by the number of firms. The larger the number of firms in the market, the smaller the absolute market share of each firm. The position of DD, i.e. its distance from the Y-axis therefore depends upon the number of firms in the market. The actual demand curve DD will shift nearer to the Y-axis as the number of firms increases and will move further away from the Y-axis as the number of firms decreases. That is, DD will shift towards the left as new firms enter the industry and it will shift towards right when the existing firms leave the industry.

As shown in Fig. 11.3 the initial, actual demand curve is shown by DD_1. It cuts the AC curve at point J. Let dd_1 be the initial perceived demand curve cutting DD_1 at point B_1. As explained in Case 2, competition among firms through price variation will continue until the perceived demand curve dd_1 becomes dd_2, which is a tangent to AC at point E. Point E shows price to be $= OP_2$. However, point E is not situated on the actual demand curve DD_1. Hence, the firm finds that corresponding to point E, the actual demand on

DD_1 is P_2R. Now point R on DD_1 is above the AC curve. Therefore output PR_2 indicates super-normal profits shown by area P_2RGC_2. These super-normal profits induce new firms to enter the industry. As the number of firms increases the absolute market share of each decreases and the actual demand curve DD_1 shifts towards the left.

This process will continue till DD_1 shifts to the position of DD_2 which intersects the AC curve at point E where the perceived demand curve dd_2 is a tangent to AC. At this point profits are normal on the basis of perceived demand curve dd_2 as well as on the basis of actual demand curve DD_2. That is, actual demand and perceived demand are equal when profits are normal. The point of tangency between dd_2 and AC is at point E where DD_2 cuts AC. Here the long-run equilibrium output is Q_2 and price is P_2.
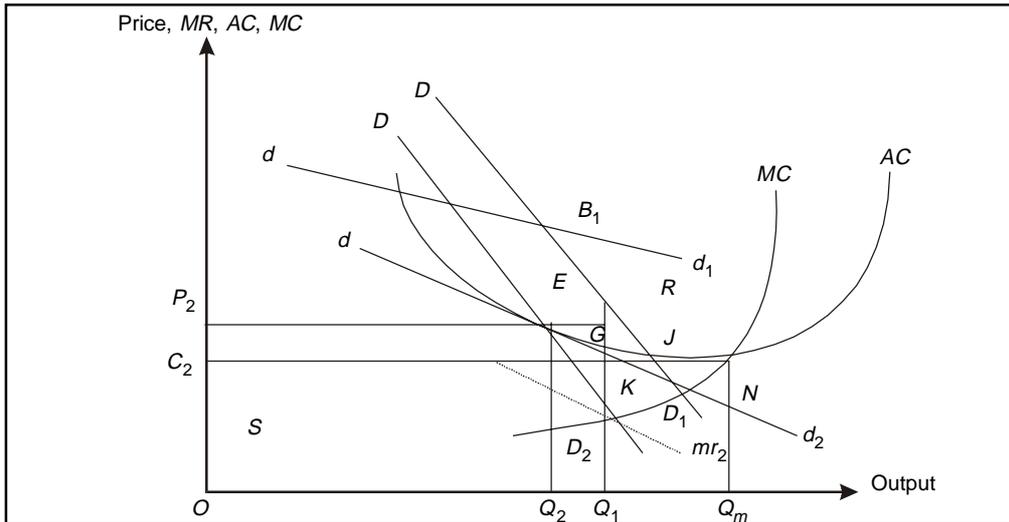
Figure 11.3

Here the competition through price variation is shown by the downward shifts in the perceived demand curve along the actual demand curve. (From position dd_1 to position dd_2, which is a tangent to AC at point E). And the competition through new entry is shown by the shift in the position of actual demand curve (DD_1 shifts to the position of DD_2 which intersects AC at the point of tangency of dd_2 and AC, i.e. at point E).

Under monopolistic competition, when there is competition through price variation as well as new entry (or exit) the long-run equilibrium of the firm will be reached when following conditions are satisfied:

(1)   Perceived demand curve, dd_2 is a tangent to AC.

(2)   Price is equal to AC.

(3)   Maximum profits = Normal profits (Economic profits=zero).

(4) $MR=MC$. Here the relevant marginal revenue is derived from the perceived demand curve.

(5)   The actual demand curve (or 'market share' demand curve) DD cuts AC at the point where perceived demand curve (dd) is a tangent to AC.

(6)   Price is $> MC$ because Price is $> MR$.

(7)   The equilibrium output is less than the optimum output.

Here also we find that the long-run equilibrium output is determined at the level where AC is falling and therefore the equilibrium output is less than the optimum output, Q_m. That is, excess capacity exists at long-run equilibrium output.

11.5 EXCESS CAPACITY AND MONOPOLISTIC COMPETITION

We have seen that under monopolistic competition the long-run equilibrium output of the individual firm is less than optimum output in all cases.

Equilibrium under monopolistic competition results in sub-optimum output with excess or underutilised capacity and unexhausted economies of scale. This excess capacity is due to two reasons. First, under monopolistic competition, product differentiation by competing firms causes the demand curve of the individual firm to slope downwards. Secondly, since the number of competing firms is large, every firm behaves independently, with the result that competition through new entry and price variation continue until every firm earns only normal profits. The typical firm will not reach long-run equilibrium until its demand curve is a tangent to *AC*. In other words, the falling demand curve and long-run tangency solution are the reasons which account for excess capacity equilibrium. (Note that at the point of tangency the slope of demand curve is equal to the slope of the average cost curve. But the slope of falling demand curve is negative. Hence the slope of cost curve is also negative).

From the above it follows that price is higher and output lower under monopolistic competition rather than under perfect competition. This is because, under perfect competition, long-run equilibrium output is determined at the optimum level and so price is equal to the minimum *LAC*. In contrast, under monopolistic competition, long-run equilibrium output is less than optimum and price, though equal to *LAC,* is greater than the minimum *LAC*.

Monopolistic competition and product differentiation are therefore considered to result in loss of social welfare because, in comparison to perfect competition, consumers pay a higher price and are supplied a lower output. Secondly, under monopolistic competition, firms do not utilize their resources as efficiently as they would if the market was perfectly competitive.

This conclusion about the welfare implication of product differentiation and monopolistic competition is not justified because the consumers are willing to make a sacrifice for the wider choice of varieties offered by differentiated products. That is, the loss in welfare suffered by consumers from higher price and lower output is compensated for by the gain in satisfaction they obtain from the choice of varieties offered by competing brands with different qualities. Thus there is no loss of welfare in terms of consumer satisfaction.

Critics point out that argument in defence of product differentiation is not valid because the consumers are not offered two options from which they have to choose one. They are not asked whether they want to pay a higher price for the lower output of differentiated products offering a wide choice of varieties or they want to pay a lower price for a larger output of identical, homogeneous products. The former option is imposed upon the consumers by producers through advertising and sales promotion campaigns that create, in buyers' minds differences regarding the qualities of competing brands, which are very often imaginary or insubstantial.

11.6 MONOPOLISTIC COMPETITION IN INDIA

The government policies often act as entry-barriers in several industries. Besides, the growth of entrepreneurship is also a council element in the Indian context.

Until a decade ago or so , even products like soaps and toothpastes were characterized by oligopolies. For some reasons, new firms just did not enter into several product lines despite favourable government policy. It is only since the 80s that one finds competition hooting up in the country's markets. Product variations, aggressive promotional campaigns and easy entry of new firms are now commonly encountered in several consumer goods industries.

11.7 LET US SUM UP

Under monopolistic competition there is a very large number of firms, but their product is somewhat differentiated. Hence the demand of the individual firms has a negative slope, but its price elasticity is high due to the existence of the close substitutes. Entry is free and easy in the industry. We have studied three models of monopolistic competition given by chamberlin. The long-run equilibrium of the firm under monopolistic competition is defined by the point of tengency of the demand curve to the LAC curve. At this point MC = MR and AC = P, but P > MC.

11.8 LESSON END ACTIVITY

In a monopolistic competition, the demand for product of a firm depend upon the price and the nature of the products of his rivals in the group. Discuss.

11.9 KEYWORDS

Differentiated Product

Selling Activities

Product Group

Actual Sales Curve

Planned Sales Curve

11.10 QUESTIONS FOR DISCUSSION

1. What are the main features of monopolistic competition?

2. Discuss the assumptions of chamberlin's group behaviour model.

3. Explain the key differences between perfect competition and monopolistic competition.

4. Explain the price and output determination of a firm under monopolistic competition.

11.11 MODEL ANSWER TO "CHECK YOUR PROGRESS"

The equilibrium condition of monopolistic competition is MC = MR and AC = P, but P > MC, while in perfect competition we have long run, equilibrium condition MC = MR = AC = P. As a consequence of the different equilibrium conditions price is higher and output is lower in monopolistic competition as compared with the perfect competition. Profits, however, is just normal in the long run in both the markets.

11.12 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

LESSON

12

OLIGOPOLY

CONTENTS

12.0 AIMS AND OBJECTIVES

This lesson is intended to discuss the more realistic market form, i.e. oligopolistic market.After studying this lesson you will be able to:

(i)   describe meaning and characteristics of oligopoly.

(ii)   differentiate between four different models of duopoly.

(iii)   describe causes of price rigidity in the oligopolistic market.

(iv)   understand pricing and output determination by collusive oligopolistic.

12.1 INTRODUCTION

In an oligopolistic market there is a small number of firms, so that sellers, are conscious of their interdependence. The competition is not perfect, yet the rivalry among firms is high. Given that there is a very large number of possible reactions of competitors, the

behaviour of firms may assume various forms. Thus there are various models of oligopolistic behaviour, each based on different reactions patterns of rivals.

12.2 MEANING AND CHARACTERISTICS

Oligopoly is a situation in which only a few firms (sellers) are competing in the market for a particular commodity.

The distinguishing characteristics of oligopoly are such that neither the theory of monopolistic competition nor the theory of monopoly can explain the behaviour of an oligopolistic firm.

These characteristics are briefly explained below:

1. Under oligopoly the number of competing firms being small, each firm controls an important proportion of the total (industry) supply. Consequently, the effect of a change in the price or output of one firm upon the sales of its rival firms is noticeable and not insignificant. When any firm takes an action its rivals will in all probability react to it (i.e. retaliate). The behaviour of oligopolistic firms is interdependent and not independent or atomistic as is the case under perfect or monopolistic competition.

2. The demand curve of an individual firm under oligopoly is not known and is indeterminate because it depends upon the reaction of its rivals which is uncertain. Each theory of oligopoly therefore makes a specific assumption about how rivals will (or will not) react to an individual firm's action.

3. In view of the uncertainty about the reaction of rivals and interdependence of behaviour, oligopolistic firms find it advantageous to coordinate their behaviour through explicit agreement (cartel) or implicit, hidden, understanding (collusion). Also because the number of firms is small, it is feasible for oligopolists to establish a cartel or collusive arrangement. However, it is difficult as well as expensive to monitor and enforce an agreement or understanding. Very few cartels last long, particularly when oligopolistic firms significantly differ in their cost conditions.

4. Under oligopoly, new entry is difficult. It is neither free nor barred. Hence the condition of entry becomes an important factor determining the price or output decisions of oligopolistic firms, and preventing or limiting entry an important objective.

5. Given the indeterminacy of the individual firm's demand and, therefore, the marginal revenue curve, oligopolistic firms may not aim at maximization of profits. Modern theories of oligopoly take into account the following alternative objectives of the firm:

   (a) Sales maximization with profit constraint.

   (b) Target or "fair" rate of profit and long-run stability.

   (c) Maximization of the managerial utility function.

   (d) Limiting (preventing) new entry.

   (e) Achieving "satisfactory" profits, sales, etc. That is, the firm is a "satisfier" and not "maximizer".

   (f) Maximization of joint (industry) profits rather than individual (firm) profits.

In view of the fact that the characteristics of oligopoly renders collusion (explicit or implicit cartel) advantageous and feasible, theories of oligopoly are divided into three broad groups, namely, models of non-collusive oligopoly, models of collusive oligopoly, and managerial theories.

The important models of non-collusive oligopoly are: (a) Cournot model, (b) Kinked demand curve models.

The two major theories of collusive oligopoly are: (a) Joint profit maximization, and (b) Price leadership.

Emphasizing the distinguishing characteristics of joint stock enterprises are the three models of managerial theory, namely, (a) Sales maximization with profit constraint, (b) Maximization of managerial utility function, and (c) Firm as a satisfier (behaviourist theory).

The first two groups are discussed below.

12.3 MODELS OF DUOPOLY

12.3.1 Cournot Model (Duopoly)

The Cournot model (by Antoine Cournot, 1838) is in terms of duopoly (two sellers) but it can be easily extended to an oligopolistic situation. This model analyses the process of equilibrium in a duopoly situation when each duopolist assumes that his rival will not react when he changes his output to maximize profits.

Assumptions

1.   There are two sellers in the market.

2.   The products sold by these two sellers are homogeneous.

3.   The market, or total demand curve, is known and it is a straight line.

4.   Each duopolist assumes that his rival's output will remain constant when he changes his output. Thus, each duopolist assumes his rival will not react to his action. This is, for each duopolist the conjectural variation or seller-interdependence, as given by dQ_1/dQ_2 or dQ_2/dQ_1 is assumed to be zero. (Q_1 and Q_2 are the outputs of two sellers).

5.   Each duopolist produces output of which the profits are at the maximum.

6.   The cost of production is zero for both the sellers. For example, two natural springs of mineral water with healing qualities, each owned by one seller. The average and marginal costs for each seller are zero and these curves coincide with the *X*-axis.

In Figure 12.1*, CD* = known straight line total (market) demand curve. Note that under pure competition, Price = marginal cost which is zero by assumption.
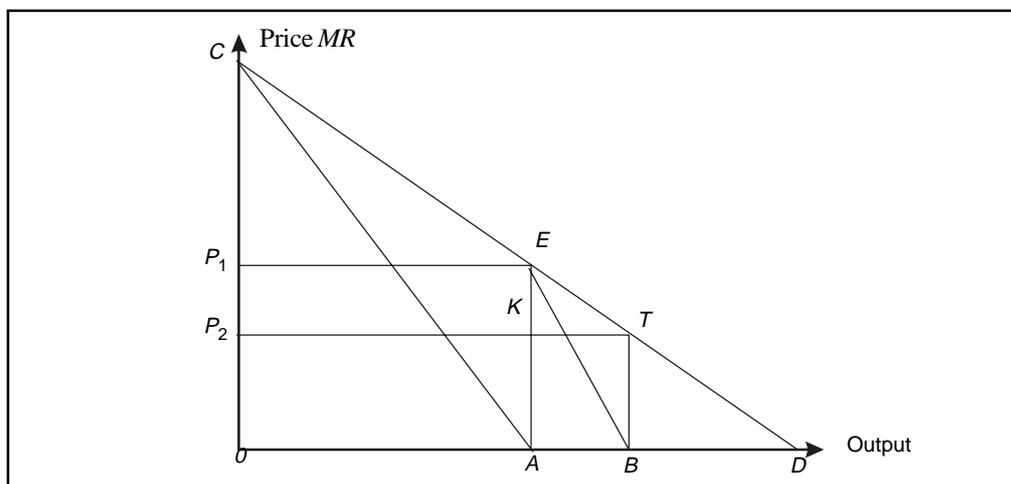

Figure 12.1

Hence, demand or output at zero price shows the competitive output.

$\therefore$ OD = Competitive output.

Let the two duopolists be denoted by X and Y. Let Q_x and Q_y be their respective output.

Suppose seller X enters the market first, followed by seller Y.

We analyze the behaviour of X and Y in stages.

In stage I, seller X acts as a monopolist. He faces demand curve CD so that CA is his marginal revenue curve which must be situated halfway between the Y-axis and demand curve. CA cuts OD at A, such that $OA=AD=$ 1/2 OD. At output OA, marginal revenue = marginal cost = zero and profits are at their maximum. Seller X charges price P_1 and makes profit = $OARP_1$.

Thus at stage I, we find Q_x = 1/2 OD.

Now seller Y enters with the assumption that X will keep his output constant at 1/2 OD. In other words, Y considers his demand curve to be RD which shows the leftover demand after X has supplied OA output.

Hence at stage I, seller Y finds his demand curve to be RD with RB as his marginal revenue curve. RB cuts the X-axis at B. For seller Y, marginal revenue = marginal cost = zero at output AB. Thus profit maximizing output of Y at stage I, is $AB=$ 1/2 $AD=$ 1/2 (1/2 $OD)$ = 1/4 OD.

Thus in stage I, $Q_x = OA=$ 1/2 OD

and $Q_y = AB = $ 1/2 $AD = $ 1/2 (1/2 $OD)$ = 1/4 OD

Seller Y charges price $BT=OP_2$ and makes a maximum profit = $ABTK$.

However, since x and y are selling homogeneous products, the price will decrease from OP to OP_2 for both of them. Profits of x will thus decline to $OAKP_2$.

Assuming seller Y will keep his output Q_y constant at 1/4 OD seller X will have to reduce his output so as to raise the price and his profit.

In stage II seller X will produce profit maximizing output on the basis of the demand leftover after assuming Q_y to be = 1/4 OD. Therefore, in Stage II, X will produce output $Q_x = $ 1/2 $(OD–AB)= (OD–BD)$ and BD is 1/2 $AD=$ 1/4 OD.

At stage II, Y decides his profit maximizing output assuming Q_x will remain constant at $(1/2–1/8)$ OD. Hence, Q_y at stage II will be = 1/2 $[OD–(1/2–1/8)$ $OD]$.

That is, $Q_y = $ 1/2 $(OD–$1/2 $OD + $ 1/8 $OD)$

= $(1/2–1/4 + 1/16)$ $OD=(1/4 + 1/6)$ OD.

We can carry on this reasoning further, to stage III, stage IV, etc., to find Q_x and Q_y at each stage.

In short, we find that at each stage, seller X will decrease his output in such a way that it will be equal to one-half of OD minus the output of Y in the previous stage (which is initially zero). On the other hand, Y will increase his output Q_y at each stage so that it will be equal to one-half of the difference between OD and Q_x at the same stage.

The stagewise changes in Q_x and Q_y are summarized below.

Stage	Values of Q_x	Values of Q_y
I	$Q_x = 1/2$ OD	$Q_y = 1/2(1-1/2)OD$ $= 1/4$ OD
II	$Q_x = 1/2$ $(1/14)$ OD $= (1/2-1/8)$ OD $OD = 3/8$	$Q_y = 1/2[1-(1/2-1/8)]$ OD $= (1/2-1/4+1/16)$ OD $= (1/4+1/16)$ OD $= (5/16)$ OD
III	$Q_x = (1/2-1/4+1/16)$ OD $= (1/2-1/8-1/32)$ OD	$Q_y = 1/2[1-1/2-1/8-1/32]$ OD $= (1/4[1-1/16 + 1/64])$ OD

We find that at each stage, Q_x declines by smaller and smaller quantities. In contrast, Q_y increases by smaller and smaller amounts at each stage. Both Q_x and Q_y will, therefore, arrive at some finite values which will give the equilibrium values of Q_x and Q_y.

The equilibrium values of Q_x and Q_y are found in the following way:

$Q_x \quad = \quad [1/2 - 1/8 - 1/32...]$ OD

$= \quad [1/2 - 1/2 \ (1/4) - 1/2 \ (1/4)^2...]$ OD

$= \quad [1/2 - 1/2 \ [(1/4 + (1/4)^2 + (1/4)^3 .....]$ OD

$= \quad 1/2 - 1/2 \ [(1/4) / (1 - 1/4)]$ OD

$= \quad (1 /2 - 1/6)$ OD

$= \quad (1/3)$ OD

$\therefore$ Equilibrium $Q_x = (1/3)$ OD

$Q_y \quad = \quad (1/4 + 1/16 + 1/64 ....)$ OD

$= \quad [(1/4 + (1/4)^2 + (1/4)^3 ....]$ OD

$= \quad [(1/4) / (1-1/4)]$ OD

$= \quad (1/3)$ OD

Equilibrium $Q_y = (1/3)$ OD

Hence the total equilibrium output of the two duopolists x and y is $= (Q_x + Q_y) = 1/3$ $OD+1/3$ $OD = 2/3$ OD.

Since OD = competitive output, the duopoly equilibrium output is 2/3 of competitive output, and the equilibrium output of each duopolist is = 1/3 of competitive output.

We can write 2/3 as = (2) / (2+1) and 1/3 as = 1/(2+1), where 2 is the number of sellers in duopoly.

Extending this duopoly case to oligopoly with the number of firms (sellers) to be = N, we can say that according to the Curnot model, the equilibrium output of each of the N oligopolists is = 1/ $(N+1)$ $\times$ Competitive output. And total equilibrium output of N oligopolistic firms is = $N/(N+1)$ $\times$ Competitive Output.

12.3.2 Bertrand's Duopoly Model

This model assumes that his rival firm will keep its price constant irrespective of his own decision about pricing. Thus each firm is faced by some market demand and aims at maximizing its profit assuming that its competitor will not change its price.

The model uses the analytical tools of reaction functions of the duopolists derived on the basis of isoprofit curves. These curves are drawn on the basis of various combinations of prices charged by the rival firms for a given level of profit. The equilibrium point is

reached where the curves of two firms intersect. The prices at which the two firms will sell their respective outputs is determined by the point equilibrium. This is a stable equilibrium.

The assumption that firms never learn from past experience is naive. Each firm maximizes its own profit but the joint profits are not maximized.

12.3.3 Edgeworth's Model of Duopoly

This model also assumes that each seller assumes his rival's price, instead of his output, to remain constant. It is assumed that the entire market is equally divided between the two sellers who face identical demand curves. A continuous price war goes on between the duopolists and the equilibrium price goes on fluctuating. The equilibrium is unstable and indeterminate since price and output are never determined. This model is also based on a naive assumption that each firm continues to assume that his rival will never change its price even if it may change its own.

12.3.4 Stackelberg's Duopoly Model

This is an extension of the duopolist model. It assumes that one of the duopolists is sufficiently sophisticated to recognize that his competitor acts on the cournot assumption. This permits the sophisticated duopolist to determine the reaction curve of his rival and incorporate it in his own profit function. Consequently he maximizes his profit like a monopolist. He emerges as the leader and a stable equilibrium emerges as the naive firm will act as a follower. However, if both firms are sophisticated and act like leaders, disequilibrium results. There will either be a price war until one of the firms surrenders or a collusion will be reached between the two firms.

Check Your Progress 1

The cournot model assumes a duopoly but is not extendable to multifirm oligopoly. Do you agree with this statement? Give reason for your answer.

12.4 KINKED DEMAND CURVE MODEL OF OLIGOPOLY

There are two versions of the Kinked Demand Curve model. One is called the Sweezy Version and the other is called the Hall and Hitch Version. Both models were conceived independently in 1939. The essential difference between these two versions is that Sweezy's model is based on the marginalist approach, with the hypothesis that even an oligopolistic firm aims at profit maximization. In contrast, the Hall and Hitch version rejects the marginalist approach of profit maximization. It argues that, under oligopoly, firms aim at 'fair' profit and follow the Full Cost principle in determining the price.

12.4.1 Sweezy's Model of Kinked Demand Curve

According to Sweezy, the most distinguishing feature of oligopoly is that an individual firm does not know (and cannot determine) the exact nature (functional form) of its actual demand curve because of the uncertainty and indeterminacy of rivals' reactions to its own actions. An oligopolistic firm is therefore guided in its decisions by the 'imagined' demand curve which is based on what it expects to be the most likely (probable) reaction of its rivals.

Under oligopoly, a firm expects that when it raises its price, it is most likely that rival firms will not follow suit by raising their prices. The rivals will keep their prices constant in order to increase their sales at the expense of the firm that raises the price. Hence, when a firm increases its price, its demand is expected to fall much more than it would

if its rivals were not to keep their prices constant. That is, for upward changes in price, a firm's demand is expected to be highly elastic.

In contrast, when the firm lowers its product price, it is most likely that its rivals will follow suit because if they did not do so they would lose sales to the firm that lowered the price. Hence, when a firm reduces its price, its demand is expected to increase much less than would otherwise have been the case (because its rivals will also reduce their prices). That is, for downward changes in the price, a firm's demand curve is expected to be less elastic than it would have been if the firm's rivals were not to follow suit by reducing their prices.

Consequently, for an oligopolistic firm, the demand curve is highly elastic and gradually falling for prices above the current or existing price, and for prices below the current price the demand curve is less elastic and steeply falling.

Because of the differences in elasticity (and slope) at prices above and below the current price, the demand curve of the firm has a corner or a kink at the current or existing price.

In Figure 12.2 the firm's demand curve is *APB,* which has a kink or corner at current price *P* and output *ON.* The upward segment *AP* is relatively more elastic than the downward segment *PB.* That is, if e_1 shows the elasticity of *AP* and e_2 shows the elasticity of PB_1 then e_1 is $> e_2$. In Figure 12.2 dotted line PB_1 shows the decrease in the firm's demand that would have occurred if the rivals were not expected to keep their prices constant when the firm raised price above *P.* Dotted line PA_1 shows the rise in demand if rivals were expected not to follow any fall in price below *P.*

Since the elasticity for a change in price above *P* is more than, and different from, elasticity for a change in price below *P,* there are two values of marginal revenue for current price = *P.* Thus the marginal revenue curve has a discontinuity or gap at price = *P.* For the upper *AP* portion of the demand curve the marginal revenue (MR_1) curve is *QC* and for the lower portion *PB,* the marginal revenue (MR_2) curve is *DE.*

The marginal revenue curve corresponding to *APB* is shown by *QCDE* with discontinuity or gap = *CD.* Note that both e_1 and e_2 have to be > 0 for MR_1 and MR_2 to be positive at *P.*
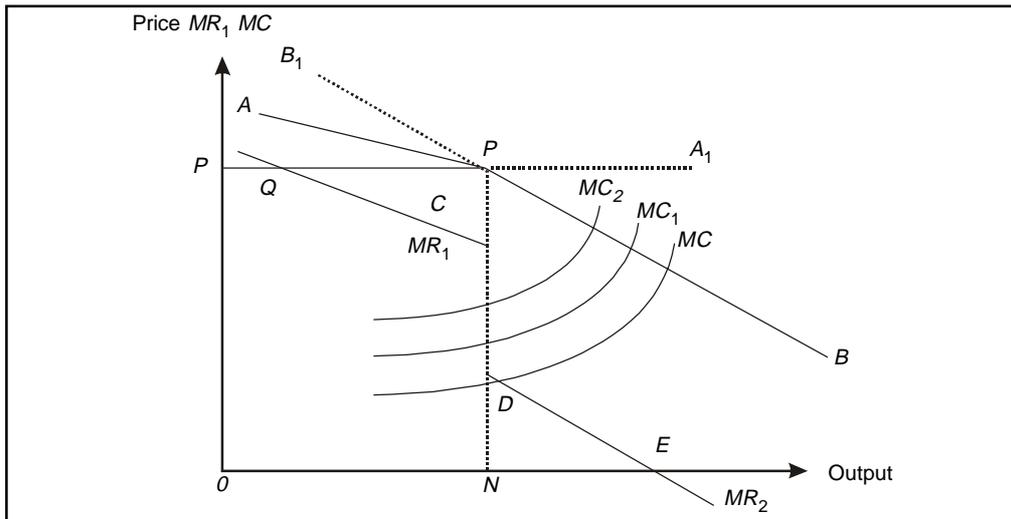

Figure 12.2: Sweezy's Kinked Demand Curve Model

The magnitude (or length) of this gap is given by $P(1/e_2 - 1/e_1)$. This follows from the fact that $MR = P(1 - 1/e)$. We find the $MR_1 = P(e_1 - 1)/e_2$ and $MR_2 = P(e_2 - 1) e_2$.

Hence, $MR_1 - MR_2 = P(e_1e_2 - e_2 - e_1e_2 + e_1)/e_1e_2 = P(e_1 - e_2)/e_1e_2 = P(1/e_2 - 1/e_1)$.

Since e_1 is $> e_2$, the gap $MR_1 - MR_2$ is positive.

The marginal cost curve, MC of the firm passes through the discontinuous gap CD in the marginal revenue curve $QCDE$. Though the current, existing price $= P$ is not precisely equal to the profit maximizing equilibrium price (as there is no unique MR at price P), this price P is consistent with profit maximizing, marginalist equilibrium. For output less than ON we find MC is below marginal revenue and for output more than ON we find MC is above marginal revenue. That is, MC cuts the discontinuous MR curve from below.

Since, under oligopoly, demand curve is kinked at the existing price (P) and marginal revenue curve has discontinuity CD at the existing price, any upward or downward shift in the MC curve will not bring about any change in the current or existing price so long as the new MC curve passes through the gap (CD) in the marginal revenue curve $(QCDE)$.

In Figure 12.2 the new higher marginal cost curves MC_1 and MC_2 are passing through the gap CD with the result that the current price $= P$ continues to be consistent with profit maximization even while remaining constant at the existing level.

Thus the most important conclusion of Sweezy's kinked demand curve model of oligopoly is that price remains unchanged and rigid or "sticky" at the existing level P when, in the short-run, the marginal cost increases due to a rise in raw material prices or hike in wages through trade union pressure.

Thus Sweezy's kinked demand curve model explains the rigidity or stickiness in oligopolistic prices in the face of short-term increases or decreases in variable input costs. When costs of raw materials or labour rise, profits will get squeezed and when these costs fall, the benefit of lower input costs will not be passed on to the consumers.

Thus the Sweezy model of kinked demand curve under oligopoly explains why prices of oligopolistic firms are inflexible and fail to reflect short-run changes in variable costs of raw materials and wages.

The principle shortcoming of the Sweezy model is that it does not explain how the existing or current price is determined, and this is a criticism that Sweezy accepts.

12.4.2 Hall and Hitch version of kinked demand curve

The Hall and Hitch model of the Kinked demand curve is based on an empirical survey of a sample of 38 well managed firms in England. The survey was conducted by these two Oxford economists to find out how firms in the real world determine price and output.

The principal findings of the study are as follows:

(a) In the real world, most manufacturing firms operate in oligopolistic markets.

(b) Contrary to what is assumed by economic theory, in reality oligopolistic firms do not know their demand curve because of uncertainty regarding their rivals' reaction. They do not therefore know their marginal revenue curve. Since most large firms tend to be multi-product firms, they also do not know the marginal cost curve. Thus in the real world, firms cannot determine equilibrium price and output by marginalist calculations, i.e. by equating marginal revenue and marginal costs.

(c) Oligopolistic firms in reality determine their price on the basis of the Full Cost principle. They charge that price which not only covers variable and fixed costs but also yields a fair profit margin. The full cost is the sum of average variable cost (AVC) and average fixed cost (AFC), at normal output level and a predetermined percentage of this sum added for 'Fair' (reasonable) profit. In short, according to this principle, Price = Full Cost = ($AVC + AFC$) at Normal Output + 'Fair' Profits as a percentage of ($AFC + AVC$).

For instance, if normal output is 1000 units, total fixed and total variable costs at this output are Rs. 8000 and 2000, respectively, and fair profit is considered to be 10 per cent, then full cost Price $= 8 + 2 + 1 = 11$ Rs./Unit.

(d) The demand curve has a kink at the price which is equal to full cost price. If a firm charges a price higher than full cost, its rivals will not follow suit but will keep their prices constant. Hence, for prices higher than the full cost price, the demand curve of an oligopolist has high elasticity. If the firm charges a price lower than full cost price, its rivals will follow suit by lowering their prices. Hence, for prices less than the full cost price, the oligopolist's demand curve has relatively low elasticity.

(e) Oligopolistic firms adopt full cost pricing rule because it not only covers *AFC* at normal output but also earns a reasonable rate of profit. The objective of oligopolistic firms is to have long-run stable profits and a "quiet life", free from uncertainties. If profits exceed what is regarded as a "reasonable" or "fair" rate, it may attract new entrants and accusation of "excessive" profits from customers as well as distributors. Both these consequences will cause instability of long-run profits and make life difficult (unquiet) for firm's decision-makers. Similarly, charging a price below full cost will be considered "unethical" by competitors and create a threat of price war. Also, it is difficult to raise price later to the full cost level. Thus, for oligopolistic firms, price tends to remain rigid or sticky at the full cost level, and short-run changes in costs and demand will not cause changes in the oligopolistic price.

The full cost version of the kinked demand curve is shown by Fig. 12.3 where $ON_1 =$ Normal output, $P_1 =$ Full Cost price and $A_1 P_1 B_1$ is the kinked demand curve. Elasticity e_1 for AP_1 is greater than elasticity e_2 for $P_1 B_1$. The kink occurs at the full cost price. Thus unlike the Sweezy version, this version explains how the existing price is determined.

Notes: $OP =$ Full Cost Price at Normal Output.

$ON_1 =$ Normal output, e_1 is $> e_2$
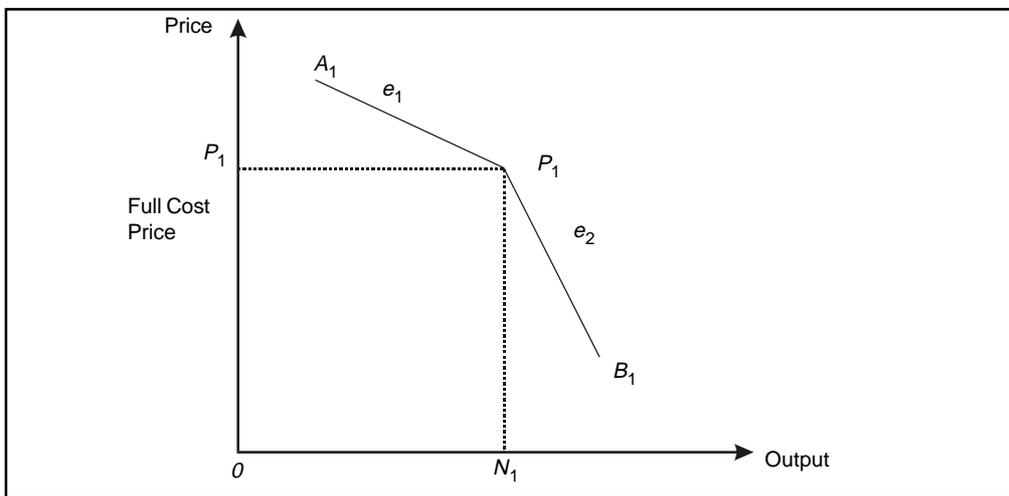
Figure 12.3: Hall and Hitch Version of Kinked Demand Curve

Check Your Progress 2

The kink demand curve theory explains why a price once determined would remain sticky but does not determine that price level. Comment.

12.5 COLLUSIVE OLIGOPOLY MODELS

There can be two types of collusion: (a) Cartels—Firms jointly fix a price and output policy through agreement, and (b) Price Leadership—One firm sets the price and others follow it.

12.5.1 Cartel

A cartel is a formal collusive organization of the oligopoly firms in an industry. There may either be an open or secret collusion. A perfect cartel is an extreme form of collusion in which member firms agree to abide by the instructions from a central agency in order to maximise joint profits. The profits are distributed among the member firms in a way jointly decided by the firms in advance and may not be in proportion to its share in total output or the costs it incurs.

If A and B are two firms which join together to form a cartel, the cartel's marginal cost curve can be shown as a lateral summation of MC_1 (marginal cost of firm A) and MC_2 (marginal cost of firm B), as in Figure 12.4. The cartel is in equilibrium at point E when $MC=MR$. P is the cartel equilibrium price. Each firm will be in equilibrium when it produces output corresponding to the MC of the cartel equilibrium, i.e. at points E_1 and E_2 respectively. Each firm takes price as given i.e. P. The shaded areas represent the shares of profits contributed to the aggregate cartel profit. The division of this profit between the firms depends upon their relative bargaining strengths.
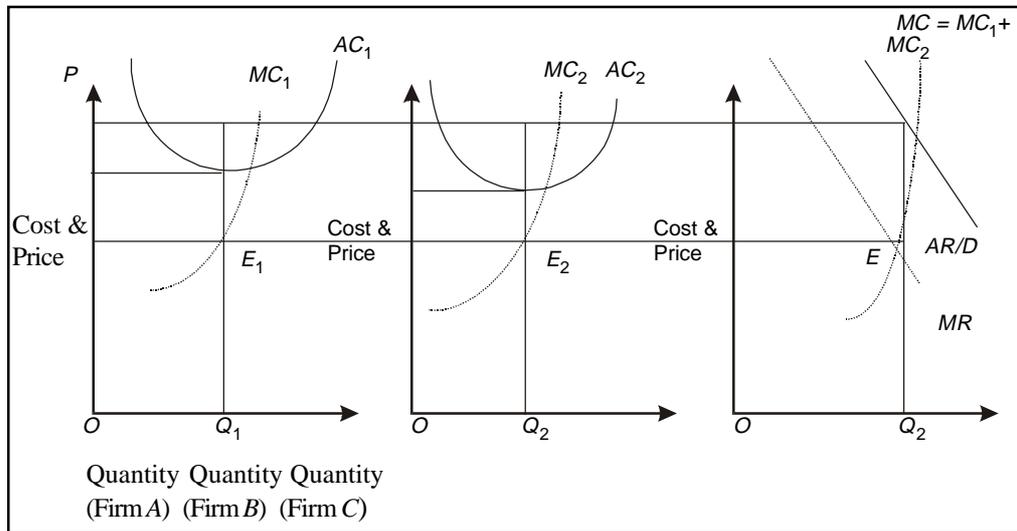
Figure 12.4: Equilibrium under Oligopoly: Cartel

12.5.2 Price Leadership

This is an example of imperfect collusion among duopoly firms. It may result through tacit or formal agreement as one firm sets the price and others follow it. There are two forms to price leadership:

1. *Price leadership by a low cost firm:* Say, two firms A and B face identical demand curves (i.e. AR) and MR. If firm A has lower MC and AC curves then $MC_1 < MC_2$ and $AC_1 < AC_2$, as shown in Figure 12.4. Firm A will maximise its profit by equating MR to MC_1 at point E_1 and selling Q_1 units at price P_1. Firm B will maximise its profits by equating MR to MC_2 at point E_2 and selling Q_2 units at price P_2. But firm B will not be able to charge P_2 price as firm A is charging P_1 which is lower than P_2. The high cost firm will then accept the leadership of the low cost firm and sell Q_2 units at price P_1. The high cost firm shall earn less profit than low cost firm.

2. *Price leadership by dominant firm:* It is more common and happens when a dominant firm shares a larger part of the market along with few small firms. It may become monopolist but compromises with the small rival firms which in turn accept the dominant firm as the price setter and behave as if they are firms under perfect competition i.e. price takers.
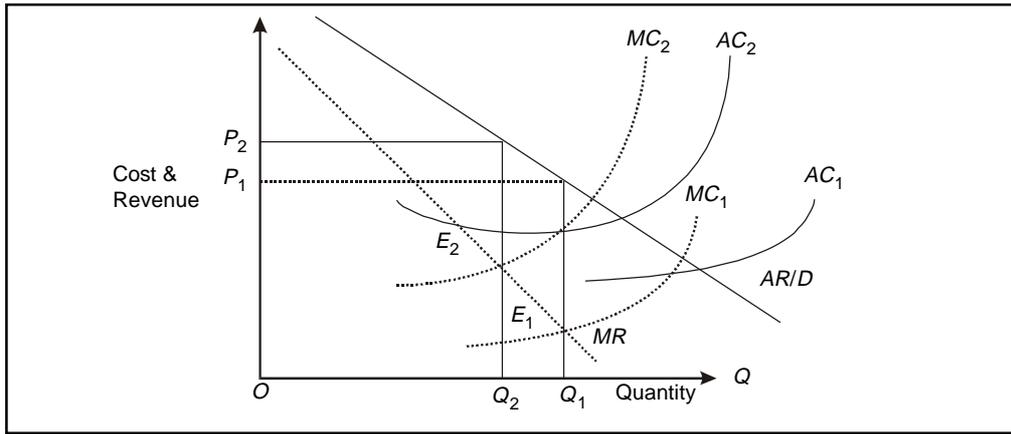
Figure 12.5: Price Leadership by a Low Cost Firm under Oligopoly

It is assumed that the dominant firm knows the aggregate market demand. It finds its own demand curve by setting a price and deduct from the market demand the quantity supplied jointly by the small firms. It also knows the supply curve of the small firms through a knowledge of their individual *MC* curves. The part of the market demand not supplied by the small firms will be its own share. Given a price, the market share of the dominant firm equals the market demand less the share of small firms. Figure 12.6 shows the aggregate market demand curve *(AR)* and the supply curve of the small firm (a) and dominant firm (b).
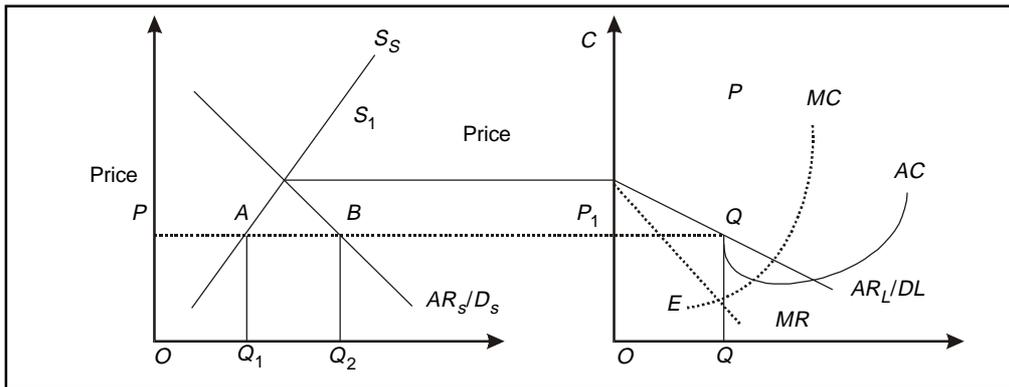
Figure 12.6: Price Leadership by a Dominant Firm under Oligopoly

The gap between *D* and S_s of small firm determines the *AR* curve (D_L) of the dominant firm. The dominant firm maximizes its profit when *MR=MC* at point *E*. It sells *Q* units at price *P*. The demand curve for small firm becomes the horizontal line *PB* which is *AR* as well as *MR* curve for them. S_S is their *MC* or supply curve. They supply Q_1 units at price *P*.

12.6 LET US SUM UP

Oligopoly is a market form characterised by few firms. It is also know as 'competition among few'. Broadly, oligopoly market can be classified into two groups: (i) collusive oligopoly, and (ii) non-collusive oligopoly. Under non-collusive oligopoly, we have studied four models of duopoly and kinked demand curve analysis. Under collusive oligopoly, we have studied models of cartel and price leadership.

12.7 LESSON END ACTIVITY

1. Firm A and B formed a cartel. The following matrix depicts their share of market in two circumstances that they cheat in the cartel or they cooperate. From your given knowledge of cartels, explain the matrix.

		Firm A	
		Cheat	Cooperate
Firm B	Cheat	A: Rs 10 lakhs B: Rs 10 lakhs	A: Rs 5 lakhs B: Rs 25 lakhs
	Cooperate	A: Rs 25lakhs B: Rs 5 lakhs	A: Rs 20 lakhs B: Rs 20 lakhs

2. Comment on the following statements with logical reasoning and appropriate diagrams.

   a)   In oligopoly, there is no one single determinate solution, but a number of determinate solutions depending upon different assumptions.

   b)   The success of price leadership of a firm depends upon the correctness of his estimates about the reactions of his followers.

12.8 KEYWORDS

Oligopoly is a market form characterised by few firms.

Duopoly is a special type of oligopoly market in which there are only two firms.

Curnot model: A duopoly model that analyses the process of equilibrium in a duopoly situation when each duopolist assumes that his rival will not react when he changes his output to maximize profits.

Sweezy's model of kinked demand curve: An oligopoly model which assumes that an individual firm does not know (and cannot determine) the exact nature (functional form) of its actual demand curve because of the uncertainty and indeterminacy of rivals' reactions to its own actions.

Bertrand's duopoly model: This model assumes that his rival firm will keep its price constant irrespective of his own decision about pricing.

Edgeworth's model of duopoly: This model also assumes that each seller assumes his rival's price, instead of his output, to remain constant.

Stackelberg's duopoly model: This model assumes that one of the duopolists is sufficiently sophisticated to recognize that his competitor acts on the Cournot assumption.

Cartel: A cartel is a formal collusive organization of the oligopoly firms in an industry.

12.9 QUESTIONS FOR DISCUSSION

1.   Discuss the meaning and features of oligopolistic form of market.

2.   Compare between cournot is model of duopoly and Bertrand's duopoly model.

3.   What is cartel? Explain, with the help of diagram, the price and output determination under market sharing cartel.

4.   Discuss price leadership model by a low cost firm.

5.   Explain price rigidity in sweezy's kinked demand curve model.

12.10 MODEL ANSWER TO "CHECK YOUR PROGRESS"

Check Your Progress 1

Courtnot's model of duopoly can be extended to more than two firms. It can be shown that if there are three firms in the industry, each will produce one quarter of the market and all of them together will supply 3/4 of the entire

market. In general if there are n firms in the industry each will produce $\dfrac{n}{n+1}$

of the market and industry output will be $\dfrac{n}{n+1}$ of the entire market.

Check Your Progress 2

The kinked demand curve explains the 'stickiness' of prices but does not explain the level of the price at which the kink will occur. In the following figure, we depict two kinked-demand curves, with the kink occur it at a different price level. Sweezy's theory can not define which of the two kinks will materialise.

Quantity
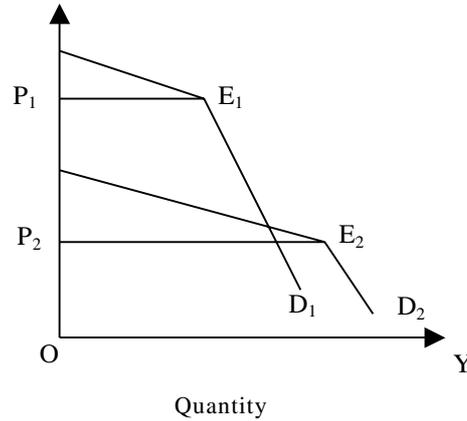
12.11 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

LESSON
13

PRICING STRATEGIES

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CONTENTS

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13.0 AIMS AND OBJECTIVES

This lesson is intended to discuss various price strategy adopted by firms, particularly in case of firms producing multiple products and when government intervenes in market price. After studying this lesson you will be able to:

(i) explain the pricing of products with interdependent demand and joint demand

(ii) describe various price strategies e.g., transfer pricing, cost plus pricing, ramsay pricing, cycle pricing. etc.

(iii) describe the role of government in influencing prices.

13.1 INTRODUCTION

In the previous chapter, we discussed pricing decisions made by a firm under the assumption that most of the firms produce only one product, sold it in only one market,

are organised as centralised entity and have precise knowledge of the demand and cost curves faced by the firm. But in actual practice, most firms produce more than one product, sell products in more than one market, are organised as semi- autonomous profit centres and have general rather than precise knowledge of the demand and cost curves they face. Therefore, this chapter provides broader perspectives of pricing decisions made by a firm. In the real business world, firms practice numerous pricing methods. We will examine pricing practices followed by firms in specific situations.

13.2 PRICING OF MULTIPLE PRODUCTS

In a multi-product corporation, production decisions relating to one product may affect the manufacturing or marketing costs of other related products. The product may be interrelated or independent. For example, Pringles and Tide of P and G are independent while Pantene and Head and Shoulders are interrelated. In case of independent products, demand and cost of one product is not influenced by that of the other. Each product will be produced where MR = MC. However, pricing of related products requires that demand inter-dependencies should be taken into account.

13.2.1 Products with Interdependent Demand

Related products can be complementary or substitutes. Personal computer and keyboard are complements but two different sizes of PC's of different firms are substitutes. The effect of a change in the price of one product on the demand of the other has to be taken into account. Profit maximisation requires that the output levels and prices of various products produced by the firm be determined jointly.

Suppose a firm produces and sells two products, X and Y, its total revenue (i.e., sales) can be represented as

$$TR = TR_X + TR_Y \qquad \qquad \text{Eq 7.1}$$

where TR_x and TR_y is the revenue from product X and Y, respectively. The marginal revenue (MR) of each product is

$$MR_x = \frac{dTR_x}{dQ_x} + \frac{dTR_y}{dQ_x} \qquad \qquad \text{Eq 7.2}$$

$$MR_Y = \frac{dTR_Y}{dQ_Y} + \frac{dTR_x}{dQ_Y} \qquad \qquad \text{Eq 7.3}$$

dTR_x / dQ_x represents a change in revenue for good X resulting from a unit increase in sales of X. While dTR_Y / dQ_X reflects a change in revenue from the sale of good Y, caused by a one unit increase in sales of good X (the demand interdependency). Similar interpretation can be made for the second equation. If the two goods are complements, this effect will be positive, since an increase in the quantity sold of one product will increase the total revenue from the other product. On the other hand, if products X and Y are substitutes, this effect will be negative, since an increase in the quantity sold of one product will reduce the total revenue from the other product. Thus, proper attention should be given to demand–inter relationships among the products a firm sells. If two goods are complements profit maximisation requires greater role of output for product X. In fact, output of X should be increased until

$$\frac{dTR_X}{dQ_X} + \frac{dTR_Y}{dQ_X} = MC_X$$

where MC_X is the additional cost incurred by the firm in producing an additional unit of product X. Similarly, for goods that are substitutes, it can be easily shown that ignoring demand interdependency will cause too many units of output to be produced.

13.2.2 Pricing of Joint Products

Products are often interrelated in production as well. For example, some products are produced in fixed ratio like production of beef and hides in the slaughterhouse. When goods are produced in fixed proportion, they are regarded as a "product package". Thus, one hide and two sides of beef might be a bundle in the case of cattle. Since these products are produced jointly, there is no conceptual basis to allocate the cost of production between the two goods.

To determine optimal price and output of each such product, the marginal revenue of the output bundle should be compared with its marginal cost of production. If the total MR i.e., the sum of marginal revenues from each product package is greater than its marginal cost, than the output should be increased. Thus, output should be increased until marginal cost equals the sum of the marginal revenues obtained from selling an additional unit of the product package.

13.3 TRANSFER PRICING

Many large vertically integrated (vertical integration refers to operation of a firm at more than one stage of production process) firms are decentralised and made semi-autonomous profit centre. One division of a firm sells its product to another division of the same firm. The Reliance Industries has vertically integrated manufacture chain from naphtha to textiles. Oil refining unit produces naphtha, which is used to produce polymers like polyethylene and polypropylene. At a later stage, polyester staple fibre and filament yarn is manufactured by using these polymers that are again used to produce fabric.

The price at which transfer takes place is called the transfer price. Pricing problem arises because if one unit provides intermediate good to the other, the revenue of the unit will depend on the price charged. A high price will increase profits of the unit at the earlier stage of production, whereas a low price will make later stage production more profitable. While an incorrect price can affect the total profit earned by the firm.

13.3.1 No External Market

We assume that the Orion Corporation, a chemical firm has only two separate divisions, a production division and a marketing division. The production division manufactures the basic chemical, which is sold to the marketing division; the marketing division packages the basic chemical into the final product and sells it to outside customers. We assume that there is no external market for the basic chemical produced by the firm and all of the chemical produced during the period must be sold i.e., no inventories is carried over. Then the marketing division of the firm is completely dependant on the production division for the supply of basic chemical. Figure 13.1 (a) shows the optimal price and output for the firm as a whole.

Looking at the two divisions combined, the marginal cost to the firm, MC, at any level of output is the sum of the marginal cost of production, MC_p and the marginal cost of marketing, MC_M. The firm will maximise profit by choosing the output where $MC = MR_M$. To sell this output, it should establish a price P_M for its final product.

If each division maximises its own divisional profit, the transfer price, P_t should equal MC_P, the marginal production cost at the optimal output Q. To see this, note that once this transfer price is set, the production division will encounter a horizontal demand curve for the basic chemical it produces, and its marginal revenue will equal P_t. To maximise its profit, it will choose the output level where $MC_P = P_t$. As shown in the figure, this output level is Q which is the optimal output for the firm as a whole.

The marketing division equals the transfer price P_t to its marginal cost curve MC_t which is the sum of the marginal cost of marketing MC_M and the transfer price P_t. This division will maximise profits by setting its output level at Q, where its marginal cost MC_t equals its marginal revenue MR_M. To sell this amount it charges a price P_M. Thus, this division like the production division acts to promote overall interests of the firm. It establishes the output level Q and the price P_M that maximises the overall profits of the firm.
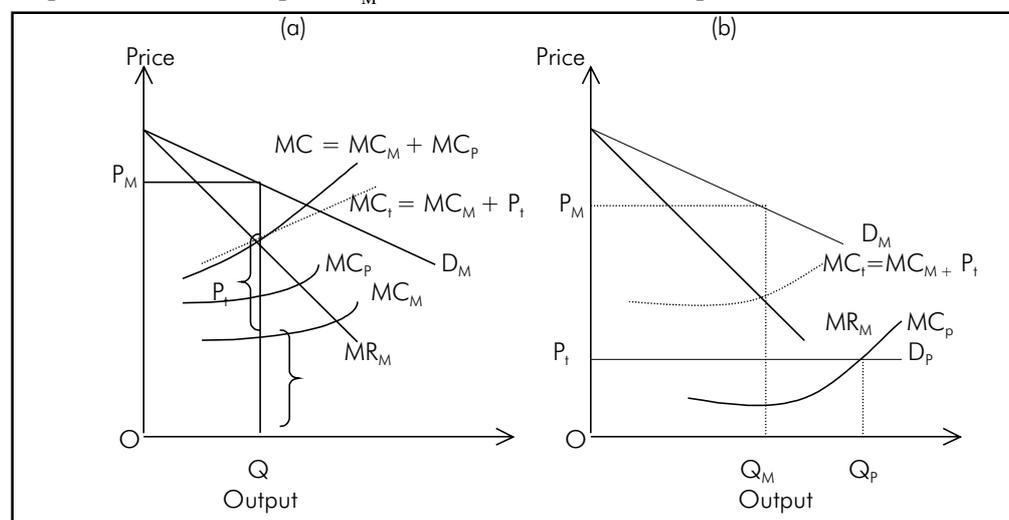
Figure 13.1: Determination of Transfer Price

13.3.2 A Perfectly Competitive Market for the Transferred Product

In many cases, there is a market outside the firm for the product that is transferred from one division to the other. The marketing division can buy more basic chemical from external suppliers, if required. Similarly, the production division can sell more of the basic chemical in the external market.

Since there is a perfectly competitive market for the basic chemical, the production division faces a horizontal demand curve D_p as shown in Fig. 13.1 (b) for its output where P_t is the price of basic chemical in external market. To maximise profit, the production division should produce the output Q_p where $MC_p = P_t$.

To maximise the overall profit, the transfer price should equal P_t the price of the basic chemical in the perfectly competitive market outside the firm. Since the production division can sell any amount of basic chemical in the external market at price P_t, it has no incentive to sell it at a price below P_t to the marketing division. Similarly, since the marketing division can buy the chemical from external suppliers, it has no incentive to buy it from production division at a price above P_t.

The marginal cost curve of marketing division is MC_t which is the sum of the marketing marginal cost MC_M and the price of basic chemical P_t. To maximise profit, marketing division must choose output level Q_M where its marginal cost equals its marginal revenue ($MC_t = MR_M$). Figure 13.1 (b) shows that the output of the marketing division Q_M is less than the output of the production division Q_p, the optimal solution is to sell part of output ($Q_p - Q_M$ units) to the external customers.

Check Your Progress 1

Explain the pricing strategy with regard to joint products.

13.4 COST PLUS PRICING

Surveys of business pricing practices indicate that most firms use cost plus pricing or full cost pricing or average cost pricing technique. This can be an optimal pricing policy

where prices are set to cover all direct costs plus a percentage mark-up for profit contribution. It applies only for market structures where companies have some market power and are, therefore, able to set prices for their products. There are various forms of cost plus pricing, the typical form involves following two steps.

1. The firm estimates the cost per unit of output of the product. The cost per unit is the variable production and marketing cost per unit of output plus the average overhead cost.

$$AC = AVC + AFC$$

$$AVC = TVC/Q$$

$$AFC = TFC/Q$$

Since this cost generally varies with output, the firm must base this computation on some assumed level. Usually, firms use for this purpose some percentage of capacity, generally between two-thirds and three-quarters.

2. A mark-up or profit margin is added to the estimated average cost. This mark-up is generally in form of a percentage and includes certain costs that provide a return to firm's investment. It is determined by demand elasticities and competition. Mark-ups are lower where demand is more elastic and competition intense. The mark-up can be expressed as follows:

$$Mark\text{-}up =$$

Where price - cost is profit margin. Suppose the cost of a paperback book is Rs 4 and its price is Rs 6.

$$Markup = \frac{6-4}{4} = 0.50$$

Case Study 1: Cost – Plus Pricing at General Motors

Cost plus pricing has been used by the giants of American industry as well as by smaller firms like Computron. For decades, General Motors used cost-plus pricing with the objective of earning a profit of 15 per cent (after taxes) on total invested capital. Its managers assumed it would sell enough cars in the next year to operate at about 80 per cent of its capacity; and on this basis of this assumption, they calculated what its cost per car would be. They added to this cost a mark-up big enough to produce the desired return on investment, the result being the so - called standard price. General motors' high level price policy committee took this standard price as approximation, and made small adjustments to reflect competitive conditions, long run goals of the firm, and other factors.

Since these adjustments tended to be quite small, the actual price did not differ much from the standard price.

During the 1960s, the major American auto producers, Ford and Chrysler, also seemed to use the same sort of procedure in setting prices annually for their models. Once announced, these prices normally stayed unchanged through an entire model year, although there were standard discounts to dealers to get rid of end-of-year inventories. The situation was described as follows:

'Each firm, figuring the prices to announce for forthcoming models, naturally looks at trends in its own production and model – change costs and at general developments in the economy. It also pays close attention to its rivals' costs and what they might be expected to charge. In this game, the firm likely to prefer the lowest price has a good deal of leverage to determine the general range of prices announced for any given type of car. The firms in this industry, as in others, dislike getting caught with overpriced

model more than they fear being slightly under the market. In the 1930s, Ford tended to prefer the lowest prices and hence drew close attention from its rivals. In more recent years, General Motors has been closely watched.'

Source: American Industry: Structure, Conduct, Performance; R Caves, Englewood Cliffs, N J: Prentice–Hall, 1967.

or 50 per cent. If we solve the equation of mark-up for price we get,

$$\text{Price} = \text{AC} (1 + \text{mark-up})$$

Thus the price of the paperback book is,

$$\text{Price} = 4 (1 + .50) = \text{Rs } 6$$

Some firms set a target - return figure, that they hope to earn, which determines the mark-up. If Rs X is the total profit, the mark-up over cost on each unit of output will be X/Q. Thus under target rate of return pricing, price is set equal to

$$P = \text{AVC} + \text{AFC} + \frac{X}{Q}$$

Evaluation of Cost – Plus Pricing

Cost plus pricing may contribute to price stability and it is simple and easy to use. It provides justification for price changes. Despite these merits, it is criticised for not taking demand conditions into account. It is also criticised for relying on historical or accounting data instead of incremental or opportunity costs.

If applied properly, cost plus pricing may result in firms coming close to maximum profits. Though it appears to be inconsistent with profit maximisation as it does not takes elasticity of demand or marginal costs explicitly. As one may ask in the example, why 50 per cent mark-up was taken. Why not 25 per cent or 150 per cent? Though average cost is a basis of price determination, it is close approximation of marginal cost decision making. The mark-up is determined by price elasticity of demand for the book. To understand why this is true, recall that

$$\text{MR} = P\left[1 + \frac{1}{e_p}\right]$$

Since profit is maximised when MR = MC, we can rewrite the equation as

$$\text{MC} = P\left[1 + \frac{1}{e_p}\right]$$

Further under certain conditions MC = AC. Thus the equation is rewritten as

$$\text{AC} = P\left[1 + \frac{1}{e_p}\right]$$

$$\text{or AC} = P\left[\frac{ep+1}{e_p}\right]$$

By rearranging the equation we get

$$P = \text{AC}\left[\frac{e_p}{e_p+1}\right] \quad \frac{\text{Price} - \text{Cost}}{\text{Cost}}$$

Under conditions of cost plus pricing

$$P = AC\,(\,1 + \text{mark-up})$$

If we compare the previous two equations

$$(1 + \text{mark-up})\ \frac{e_p}{e_p + 1}$$

The equation clearly shows that, a firm's maximum profit depends on the products' price elasticity of demand. The optimal mark-up goes up as the price elasticity of demand for the product goes down. If the quantity demanded of a product is not very sensitive to its price, a high price can be set to make maximum profits. Table 6.1 shows the relationship between optimal mark-up and price elasticity of demand.

Table 13.1: Optimal Price Mark-up and Price Elasticity of Demand

Price Elasticity of Demand	Optimal percentage markup of MC
1.2	500
1.4	250
1.8	125
2.5	67
5.0	25
10.0	11
20.0	5
50.0	2

13.5 INCREMENTAL/MARGINAL COST PRICING

Correct pricing and output decisions require incremental analysis. That is, a firm should change the price of a product, introduce a new product, accept new orders, and so on if the incremental revenue exceeds incremental costs (refer incremental principle, section 1.6.1). Incremental/marginal/direct cost pricing implies that price of a product is based on incremental cost of production.

When excess capacity exists in the short run, overhead or fixed costs are irrelevant in determining whether or not a firm should undertake a particular course of action. Since fixed or overhead costs have already been covered, any action on the part of the firm that increases revenues more than costs leads to an increase in total profits of the firm and should be undertaken. Long run effects should be considered if the firm anticipates the demand to increase in future if it decides to introduce a new product or lower prices of existing product in the short run to use idle capacity.

In case firm is operating at full capacity, then a lower price to increase sales or introduce a new product will increase all costs, including those for plant and equipment. Full cost and incremental cost pricing in such a case should be considered. Thus, a product can be produced profitably if its price exceeds incremental costs of supplying the product.

Unlike the full cost pricing that is based on average cost, incremental cost pricing considers only variable cost. The two differ on grounds of fixed cost. Fig. 13.2 differentiates between the two. In a competitive situation, a firm will shut down in the short run only when the price is below the AVC, while in the long run the firm tries to cover its total average cost. That is AC = AVC + AFC, which is equal to fully distributed costs. If the firm considers incremental cost, it will not shut down in the short run. Point A is the shut

down point at which the firm sells Q_1 quantity at price P_1. Point B is the break even point where total revenue of the firm is equal to total cost.
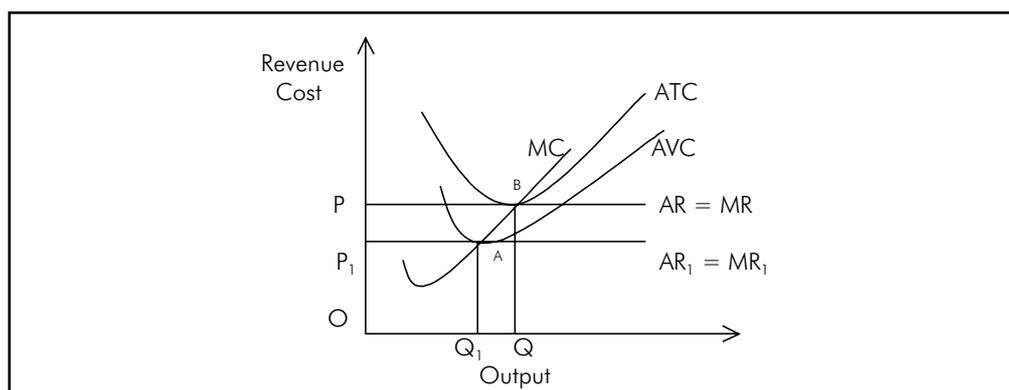
Figure 13.2: Full Cost Vs Incremental Cost Pricing

13.6 RAMSEY PRICING

If an enterprise has common costs, marginal cost pricing may not be feasible. Ramsey pricing is the second best alternative that allows the firm to recover its costs while minimising adverse effects of allocative efficiency. In case of common costs, an unregulated profit–maximising firm may decide which products should be priced above incremental costs and how much above. But for regulated firms limited to a maximum rate of profit and for non-profit enterprises expected to just cover costs, Ramsey pricing provides answers.

A simple version of Ramsey pricing specifies that deviations of prices from marginal costs should be inversely proportional to the demand elasticities of goods and services. Thus, prices of goods for which demand is elastic should be priced near the marginal cost. Conversely, where demand is inelastic, prices should be lower in relation to marginal cost.

If demand is elastic, increasing the price causes a substantial reduction in quantity demanded. But if demand is highly elastic, large changes in prices will result in lesser change in quantity demanded. In the extreme case of totally inelastic demand, there would be no change in quantity demanded as price is increased. Hence, if deviations from marginal cost are greatest for goods with inelastic demand, the resource misallocation is minimised.

13.7 CYCLE PRICING

Cyclical pricing is based on the cyclical variations of economic activity overtime. Time series data reveals that economic/business activity exhibits cyclical variations that are termed as business/trade cycles. Each cycle has four phases as shown in Fig. 13.3. The trough is the point where national output is lowest relative to its full employment level (full employment level is defined as the total amount of goods and services that could have been produced if there had been full employment). The firm should reduce prices to operate when economic activity is at its ebb. Expansion is the subsequent phase during which national output rises. The peak occurs when national output is highest relative to its full employment level during which the firm should increase prices. Finally, recession is the subsequent phase during which national output falls.
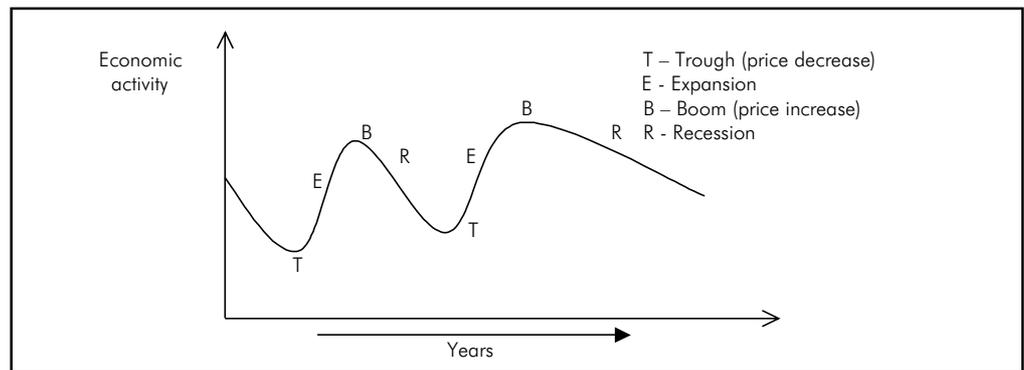
Figure 13.3: Business Cycles and Cyclical Pricing

The firm can set a standard (full) cost and adjust his mark-up according to macroeconomic changes. Discounts and allowances are sometimes used as a part of cyclical pricing. Apart from cost of production, the firm can take the industry price level, price of substitutes, disposable income, and competitive environment into account to set prices in various phases of business cycles. But it has been observed that under cyclical pricing cost is not the sole determinant. The firm may have to make adjustments in price despite no change in cost of production.

13.8 PRODUCT TYING

Under product tying, buyer of one product is obligated to buy a related (usually complementary) product from the same supplier. In 1980s, customers who leased IBM computer had to buy paper computer cards made by IBM. Similarly in 1950s, customers who leased Xerox copying machine had to purchase paper from Xerox. The seller may charge reasonable price for the major product and collect monopoly profits on the lower complementary product. Product tying is undertaken for several reasons.

1.   Tying is done to maintain quality control and protect the brand name. Sometimes an inferior good can be used as a complementary good.

2.   Efficiency in distribution can be achieved if there are savings to the company by achieving a total lower cost in delivering both the products.

3.   Evasion of price controls is possible. If there is a ceiling price on one of the two products, then selling the second product at a higher price will circumvent the control.

Courts intervene to forbid restrictions on competition arising from product tying. For example, McDonald's was forced to allow franchises to purchase raw material and supplies from any McDonald's approved supplier rather than only from McDonald's. This increased competition and ensured quality and protection of brand name.

13.9 OTHER PRICING PRACTICES

13.9.1 Price Skimming and Penetration Pricing

Price skimming refers to setting high prices when the product is launched to "skim" the market. Prices are subsequently lowered gradually. Du Pont is a major follower of this practice. With each innovation – cellophane, nylon Teflon and so on, it estimates the highest price it can charge given the comparative benefits of its new products versus the available substitutes. The company sets a price that makes it just worthwhile for some segments of the market to adopt the new material. Each time sales slow down, Du Pont lowers the price to draw the next price sensitive layer of customers. In this way, Du Pont skims a maximum amount of revenue from the various market segments.

Case Study 2: Role of Smart Pricing Strategy in Earning Higher Profit Margin

How did Ford manage to earn $7.2 billion last year, more than any auto maker in history? The hot economy helped. But Ford could not have done it without a new pricing strategy that helped upgrade the mix of vehicle it sells. From 1995 to 1999, Ford's US market share fell, from 25.7% to 23.8%. Ordinarily that is cause for alarm. But behind those numbers was a 420,000 unit decrease in sales of low margin vehicles, such as Escorts and Aspires, and a 600,000 unit increase in sales of high margin vehicles, such as Crown Victorias and Explorers. Ford cut prices on its most profitable vehicles enough to spur demand but not so much that they ceased to have attractive margins. "This is probably the biggest driver of Ford's profitability," says Lloyd Hansen, Ford's controller for North America and global marketing.

Chalk up another victory for the power of smart pricing. While most companies have gotten savvy about cutting costs, few have figured out how much money they are giving up by using lunkheaded pricing strategies. Lacking detailed information about market demand and their own supply capabilities, companies routinely overprice some products and underprice others. Hansen admits that until about 1995, Ford was among the offenders. Its sales force was compensated on how many units it sold, regardless of profit margins. So it tended to push the low margin cheap as because you could move more units with less spending of precious marketing dollars.

The new strategy of smart pricing draws on microeconomics, buyer psychology, and computing power to sift through lots of data on spending patterns. Talus Solutions, which developed yield – management software for airlines and hotels, is teaching its tricks to other businesses, ranging from United Parcel Service to apartment landlords to a major TV network. Clued - in companies are boosting profit margins – and dealing a blow to the idea that the Internet will inevitably drive down all prices towards marginal costs.

As one of the world's biggest companies, Ford is a good testing ground for the new pricing approach. Starting in 1995, it stepped up market research to find features that, "the customer was willing to pay for but the industry was slow to deliver", such as more comfortable supercabs on trucks, says Hansen. Second, it set up its sales units as businesses and told them which vehicles and option packages made Ford the most money – so they would stop pushing dogs. Third, with assistance from Talus, it rejiggered pricing to encourage customers to move up to better, higher profit vehicles. In 1998, the first five US sales regions that tried the new strategy collectively beat their profit targets by $1 billion, while the 13 that did not missed their targets by about $250 million, says Hansen. Last year, all 18 regions were on board.

It's no coincidence that airlines were the first to get about smart pricing. As long ago as the late 1960s, travel agents were comparing their prices and placing their orders on computer screens. The airlines eventually figured out that the key to making money was to segment customers by their willingness to pay. They squashed discount carriers by offering superlow fares with lots of restrictions for travellers on tight budgets. Today, the prices paid for seats on a flight are as unique as snowflakes. Hotel chains, starting with Marriott in the 1980s, followed suit.

The lessons of airlines and hotels are not entirely applicable to other industries because plane seats and hotel beds are perishable – if they go empty, the revenue opportunity is lost forever. So it makes sense to slash prices to top off capacity if it's possible to do so without dragging down the prices that other customers pay. Cars and steel are not so perishable. Still, an underused factory or mill is a lost revenue opportunity. So it makes sense to cut prices to use up capacity if it's possible to do so while getting other customers to pay full price. That requires segmenting the market – geographically, for instance – so that full price customers cannot see bargains that others are getting. Conventional wisdom says that bargain hunting software on the Web makes it harder to charge different prices to different customers. "There's going to be a domino effect where these markets at one at a time succumb to competition," says Ethan Harris, a senior economist at Lehman Brothers Inc.

Contd...

But there are plenty of examples of prices in the Internet era, even prices of the Net itself, that aren't showing any signs of being driven towards marginal cost. A study last year by Erik Brynjolfsson and Michael Smith at Massachusetts Institute of Technology found that while Amazon.com charges less than bricks-and-mortar stores for books and CDs, its prices remain substantially - and durably – higher than those of online discounters. Although discounter Books.com charged less than Amazon.com 99 per cent of the time, its share of traffic was just 2.2 %. Brynjolfsson speculates that Internet may heighten the importance of trust and brand awareness, both of which Amazon.com has garnered in spades.

One tenet of the new revenue management is that prices should vary constantly with changes in supply and demand. For instance, Archstone Communities Trust, an Englewood operator of apartment complexes, is using Talus Solutions software to set rental rates. If the market is weak, Archstone might offer a prospective tenant a low rent for just a month, instead of locking in that low rate for a full year. Higher rates would be offered for 3-month or 12-month leases.

Varying the price constantly works best when there's no bond between the buyer and the seller. In the stock market, for instance, you don't know and don't care who sold the shares you're buying. But in many transactions, relationships do matter. 'Asking About Prices,' a 1998 book by Princeton economist Alan Blinder and others, concluded from interviews with 200 companies that a big reason for "sticky" prices is that sellers fear antagonising customers with frequent price changes.

A less controversial pricing strategy is to offer customers a unique bundle of products and services so that you meet their needs precisely. That makes it harder for them to make price comparisons. "The idea is to remove yourself form the world of univariate comparisons," says Stuart Feldman, director of IBM's Institute of Advanced Commerce. It's the latest idea in software, which is vulnerable to price wars because the cost of producing more copies is near zero.

Source: The Economic Times, Brand Equity, April 12–18, 2000.

Market skimming is profitable if certain conditions are fulfilled.

1. There is sufficient demand from large number of buyers.

2. The unit costs of producing should be low to take advantage of charging a price that people can bear.

3. A high initial price should not attract more competitors.

4. A high price should support the image of a superior product.

Penetration pricing refers to charging lowest price to secure a certain market share. Texas Instruments is a major practitioner of market-penetration pricing. The company builds a large plant, sets its price as low as possible, with a large market share, experience falling costs, and cut its price further as costs fall. In 1996, Amul launched its Mithai Mate Rs 10 lower than the same quantity of Nestle's Milkmaid, in condensed milk segment, with an eye on the market share. Following conditions favour setting a low price.

1. The market is highly price sensitive and a low price stimulates more market growth.

2. Production and distribution costs fall with an increase in production.

3. A low price discourages actual and potential competition.

13.9.2 Value Pricing and Prestige Pricing

Value pricing refers to the selling of quality goods at much lower price than previously. Manufactures redesign a product to maintain or enhance quality while lowering costs so

as to earn a profit. For example, the PepsiCo Inc.'s Taco Bell chain saw its fourth quarter 1990 sales jump 15 per cent in response to a 'value' menu offering 59-cent tacos and 14 other items for either 59 cents or 79 cents. This forced McDonald's and Wendy's to respond with a value menu of their own.

Value pricing is likely to become common with increasingly sophisticated and bargain conscious consumers. Walter Viera of marketing advisory services group is of the view that, " it won't be only the mass market players who will have to think of value. Top industry marketers such as Cartier will have to address the fact that their customers want value even at that price. Its specially important for marketers in India."

Prestige pricing or image pricing refers to deliberately setting high prices to attract prestige – oriented consumers. It is assumed that some customers will demand a product at a higher price since it will bestow prestige or snob value to them.

For instance, in the luxury automobile market, high priced cars are perceived to possess (unwarranted) high quality, even though other makes of similar quality are sold at a lower price. The buyers perceive the two makes of automobiles as different products. Image pricing is especially effective with ego sensitive products such as perfumes and similar luxury goods.

13.9.3 Going Rate and Sealed Bid Pricing

Going rate pricing refers to pricing of new product of a firm according to the prevailing prices of comparable products in the market. If comparable products are available in the market then the prices of related goods or existing brands are taken into account to set the price of the new product.

Major car companies take import cost of components into account with other factors in determining the price.

Sealed bid method is totally competition based. Prospective sellers (buyers) are asked to quote their prices through sealed cover and who quotes the least (most) is awarded the contract (purchase/sale deed). This method is popular in construction activities and in disposition of used products.

13.10 GOVERNMENT INTERVENTION AND PRICING

Government plays a vital role in influencing the business and prices.Government regulates the business. It not only decides the rule of the game it also look after the implementation of the rules. Government can influences the prices in following manner:

1. ***Reservation:*** It limits the spheres of investment by reserving the industry for small scale, public and co-operative sector. As prior to liberalization Petroleum, Telecommunication, Coal, Power, etc. were the monopoly of Public Sector, but liberalization bring new investment opportunities for private sector as now only two sector railways and atomic energy are reserved for public sector. Many industry are still reserved for small scale sector. Because of this policy we see boom in many industry in last fifteen years. As now India has more mobile user than that of Land line users, Reliance established one of the largest grass root refinery of the world, and besides other big players as Bharti Telecom , Reliance and TATA have invested heavily in Telecommunication new power projects were established by private sector, Aviation is no more an Govt. monopoly, dozen of private players are there as Sahara Airlines, Kingfisher Airlines, Spicejet, Air Deccan etc., host of new player enters in finance sector specially in Insurance Sector as now to tap new opportunity, many business houses like TATA, AVBirla, Bajaj, ICICI etc have forayed in insurance sector. Through the reservation govt. can increase or decrease the competition and can also influence the level of investment thus can influence the pricing.

2. *Licensing:* License is an very effective tool in the hands of Govt. to regulate the business. Earlier, for almost every new venture license is required and through it Govt. used to keep tight control on the production in private sector, but now only investment in few industries requires license. Though in few cases industry may have to acquire license from different other authorities as Pollution control board, ISI, Ministry of Environment and Forest, Food and Drug Administration etc. Higher the level of licensing in a country , higher the govt. intervention in the pricing.

3. *Expansion:* Government can give the opportunity to the business house to expand to its height and can even limits its expansion programmes. As earlier through MRTP Act, Govt. have restricted the expansion of big houses, not only this various restriction were imposed on increasing production capacity or launching new variants, even restriction were there on advertisement budget of big houses. Restriction was there on investment in abroad. Indians companies are producing at economies of scale, consumer have a wide choice from big product portfolio of companies. Thus the level of investment and production capacity is on the mercy of Govt.

4. *Foreign Direct Investment:* It is the Govt. who decides , whether MNC can invest in a country or not. Because of Govt. policy there are very few MNCs in India. Even companies like IBM and Coca Cola had to leave India because of Govt. policy. Today MNC are in the field of even sectors like insurance ,petroleum, banks and publication but they are not in Retail sector as Govt. don't allowed foreign participation in retail sector.

5. *Import and Export Policy:* With a small declaration Govt. can open and close various avenues for export and import. As a policy matter Govt. can use various tool to impose restriction on import as quota, tariffs, cumbersome import process, import licenses etc. Till 1991, India followed a protectionist policy and protected the industry from import through various tools. But now policy has been changed and import is easy. It begets new opportunities and treat for the business. As because of this Indian Toy industry very badly affected and many have to shut down their operation. So it is the Govt., which decides that what can be imported or exported, and what can not be. Cheap import of raw material or finished goods reduces the prices and vice versa.

6. *Taxes:* Through taxes also Government regulates the industry. Govt. usually impose high rate of tax on the industry which it don't want to encourage as after independence very high excise was imposed on product like ACs, Automobile etc and there was virtually no tax on production of products reserved for small scale industry and to increase the use of particular product. Govt. even provide subsidy as on Fertilizer and Tractor and other farm equipment. Govt. also influences the location of industry by giving tax breaks in establishing industry in a particular region. Higher the taxation higher the prices.

7. *Supply of Money:* Demand depends upon the purchasing power of the consumer and the purchasing power depend upon supply of money and supply of money is decided by the Govt. (RBI). There are many ways through which Govt. regulate the supply of money. RBI can increase the supply of money in the market by decreasing the CRR , SLR etc. which decreases the interest rate in the market. In last 15 years interest rate have been decreased drastically, which have given more purchasing power to consumer. It boosted the consumer goods industry and Housing industry. Govt. can also increase or decrease the supply of money by increasing or decreasing income tax rate and interest rate on savings. So industry is to an extent dependent on Govt. to increase the demand. Higher the supply of money in the market higher the prices and vice versa.

8. *Supply of FOREX :* Govt. not only regulate import and export through policy decision it also control it through control of supply of foreign exchange. Prior to

liberalization it is the Govt. which used to decide the exchange rate, to restrict the import it usually restrict the supply of Forex, to boost export and discourage import Govt. also devaluate the currency. After liberalization when Rupee is convertible then also RBI control the supply and exchange rate through open market operation.

Besides all these, Government regulates the business through administrative and physical controls. So we see that Govt. regulates almost every aspect of business and not only this it gives opportunity to invest and simultaneously it restrict investment in particular area. FOREX controls again gives the power in the hand of Govt. to control the import and export.

9. *Incentives:* Govt. also regulate the industry by giving incentive in key thrust areas. As Govt. gives tax breaks if industrial unit is established in backward area. It also gives subsidy under various schemes to small scale sector. To support exports it establishes special Zones like SEZs , it gives subsidy on export, tax relaxation on export, import licenses and less import duty for exporters, and easy financing through banks. To support a particular industry in national interest it also direct the financial institution to give liberal loans to that sector that too at easy terms. To give boost to housing industry Govt has given exemption to housing loan from Income Tax. Higher the incentives in specific areas lower the prices.

10. *Administered Pricing:* Many times Govt. directly influences the prices. It dictates the prices. As in India, Govt. announces the support prices for agriculture produces. Many times it directly influences the prices of petroleum products.

Govt. also plays a significant role in pricing of the pharmaceuticals product specifically the life saving drugs. Many a times it declares the maximum price at which a drug can be sold.

13.11 LET US SUM UP

This chapter provides perspective of pricing decisions made by a firm. Firm practice numerous pricing practices. This chapter discuss some of them. In a multi-product corporation product may be interrelated or independent. The pricing of related products requires that demand inter-dependencies should be taken into account.

Many a time organization sells same product at different prices. This is called price discrimination. They discriminate the prices to skim maximum. As discounts are given to the bulk buyers, to customers who give cash payments, some time goods are sold on marginal cost. Chapter also discusses other pricing strategies as price skimming and penetration pricing, values and prestige pricing.

13.12 LESSON END ACTIVITY

1. Describe in detail how Government influences the pricing .

2. Discuss the regulatory role of the government

13.13 KEYWORDS

MR: Marginal Revenue

MC: Marginal Cost

AVC: Average Variable Cost

Joint Products: More than one product which are produced by single production process

Substitute Goods: The goods which can be used in place of each other.

13.14 QUESTIONS FOR DISCUSSION

1. (a) Why do firms produce more than one product?

    (b) What is demand interrelationship for a multiple product firm?

    (c) What is the rule for profit maximisation for a multi product firm?

2. Why should jointly produced goods in fixed proportions be regarded as a single production package and treated separately in demand?

3. A city has only one furniture store. Is it likely that the store could successfully practice price discrimination? Why or why not?

4. Is persistent dumping beneficial for the country? Why do countries resort to dumping?

5. (a) What stages are involved in cost plus pricing?

    (b) What are the advantages and disadvantages of cost plus pricing?

6. How can cost plus pricing be reconciled to the "marginal revenue equals marginal cost" rule of economic theory?

7. How does the presence or absence of external markets affect the role played by top management in pricing of intermediate products produced by a vertically integrated firm?

8. If an intermediate product were available from a perfectly competitive industry, why would a vertically integrated firm produce the product internally? That is, what is the advantage of vertical integration in this case?

9. Describe the following with examples:

    (a) Price penetration and price skimming

    (b) Value pricing and prestige pricing

    (c) Product tying

    (d) Competition based pricing

10. The managers of a firm are considering offering a new service. The proposed price of the new service would be greater than its incremental cost but would not cover fully distributed costs. As a user of services already provided by the firm, would you favour or oppose the new service? Explain.

11. What is Ramsey pricing? How is it related to marginal cost pricing? What is the important exposition of this technique of pricing?

12. As a manager of a steel firm how would you take pricing decisions in context of business cycles?

13. How is bundling similar to price discrimination? Which requires more information about consumer preferences?

13.15 MODEL ANSWER TO "CHECK YOUR PROGRESS"

To determine optimal price and output of each of joint products, the aggregate marginal revenue (AMR) should be compared with its marginal cost of each such product. Output should be increased until marginal cost equals the sum of the marginal revenues obtained from selling and additional unit of the product package.

13.16 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

UNIT-IV

LESSON

14

PROFIT ANALYSIS

14.0 AIMS AND OBJECTIVES

The main objective of this lesson is to discuss meaning, nature and various theories of profit. After studying this lesson you will be able to:

(i)   understand meaning and nature of profit

(ii)   differentiate between gross and net profits, normal and supernormal profits and accounting and economic profits.

(iii)   describe risk and uncertainty theory of profit, dynamic theory of profit, innovation theory of profit, etc.

14.1 INTRODUCTION

Profit motive is the most important motive that governs the behavior of business firms. In studying the pricing and output decisions of the business firm, economists usually rely on the assumption of profit maximization. The difference between the total revenue and total cost in economic profit, which, it is assumed the firm attempts to maximize subject to the constraints imposed by consumer demand and production costs discussed in earlier chapters. The profit analysis allows us to predict quite well the behaviors of business firms in the real world. Profit analysis is quite useful in predicting the price and output behaviors of business firms in response to changes in tax rates, wage rates, availability of resources, and so on.

14.2 MEANING AND NATURE OF PROFIT

Profit is the reward of the entrepreneur rather than the entrepreneurial functions. Profit differs from the return on other factors in three important respects: (a) Profit is residual income and not contractual or certain income as in the case of other factors; (b) There are much greater fluctuations in profits than in the rewards of other factors; and (c) profits may be negative whereas rent, wages and interest must always be positive.

The term "profit" means all excess of income over costs and this includes the earnings of self-used factors; i.e., entrepreneur's own land, capital and his own labour work called respectively implicit rent, implicit interest and implicit wage. But in economics, profit is regarded as a reward for the entrepreneurial functions of final decision making and ultimate uncertainty bearing. Profits can be expressed in the following different ways.

14.2.1 Gross Profit and Net Profit

A businessman analyses gross profit income available to him after payment is made to contractual hired factors and taxes, depreciation charges, insurance charges. In other words, it is the excess of revenue receipt over explicit payment and charges.

Gross profit = Total Revenue – Explicit costs

Net profit, also called as pure profit or economic profit, is the residual balance of income after making payments to all contractual and non-contractual payments to factors of production. Implicit costs have to be deducted from gross profit to arrive at net profit, which could be positive or negative.

14.2.2 Normal Profit and Supernormal Profit

Normal profit refers to that portion of profit which is absolutely necessary for the business to remain in operation. In other words, it is the minimum necessary to induce the business to remain and operate. Normal profit forms part of the average cost. The organiser obtains normal profit when average revenue is equal to average cost (AR = AC).

Super normal profit or abnormal profit could be treated as any return above the normal profit. It is the residual surplus after paying for explicit costs, implicit costs and normal profit. When average revenue or price is more than the average cost, the entrepreneur gets super-normal profits. The existence of this profit is not obligatory to the firm to remain in business like normal profits.

14.2.3 Accounting Profit and Economic Profit

Accounting profit is the revenue obtained during the period minus the cost and expenses incurred to produce the goods responsible for getting the revenue.

Accounting profit = Total Revenue – The cost involved in producing and selling.

This theory is heavily discounted on the ground that it does not take into consideration other expenses like the entrepreneurs wages, rental incomes on self-owned land and interest on self-capital (also called as imputed cost).

The economic profit refers to those items that take into consideration both explicit costs and implicit costs. Economists point out that economic profits are more important than accounting profits since they alone reflect the true profitability position of the business enterprise.

Economic profit = Total Revenue – Explicit costs + imputed costs.

OR

Economic profit = Accounting profit - Imputed cost.

Check Your Progress 1

What is the difference between Accounting and Economic Profit?

14.3 THEORIES OF PROFIT

The theories of profits could be analysed and explained as follows:

- Profit as the reward for risk bearing and uncertainties,

- Profit as the consequence of frictions and imperfections in the economy (dynamic theory of profits),

- Profit as a reward for successful innovation, and

- Profit as a payment for organising other factors of production.

Thus, there are several viewpoints in explaining theories of profits.

To some economists, profits are nothing different from rent. Rent is defined as a differential surplus. Similarly profit also arises when some entrepreneurs have more ability over others in the field of production. While rent refers to land, profit refers to production. A superior entrepreneur enjoys more talent as compared to a marginal entrepreneur. Prof. Senior and Prof. Mill treated rent and profit on the same level and this was responsible for developing a full fledged theory of profit by the American economist Prof. F Walker. His theory is called the "Rent Theory of Profit".

Prof. Walker's concept of profit is synonymous with Prof. Richardo's theory of rent. Rent arises due to the fact that not all pieces of land have the same fertility and productivity; likewise profit arises due to differential factors in talent and ability of the entrepreneur, who is supposed to be the captain of industry. This position ensures the emergence of differences in industrial revenue profit, just like the differences in agricultural revenue and rent. Prof. Walker treats profit as "rent of ability".

14.3.1 Risk and Uncertainty Theory of Profits

This theory envisages that profit is a reward paid to the organisation for undertaking risks. People generally do not want to shoulder risks but some who are prepared to venture in spite of risks involved should be rewarded and this rewards is profit. Higher the risk, higher will be the reward. Since business operates under conditions of uncertainty, the risk premium, in the form of profit is to be paid. Risks are not confined only to owners who receive profits and even non-entrepreneurial risks, like the risk of vocational specialisation are also important. According to Prof. Hawley, risk bearing is the special

function of an entrepreneur and it leads to the emergence of profit. Greater the risk, greater will be the expected gain to induce entrepreneur and to start the business. Most businesses are speculative and reward is necessary to the risk bearer. According to Prof. Hawley's concept, enterprise is the only real productive factor – land, labour, and capital are subordinate factors and mere means of production. Prof. F H Knight contends that risks are an inherent factor in any business and they are of two kinds, insurable risks and non-insurable risks. In the case of insurable risks one can predict the event and it could be subject to insurance. This insurance premium becomes a part of the cost of production and enters into price. But business risks are non-insurable and these risk are necessarily to be borne by the entrepreneur himself. They include risk of competition, technological risks, business cycle risks and risks arising from governmental action such as tax policy, price control, import and export restrictions, etc. The above risks are not insurable. Prof. Knight advanced the theory that pure economic profit is related to uncertainty. The foreseen risks are insurable. The only unforeseen risks are non-insurable and they are responsible for the emergence of profit. According to him, it is uncertainty-bearing rather than risk-bearing that earns profit for the entrepreneur.

14.3.2 Profit as a Reward for Market Imperfection and Friction in Economy

(Dynamic Theory of Profit)

In a static economy neither demand nor supply changes. The demand for a commodity depends upon the size of population, incomes, consumer's tastes, substitutes of commodities, price and the price of related goods. In a static equilibrium, the supply of the commodity does not change. When demand and supply do not change, the price as well as the cost of production remain constant.

So, to say, in a static equilibrium the price of the product will be equal to the average total unit cost of production including normal profit. But this static equilibrium concept is only theoretical in character.

In a dynamic world, things keep on changing and every thing is uncertain. In a dynamic economy all factors that influence demand and supply change continuously resulting in profit or loss. The demand for a commodity or service may increase due to many factors like population, rise in incomes, non-availability of substitutes, changes in tastes, etc. Such a demand may increase price of the product and the cost of production remaining constant, profit will arise. Similarly the supply position may also increase due to improvements in transport facilities, introduction of new production processes, reduction in the cost of raw materials, etc.

According to Prof. Clark, profits belong essentially to economic dynamics and not to economic statics where the economy is frictionless and full competition pervades. In a static economy, pure profit would be eliminated as fast as they could be created.

A war, an inflation, a business depression are all factors in a modern economy which lead to profit or losses. During inflation, prices and costs go up but prices increase at a faster rate than costs resulting in larger margins of profit to producers and merchants. During a depression the opposite trend prevails. These consequences are common to all firms and industries and beyond the control and influence of anyone.

At times, individual firms introduce dynamic changes through inventions of science and technology; introduction of new processes of production; introduction of new commodities and changes in advertisements and salesmanship. These changes are the cause for the emergence of profit. Some argue that profit is the result of disequilibrium and imperfect competition in the market. Especially the monopoly powers prevailing in the market help producers of companies to accrue profits. They raise prices by restricting output and the economy cannot adjust itself immediately to changes in costs and demand. Their concept of profit is due to the enhanced earnings of a permanent monopoly and which is market imperfection.

14.3.3 Innovation Theory of Profits

Prof. J A Schumpeter's theory of profits is almost akin to the theory of profits enunciated by Prof. J B Clark. Prof. Schumpeter, in his innovation theory, attributed profits to dynamic changes in the productive process due to the introduction of modern science and technology of production techniques. Risk plays no part in this theory and profits are solely attributed to dynamic development. Innovation may bring about changes in methods of consumer tastes increasing national output more than increase in costs. The increased net output is the profit out of innovation. New organisation, new promotion, new raw material, new markets or new products constitute innovation. Through advertising and research laboratories innovation is built into the competitive system. It may also be argued that profit is the cause for innovation. According to Schumpeter, profit is both the cause as well as the effect of innovations and thus it is the cause and effect of economic progress also. Profit accrues not to the innovator, nor to the financier but to the entrepreneur who introduces it into the productive process. When innovation becomes obsolete profit disappears and innovation is always subject to competition. Innovational profits have a tendency to appear, disappear and reappear as the result of emergence of new and more clever innovation.

14.3.4 Profit as a Reward for Organising other Factors of Production

A proportionate combination of the various infrastructures, men, material, money, machinery, marketing is quite indispensable to produce the desired output. Entrepreneur takes this responsibility to coordinate these infrastructures to produce products. He not only takes unforeseen risks but also, in the midst of uncertainties, combines the factors of production to produce output. A disproportionate combination of factors only increases cost of production and reduces profits. It is here that the entrepreneurial skill and wisdom play a very important part. In owner-managed firms, part of the profit goes to the manager's skill. In large corporations, the responsibility of organising the infrastructure and their efficient and effective utilisation to the optimum point fully rests with the salaried managers and as such the companies profit is to be treated as a payment for organising and directing activities.

All profits, in a sense, are complementary, since many factors like risk, uncertainty, innovation and monopoly powers, etc., affect every business activity in profit earning.

In general, it could be argued that under perfect competition, when the price is equal to the average and marginal costs, the entrepreneur gets only "normal profits" and not supernormal profits.

Under imperfect competition, which includes monopoly, duopoly, oligopoly and monopolistic competition the entrepreneur, by exercising control over the supply and price of his product and by creating artificial scarcity in the availability of products, can earn supernormal profits.

In the real world, there is imperfect competition. No single theory is capable of explaining the cause for the emergence of profit. All the theories are interrelated. Innovations cause dynamic changes leading to economic progress. Uncertainty is the hallmark of dynamic changes and innovation is uncertainty tied up with risk. Thus, all the causes of profit are interrelated and interdependent. The result is that profit is always uncertain, profits are non-calculable and cannot be accurately estimated.

Prof. Peter Drucker has enunciated three very important functions of profit namely (a) profit can measure business performance and its soundness and effectiveness (b) profit is the premium that covers the cost of staying in business and the indicator of the general efficiency of the firm (c) and profits can guarantee the supply of future capital necessary for innovation and expansion of the business enterprise. Thus profit is a very important tool for the business enterprise for its continued existence and to cater to the needs of the community.

14.4 DEPRECIATION

With the passage of time and use, the equipment, machinery and buildings wear out and in course of time they become useless from the business point of view – they only have scrap value. To measure the true income of a business, a charge is made by the accountant against the annual income of the business and this charge is termed as depreciation. It is usually provided in equal amounts over the life of the asset. The provision of depreciation enables the firm to provide for replacement of the asset by the time it is declared a scrap. The depreciation charges vary from company to company. In heavy industries like iron and steel, air transport, railways, aluminium industries, etc., heavy depreciation charges are provided; whereas in the case of banks, insurance companies, financial institutions, etc., the depreciation charges are relatively lower. Depreciation acts as an instrument for stimulating capital formation and directing investments in the national interest.

For the purpose of reporting business profits to the shareholders and income tax authorities, different methods of measuring depreciation are followed.

The commonly accepted methods of depreciation are discussed below.

14.4.1 Straight Line Method

Under this method an asset is supposed to wear evenly during its normal life and depreciation is provided uniformly on the assumption that the asset depreciates more rapidly at some stages of its life than at others. Assuming that there is no scrap value, the annual depreciation is worked out by dividing the initial value of the asset by the number of years estimated. If the asset has scrap value, it is deducted from the initial cost and then divided by the estimated life in years.

For example if the initial cost of the asset is Rs 5,000 with a scrap value of Rs 500 and estimated life of 5 years, the amount of annual value of depreciation would be

$$Rs \frac{5000 - 500}{5} = \frac{4500}{5} = Rs \, 900 / per \, year.$$

This method is very simple, provided the asset is not prone to premature retirement due to obsolescence or accidents.

The depreciation charge is made against annual income and set apart for being credited to depreciation fund. This method does not take into consideration the fact that the cost of repairs is likely to be higher in the later years of the life of the asset due to heavy wear.

From the economists point of view there are two methods of charging depreciation. First, the opportunity cost of equipment, that is, the most profitable alternative use of the asset that is foregone by putting the asset to its present use. Secondly, the exhaustion of year's worth of limited valuable life of the asset to be the basis of depreciation charges, and this is measured by the replacement value of the equipment that will produce comparable earnings. Both these economic concepts are important to management since the opportunity cost is required for operation problem of profit making, whereas the second is required to find out the replacement of eroded earnings ability which help in financial problems of preserving and administering capital.

14.4.2 Declining Balance Method (DBM)

According to this method, depreciation is provided at a uniform rate on the written value of the asset at the commencement of the year. For example, if the value of the asset is Rs 2,000 at the beginning of the year and the rate of depreciation is 20 per cent, the first year depreciation will be Rs 400 and the written down value of the asset at the beginning

of the second year would be Rs 1600. Similarly, the written down value in the 3rd year would be Rs 1280 and so on. Under this method even after 5 years the written down value will never be zero and as such the asset is supposed to have some scrap value.

The formula could be as follows:

$$D = 100 \frac{1 - \sqrt[\frac{1-x}{S}]{\frac{S}{C}}}{C} \ 1 - n\frac{S}{C}$$

D	stands for percentage of depreciation
S	stands for residual value of the asset
C	stands for initial cost of the asset
n	stands for estimated life of the asset in years

From this method, it could be seen that the written down value at the close of the 5th year is equal to the scrap value of the asset.

14.4.3 Sum of the Year's Digits Method (SYDM)

This method is similar to declining balance method that is to provide for more or less uniform total cost of operation of the asset. But this method differs from the declining balance method in that the book value remains constant while the annual rate of depreciation changes. For example, the expected life periods are 5,4,3,2 and 1, which add upto 15, than 15 serves as a common denominator of the numerators 5,4,3,2 and 1. Thus, the annual rates are 5/15, 4/15, 3/15, 2/15 and 1/15 respectively. If it is assumed that the original value of the asset is Rs 1000, scrap value is Rs 100 and the expected life of the asset is 5 years; the basis is Rs 1000 – 100 = Rs 900.

Age of asset	Varying rate of Depn.	Annual Depn.	Accumulated Depn.	Book value
1	5/15	300	300	700
2	4/15	240	540	460
3	3/15	180	720	280
4	2/15	120	840	160
5	1/15	60	900	100

Either of these two methods DBM and SYDM will be found useful as well as equitable.

14.5 VALUATION OF STOCKS

Stock could be valued in the following different ways:

- First in First Out method (FIFO) which assumes that the units purchased first are issued first.

- Last in First Out method (LIFO) which assumes the units purchased last are issued first.

- Weighted Average Method (WAM) which assumes that the goods purchased are intermixed and units are issued at a cost which is an average of the cost of each purchase, weighted by the quantity purchased at that cost. Even the closing stock is valued at the average cost.

14.6 TREATMENT OF CAPITAL GAINS AND LOSSES

Some conservative companies, which are traditionally bound, have a tendency not to include capital gains in the current profits and would like to write off capital losses from

the current profits of the year in which the loss takes place. Unrealised capital gains, should not be included in profits. In case of revaluation of property, if there is gain, it is usually transferred to capital reserve. Capital gains and losses may be defined as other real goods. All the assets that constitute the value of the firm are sucessptible to windfall changes. For example, value of cash depreciation in inflation, inventory subject to fire, etc., leads to capital losses and they may be written off out of retained earnings. Thus, the amount of profit would also be affected by the treatment of capital gains and losses.

14.7 TREATMENT OF DEFERRED EXPENSES

(Amortisation of long-term tangible assets)

These assets could be classified into two categories:

● Those having a limited life for example patents, licenses, etc.

● Those having no such limited life for example trademarks, goodwill preliminary expenses, etc.

With regard to the first item, there is no difference of opinion on the question of writing off these assets during their lifetime. The justification is based on the grounds of conservation.

In the case of intangible assets with no limited life, there is a difference of opinion whether the assets could be written off or not. If yes, then what should be the period of their amortisation. For example, with regard to goodwill, there is a view that it should be written off immediately upon or after acquisition because goodwill is a fancy asset that has no place in the balance sheet.

Check Your Progress 2

Discuss the statement "Profit is a reward paid to the organization for undertaking risks"

14.8 PROFIT PLANNING & FORECASTING

In the modern dynamic world the attitudes and policies of business firms are entirely different. Economic theory makes an assumption that the maximisation of profit is the sole objective of a business firm. Today profit maximisation refers to the long run periods; to managements rather than to owner's income; to include non-functional income; to restrain competition; to maintain management control, etc. Of late there seems to be same realisation on the part of the management and economic theorists that firms do not always aim at profit maximisation in relation to marginal cost and revenue, but set standards and targets of reasonable profits for the following considerations.

● To attain industry leadership

● To forestall potential competition

● To prevent governmental intervention and restraints

● To maintain and foster consumer goodwill

● To control wage increases

● To avoid risks threatening the survival of the business firms and

● To maintain the liquidity of the business firm.

Modern business firms feel that they have a social responsibility and an obligation to society and therefore they are even prepared to sacrifice profits during the short run

periods. The executives want to limit profit in order to maximise their own benefits either by non-diluting control over the industry or by the desire to maintain pleasant working conditions. Today firms set "profit standards" through a percentage on sales or a reasonable return on investments. To discourage potential competitors, return on investments seems to be a relevant profit standard if all new firms have similar cost standards. From the owner's point of view return on capital is the best method for profit standard because the ratio of profits to sales varies very widely among firms. Now the problem is how to set the standard and what is the criteria behind it.

Capital is formed by attracting investments (profit is a bait to attract capital along with the interest rates) and also by ploughing back the earned profits. Therefore, the criteria to be set depends upon the mode applied to achieve the above.

It is necessary to set different standards for different companies and purposes, since they give widely varying results depending on market conditions. The business firms pursue a variety of profit policies to achieve different goals like long run survival; to maintain safety margins; to introduce leisure as a variable; to maintain financial control of the firm; to maintain liquidity; to earn a satisfactory return or to maximise sales subject to profit constraints, etc.

14.8.1 Profit Planning

A sound and healthy business should always aim at consistent profit in the midst of risk and uncertainties which are a result of the dynamic nature of consumer needs, peculiar nature of competition and uncontrollable nature of costs. Thus, planning for profit is absolutely necessary, and demands a thorough understanding of the relationship between output, cost and price; and it is the "break even analysis" that can explain this relationship clearly. Through break even analysis it is possible to derive managerial actions to maintain and increase profitability.

14.8.2 Profit Measurement

For most firms, the most practical measure of whether they are making adequate profits is the rate of return on capital which is calculated as

$$\text{Rate of return on capital} = \frac{\text{Net profit}}{\text{Fixed capital}} \times 100$$

If this figure is too low then the firm would have to question either its profitability and how it could be improved or in extreme cases whether its capital could be invested more effectively elsewhere.

Profits are the excess of total revenue over total costs, where total costs include both explicit and implicit costs.

● *Equilibrium of the firm by curves of total revenue and total cost:* Profit is the difference between TR and TC. Thus the firm will be at equilibrium at the level of output where the difference between TR and TC is greatest (at OM output in Figure 14.1). S and Q are break even points.
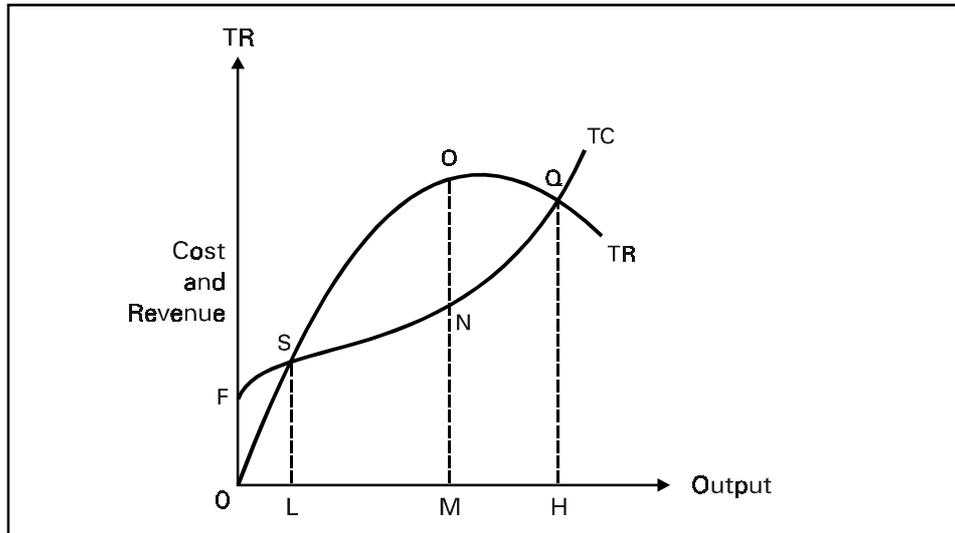
Figure 14.1

● *Equilibrium of the firm by marginal revenue and marginal cost:* The firm will be making maximum profits by expanding output to the level where MR = MC (at OM output in Figure 14.2).
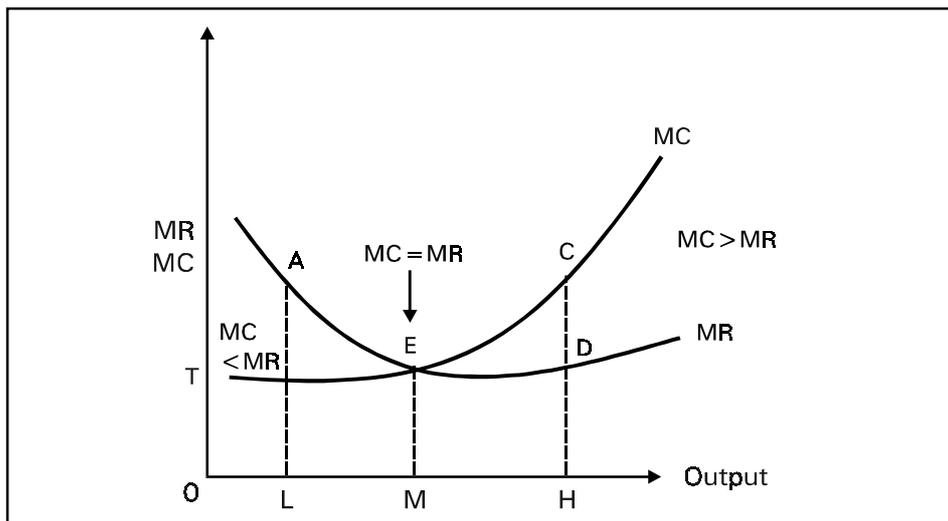
Figure 14.2

Mathematical Derivation of the Equilibrium of the Firm

The firm aims at maximisation of its profit p = R – C

p = Profit

R = TR, C = TC

Then R = f_1(X)

C = f_2(X), given the price P

The first order condition for maximisation of a function is that its 1st derivative (with respect to X here) be equal to zero. Differentiating the total profit function and equating to zero

$$\frac{\delta P}{\delta X} = \frac{\delta R}{\delta X} - \frac{\delta C}{\delta X} = 0 \text{ or } \frac{\delta R}{\delta X} = \frac{\delta C}{\delta X}$$

the term $\dfrac{\delta R}{\delta X}$ is the slope of the TR curve, i.e., the MR. The term $\dfrac{\delta C}{\delta X}$ is slope of TC curve or the MC. Thus the first order condition for profit maximisation is, MR = MC.

14.9 LET US SUM UP

This chapter discuss in detail about profit. The term profit means all excess of income over costs and thus includes the earnings of self-used factors. In economics profit is regarded as a reward for the entrepreneurial functions of final decision making and ultimate uncertainty. Profit is expressed in different ways as Gross profit, net profit, normal profit, supernormal profit, accounting profit etc. Chapter also describes the different theories of the profit. Further chapter discuss the profit planning.

14.10 LESSON END ACTIVITY

Discuss the rationale of profit planning and forecasting.

14.11 KEYWORDS

Normal Profit: It refers to the portion of profit which is absolutely necessary for the business to remain in operations.

Economic Profit: Economic Profit refers to those items that take into consideration of both explicit and implicit costs.

Profits: Excess of total revenue over total costs

CVP Analysis: Cost Volume Profit Analysis.

BEP: Break Even Point

14.12 QUESTIONS FOR DISCUSSION

1. Discuss the different theories of profit

2. Explain the concept of break even analysis

3. Distinguish between cost and profit in economics.

4. Distinguish between accounting and economic profit

5. Distinguish between normal profit, super normal profit, and monopoly profit.

6. What are the functions of profit.

14.13 MODEL ANSWER TO "CHECK YOUR PROGRESS"

Check Your Progress 1

> Accounting profit in the difference between total revenue and explicit cost. It does not consider implicit (or imputed) cost. The economic profit refers to those items that take into consideration both explicit and implicit cost. Thus,
>
> Economic Profit = Accounting profit - Implicit Cost

Check Your Progress 2

People generally avoid risks but some who are prepared to venture inspite of risks involved should be rewarded and this reward is profit. Higher the risk, higher will be the reward. Thus, profit is a reward paid to the organisation for undertaking risks.

14.14 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

LESSON
15

COST - VOLUME - PROFIT (CVP) ANALYSIS

15.0 AIMS AND OBJECTIVES

This lesson is intended to discuss the relationship of costs and volume to profit. After studying this lesson you will be able to:

(i)   establish relationship between cost, volume and profit

(ii)   describe profit - volume ratio

(iii)   explain break-even point for examining relationship between revenue, cost and profit

15.1 INTRODUCTION

The Cost-Volume-Profit (CVP) analysis helps management in finding out the relationship of costs and revenues to profit. The aim of an undertaking is to earn profit. Profit depends upon a large number of factors, the most important of which are the costs of

the manufacturer and the volume of sales effected. Both these factors are interdependent – volume of sales depends upon the volume of production, which in turn, is related to costs.

15.2 CVP RELATIONS

Cost is the result of the operation of a number of varying factors such as:

- Volume of production,

- Product mix,

- Internal efficiency,

- Methods of production,

- Size of plant, etc.

Of all these, volume is perhaps the largest single factor which influences costs which can basically be divided into fixed costs and variable costs. Volume changes in a business are a frequent occurrence, often necessitated by outside factors over which management has no control and as costs do not always vary in proportion to changes in levels of output, management control of the factors of volume presents a peculiar problem.

As profits are affected by the interplay of costs and volume, the management must have, at its disposal, an analysis that can allow for a reasonably accurate presentation of the effect of a change in any of these factors which would have no profit performance. Cost-volume-profit analysis furnishes a picture of the profit at various levels of activity. This enables management to distinguish between the effect of sales volume fluctuations and the results of price or cost changes upon profits. This analysis helps in understanding the behaviour of profits in relation to output and sales.

Fixed costs would be the same for any designated period regardless of the volume of output accomplished during the period (provided the output is within the present limits of capacity). These costs are prescribed by contract or are incurred in order to ensure the existence of an operating organisation. Their inflexibility is maintained within the framework of a given combination of resources and within each capacity stage such costs remain fixed regardless of the changes in the volume of actual production. As fixed costs do not change with production, the amount per unit declines as output rises.

Absorption or full costing system seeks to allocate fixed costs to products. It creates the problem of apportionment and allocation of such costs to various products. By their very nature, fixed costs have little relation to the volume of production.

Variable costs are related to the activity itself. The amount per unit remains the same. These costs expand or contract as the activity rises or falls. Within a given time span,

distinction has to be drawn between costs that are free of ups and downs of production and those that vary directly with these changes.

Study of behaviour of costs and CVP relationship needs proper definition of volume or activity. Volume is usually expressed in terms of sales capacity expressed as a percentage of maximum sales, volume of sales, unit of sales, etc. Production capacity is expressed as a percentage of maximum production, production in revenue of physical terms, direct labour hours or machine hours.

Analysis of cost-volume-profit involves consideration of the interplay of the following factors:

- Volume of sales

- Selling price

- Product mix of sales

- Variable cost per unit

- Total fixed costs

The relationship between two or more of these factors may be (a) presented in the form of reports and statements or (b) shown in charts or graphs, or (c) established in the form of mathematical deduction.

15.3 OBJECTIVES OF COST-VOLUME-PROFIT ANALYSIS

The objectives of cost-volume-profit analysis are given below:

- In order to forecast profit accurately, it is essential to know the relationship between profits and costs on the one hand and volume on the other.

- Cost-volume-profit analysis is useful in setting up flexible budgets which indicate costs at various levels of activity.

- Cost-volume-profit analysis is of assistance in performance evaluation for the purpose of control. For reviewing profits achieved and costs incurred, the effects on cost of changes in volume are required to be evaluated.

- Pricing plays an important part in stabilising and fixing up volume. Analysis of cost-volume-profit relationship may assist in formulating price policies to suit particular circumstances by projecting the effect which different price structures have on costs and profits.

- As predetermined overhead rates are related to a selected volume of production, study of cost-volume relationship is necessary in order to know the amount of overhead costs which could be charged to product costs at various levels of operation.

15.4 PROFIT-VOLUME (P/V) RATIO

The ratio or percentage of contribution margin to sales is known as P/V ratio. This ratio is known as marginal income ratio, contribution to sales ratio or variable profit ratio. P/V ratio, usually expressed as a percentage, is the rate at which profits increase with the increase in volume. The formulae for P/V ratio are

P/V ratio = Marginal contribution / Sales

Or

Sales value - Variable cost/Sales value

Or

1 - Variable cost/Sales value

Or

Fixed cost + Profit/Sales value

Or

Change in profits/Contributions/Changes

(All the above formulae mean the same thing).

A comparison for P/V ratios of different products can be made to find out which product is more profitable. Higher the P/V ratio more will be the profit and lower the P/V ratio, less will be the profit. P/V ratio can be improved by

- Increasing the selling price per unit.

- Reducing direct and variable costs by effectively utilising men, machines and materials.

- Switching the product to more profitable terms by showing a higher P/V ratio.

15.5 BREAK EVEN ANALYSIS

Break even analysis examines the relationship between the total revenue, total costs and total profits of the firm at various levels of output. It is used to determine the sales volume required for the firm to break even and the total profits and losses at other sales level. Break even analysis is a method, as said by Dominick Salnatore, of revenue and total cost functions of the firm. According to Martz, Curry and Frank, a break even analysis indicates at what level cost and revenue are in equilibrium.

In case of break even analysis, the break even point is of particular importance. Break even point is that volume of sales where the firm breaks even i.e., the total costs equal total revenue. It is, therefore, a point where losses cease to occur while profits have not yet begun. That is, it is the point of zero profit.

$$BEP = \frac{Fixed\ Costs}{Selling\ price\ -\ Variable\ costs\ per\ unit}$$

$$For\ Example, = \frac{Fixed\ Costs\ Rs\ 10,000}{Selling\ price\ Rs\ 5\ per\ unit\ -\ Variable\ costs\ Rs\ 3\ per\ unit}$$

$$Therefore,\ BEP = \frac{Rs\ 10,000}{5\ -\ 3} = 5,000\ units.$$

The conclusion that can be drawn from the above example is that sales volume of 5000 units will be the accurate point at which the manufacturing unit would not make any loss or profit.

15.5.1 Uses of Break even Analysis

Break even analysis is a very generalised approach for dealing with a wide variety of questions associated with profit planning and forecasting. Some of the important practical applications of break even analysis are:

- What happens to overall profitability when a new product is introduced?

- What level of sales is needed to cover all costs and earn, say, Rs 1,00,000 profit or a 12% rate of return?

- What happens to revenues and costs if the price of one of a company's product is hanged?

- What happens to overall profitability if a company purchases new capital equipment or incurs higher or lower fixed or variable costs?

- Between two alternative investments, which one offers the greater margin of profit (safety)?

- What are the revenue and cost implications of changing the process of production?

- Should one make, buy or lease capital equipment?

15.5.2 Assumptions of Break even Analysis

The break even analysis is based on certain assumptions, namely

- All costs are either perfectly variable or absolutely fixed over the entire period of production but this assumption does not hold good in practice.

- The volume of production and the volume of sales are equal; but in reality they differ.

- All revenue is perfectly variable with the physical volume of production and this assumption is not valid.

- The assumption of stable product mix is unrealistic.

15.5.3 Methods of Breaks even Analysis

The Break even analysis can be performed by the following two methods:

- The Break even Charts

- The Algebraic Method.

The Break even Chart

The difference between price and average variable cost (P-AVC) is defined as 'profit contribution'. That is, revenue on the sale of a unit of output after variable costs are covered represents a contribution towards profit. At low rates of output, the firm may be losing money because fixed costs have not yet been covered by the profit contribution. Thus, at these low rates of output, profit contribution is used to cover fixed costs. After fixed costs are covered, the firm will be earning a profit.

A manager may want to know the output rate necessary to cover all fixed costs and to earn a "required" profit of R. Assume that both price and variable cost per unit of output (APC) are constant. Profit is equal to total revenue (P.Q.) less the sum of total variable costs (Q.QVC) and fixed costs. Thus

$$p_R = PQ - [(Q.\ AVC) + FC]$$

$$p_R = TR - TC$$

The break even chart shows the extent of profit or loss to the firm at different levels of activity. A break even chart may be defined as an analysis in graphic form of the relationship of production and sales to profit. The Break even analysis utilises a break even chart in which the total revenue (TR) and the total cost (TC) curves are represented by straight lines, as in Figure 15.1.
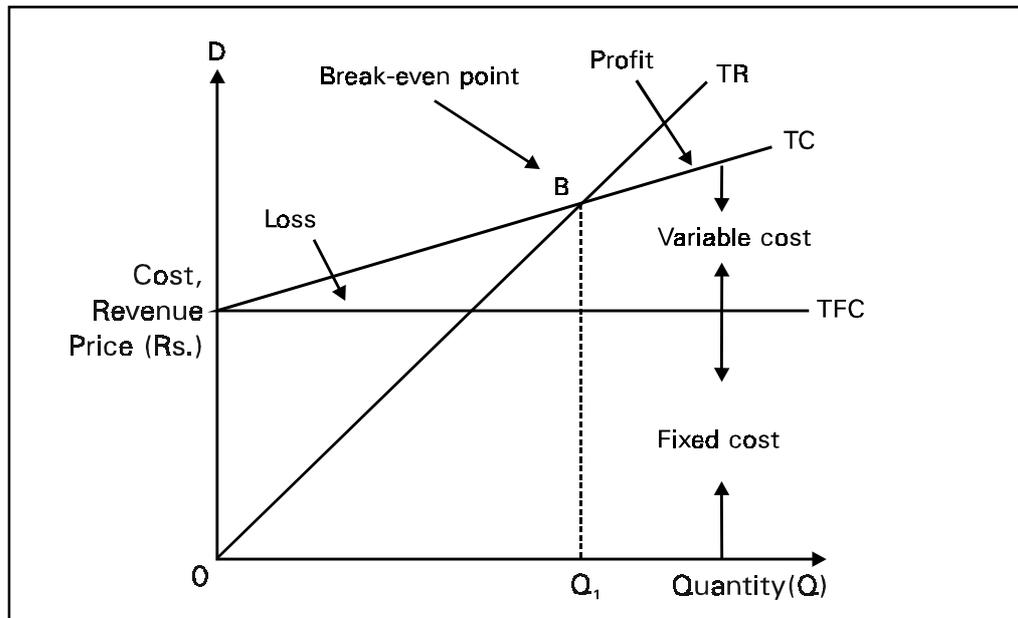
Figure 15.1

In the figure total revenues and total costs are plotted on the vertical axis whereas output or sales per time period are plotted on the horizontal axis. The slope of the TR curve refers to the constant price at which the firm can sell its output. The TC curve indicates total fixed costs (TFC) (The vertical intercept) and a constant average variable cost (the slope of the TC curve). This is often the case for many firms for small changes in output or sales. The firm breaks even (with TR=TC) at Q_1 (point B in the figure) and incurs losses at smaller outputs while earnings profits at higher levels of output.

Both the total cost (TC) and total revenue (TR) curves are shown as linear. TR curve is linear as it is assumed that the price is given, irrespective of the output level. Linearity of TC curve results from the assumption of constant variable costs.

If the assumptions of constant price and average variable cost are relaxed, break even analysis can still be applied, although the key relationship (total revenue and total cost) will not be linear functions of output. Non-linear total revenue and cost functions are shown in Figure 15.2. The cost function is conventional in the sense that at first costs increase but less than in proportion to output and then increase more than in proportion to output. There are two break even points – L and M. Note that profit which is the vertical distance between the total revenue and total cost functions, is maximised at output rate Q*.

Of the two break even points, only the first, corresponding to output rate Q_1 is relevant. When a firm begins production, management usually expects to incure losses. But it is important to know at what output rate the firm will go from a loss to a profit situation. In Figure 15.2 the firm would want to get to the break even output rate Q_1 as soon as possible and then of course, move to the profit maximising rate Q*. However, the firm would not expand production beyond Q* because this would result in a reduction of profit.
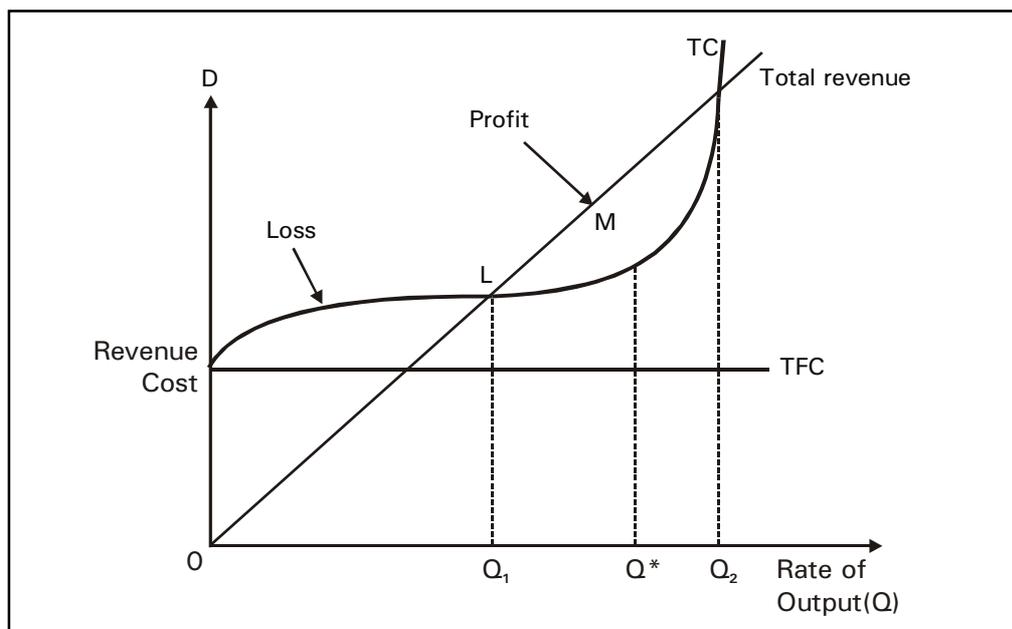
Figure 15.2

Contribution Margin

In the short run, where many of the firms costs are fixed, businessmen are often interested in determining the contribution additional sales make towards fixed costs and profits. Contribution analysis provides this information. Total contribution profit is defined as the difference between total revenues and total variable costs, which equals price less average variable cost on a per unit basis. Figure 15.3 highlights the meaning of contribution profit. Total contribution profit, it can be seen, is also equal to total net profit plus total fixed costs.
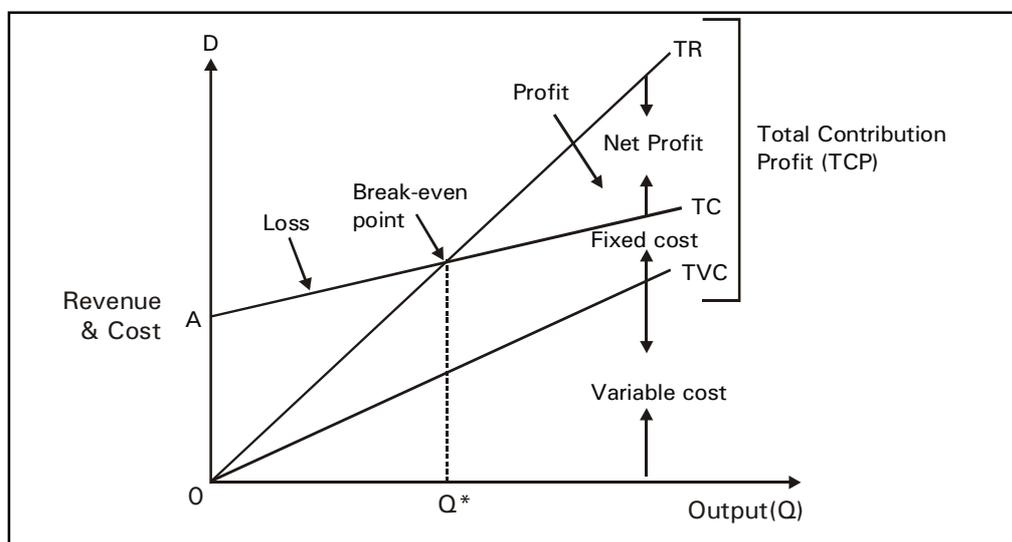
Figure 15.3

Contribution profit analysis provides a useful format for examining a variety of price and output decisions.

As is clear from Figure 15.3 Total Contribution Profit (TCP) = Total revenue (TR) – Total variable cost (TVC)

= Total net profit (TNP) + Total fixed cost (TFC)

Therefore, if TNP = 0 then, TCP = TFC. This occurs at break even point. From the above equation it is also clear that

$TR = TCP + TVC$

$= (TNP + TFC) + TVC$

Total Contribution Profit (TCP)

$= TR - TVC$

$= \text{Net Profit} + \text{Fixed Cost}$

The Algebraic Method

Break even analysis can also be performed algebraically, as follows. Total revenue is equal to the selling price (P) per unit times the quantity of output or sales (Q). That is

$TR = (P). (Q)$

Total costs equal total fixed costs plus total variable costs (TVC). Since TVC is equal to the average (per unit) variable cost (AVC) times the quantity of output or sales, we have

$TC = TFC + TVC$

or, $TC = TFC + (AVC). (Q)$

Setting total revenue equal to total costs and substituting Q_B (the break even output) for Q, we have

$TR = TC$

$(P). (Q_B) = TFC + (AVC). (Q_B)$

Or, $TFC = P. (Q_B) - (AVC) (Q_B)$

$TFC = Q_B. (P - AVC)$

$$Q_B \text{ (the break even output) } = \frac{TFC}{(P - AVC)} = \frac{TFC}{ACM}$$

The denominator in the above equation (i.e., $P - AVC$) is called the contribution margin per unit (ACM) because it represents the portion of the selling price that can be applied to cover the fixed costs of the firm and to provide for profits.

15.5.4 Advantages of Break even Analysis

The main advantages of using break even analysis in managerial decision making can be the following

- It helps in determining the optimum level of output below which it would not be profitable for a firm to produce.

- It helps in determining the target capacity for a firm to get the benefit of minimum unit cost of production.

- With the help of the break even analysis, the firm can determine minimum cost for a given level of output.

- It helps the firms in deciding which products are to be produced and which are to be bought by the firm.

- Plant expansion or contraction decisions are often based on the break even analysis of the perceived situation.

- Impact of changes in prices and costs on profits of the firm can also be analysed with the help of break even technique.

- Sometimes a management has to take decisions regarding dropping or adding a product to the product line. The break even analysis comes very handy in such situations.

- It evaluates the percentage financial yield from a project and thereby helps in the choice between various alternative projects.

- The break even analysis can be used in finding the selling price which would prove most profitable for the firm.

- By finding out the break even point, the break even analysis helps in establishing the point wherefrom the firm can start payment of dividend to its shareholders.

15.5.5 Three Alternatives for Computing BEP

The break even point may now be computed in one of three different but interrelated ways. To illustrate, assume that a factory can produce a maximum of 20,000 units of output per month. These 20,000 units can be sold at a price of Rs 100 per unit. Variable costs are Rs 20 per unit and the total fixed costs are Rs 2,00,000.

1. By direct application of the equation, $Q_B = \dfrac{TFC}{(P - AVC)}$

   $= \dfrac{Rs\ 2,00,000}{Rs\ 100\ -\ Rs\ 20} = 2500$ units

   In order to verify this, we could simply compute the TR and the TC when output equals 2500 units

   TR = $\quad$ P × Q

   $\quad$ = $\quad$ 100 × 2500

   $\quad$ = $\quad$ Rs 250,000

   TC = $\quad$ TFC + Q(AVC)

   $\quad$ = $\quad$ (200,000) + (2500) (Rs 20)

   $\quad$ = $\quad$ Rs 250,000

2. By modification of the equation above when one is to determine the break even measured in terms of rupee sales

   $$Q_B = \frac{TFC}{P - AVC} = \frac{TFC}{1 - \dfrac{AVC}{P}} \qquad \ldots\ldots\ldots\ldots (1)$$

   or $S_B = P.Q_B = \left(\dfrac{TFC}{P - AVC}\right).P$

   $$= \frac{TFC}{1 - \left(\dfrac{AVC \cdot Q_B}{P \cdot Q_B}\right)}$$

$$S_B = \frac{TFC}{1 - \left(\dfrac{TVC}{TR}\right)} \quad \text{................. (2)}$$

or

Where S_B is the break-even sales level. The denominator, $1 - \left(\dfrac{TVC}{TR}\right)$, provides a measure of the contribution made by the product to recover fixed costs. For example, the break even level in rupee sales is :

$$S_B = \frac{Rs\ 2,00,000}{1 - \left(\dfrac{20}{100}\right)} = Rs\ 2,50,000$$

which is the same result that can be obtained by multiplying the break even quantity by unit price. In equation (1) the contribution margin is calculated on a per unit basis from the ratio of AVC to price. In equation (2) the contribution margin is calculated on a total sales revenue basis from the ratio of TVC to TR. The ratio is the same in each case and in both the situations the calculated ratio is subtracted from the equation, Q_B (P - AVC) = TVC, to yield the percentage of revenue that contributes to recovery of fixed costs or overheads.

3. In order to determine the break even point in terms of percentage utilisation of plant capacity (% B), (or load factor to be achieved) the equation:

$$Q_B = \frac{TFC}{(P - AVC)} = \frac{TFC}{ACM} \quad \text{has}$$

to be modified as

$$\% B = \frac{TFC}{(P - AVC) \times Q(cap)} \times 100$$

where, Q (cap) is the maximum capacity of the plant expressed in units of output.

$$\% B = \frac{Rs\ 2,00,000}{(Rs\ 100\ -\ Rs\ 20)\ 20,000} \times 100$$

= 12.5%, which indicates that the firm can break even by using only 12.5% of its capacity.

Example

Indian Airlines has a capacity to carry a maximum of 10,000 passengers per month from Calcutta to Guwahati at a fare of Rs 500. Variable costs are Rs 100 per passenger, and fixed costs are Rs 3,00,000 per month. How many passengers should be carried per month to break even? What load factor (i.e., average percentage of seating capacity filled) must be reached to break even?

Ans.:   P - AVC = Rs 500 - Rs 100 = Rs 400/-

$$Q_b\ (Passengers) = \frac{Rs\ 30,00,000}{Rs\ 400}$$

= 7,500 passengers

The break even sales value

$$Q_b = \frac{Rs\ 30,00,000}{1-\left(\dfrac{Rs\ 100}{Rs\ 500}\right)} = \frac{Rs\ 30,00,000}{0.8}$$

$$= Rs\ 37,50,000$$

Check Your Progress 1

"Per unit contribution margin in price less average variable cost." Discuss.

15.5.6 Break even Models and Planning for Profit

The break even point represents the volume of sales at which revenue equals expenses; that is, at which profit is zero. The break even volume is arrived at by dividing fixed costs (costs that do not vary with output) by the contribution margin per unit, i.e., selling price minus variable costs (costs that vary directly with output). In certain situations, and especially in the consideration of multi-products, break even volume is measured in terms of rupee sales value rather than units. This is done by dividing the fixed costs or overheads by the contribution margin ratio (contribution margin divided by selling price). Generally, in these types of computations, the desired profit is added to the fixed costs in the numerator in order to ascertain the sales volume necessary for producing the target profit.

If management plans for a certain profit, then revenue needed to cover all costs plus the desired profit is

$$P.\ Q = TR = TFC + AVC \times Q + Profit$$

and $$Q_B = \frac{TFC + Profit}{P - AVC}$$

or $$Q_B = \frac{TFC + \pi}{P - AVC} = \frac{TFC + \pi}{ACM} \quad \text{where, p = Profit.}$$

and $$S_B = P.\ Q_B = \frac{TFC + \pi}{1 - \left(\dfrac{AVC}{P}\right)}$$

and $$\%\ B = \frac{TFC + \pi}{(P - AVC)\ (Q(cap))}$$

Thus, in the example used above,

Q cap	=	20,000
P	=	Rs 100
AVC	=	Rs 20
TFC	=	Rs 200,000
Q_B	=	2500 units
S_B	=	Rs 250,000
% B	=	12.5

If the management now wants to earn a target profit of Rs 50,000, then we get new levels of $Q_B = 321,500$ and % B = 15,625. If we add this target profit to the fixed costs we see that the break even levels of all three factors we increased. The information in this example could be extended so as to make provisions for such factors as payment of taxes or for payment of any other fixed obligations that might be associated with the fixed costs (such as interest payments on bonds or debentures used to finance an investment).

15.5.7 Drawbacks of Break even Analysis (BEA)

This analysis will be useful only in situations relatively stable and slow moving rather than volatile and erratic ones. In conditions when proper managerial accounting techniques and procedures are maintained, the BEA will be useful. In a particular period costs are affected not by the output of that period but due to past output or a preparation for future output. As such the BEA cannot pin down that cost is the result of output of a particular period. It is difficult to deal with selling costs under the framework of BEA because changes in selling costs are a cause to bring out changes in output and not the result of output sales. In the real world, perfect competition is very rare and as such it is necessary to make calculations at different time periods. The relationship between cost, revenue and volume (output) is realistic only over narrow ranges of output and for long ranges. If too many products and too many plants are grouped together in a productive process, the BEA cannot identify which is good or which is bad, since all are grouped together. The BEA assumes that profits are the result of output but ignores that other factors like technological changes, improved management and variations in the proportions of fixed factors are also possible for profits. Inspite of these, BEA is an important tool in decision making.

15.6 LET US SUM UP

Profit depends upon a large number of the factors, the most important of which are costs of production and the volume of sales effected. The percentage of contribution margin to sales is known as profit-volume (P/V) ratio. The formula for P/V ratio is given by marginal contribution/sales. A comparison of P/V ratios for different products can be made to find out which product is more profitable. One of the most used method to examine relationship between volume, cost and profit is break even analysis. There are two methods of break even analysis: (i) the break even charts, and (ii) the algebraic method.

15.7 LESSON END ACTIVITY

The following are the budgeted data of a company

		Rs	Rs
Sales	(15000 units @ Rs 5 per unit)		75,000
Less:	Fixed cost	28,000	
	Variable cost	15,000	
	Operating profit		32,000
Add:	Other incomes	9,000	
Less:	Other expenses	3,000	6,000
	Net profit		38,000

Compute the break even point.

15.8 KEYWORDS

Cost

Volume of Sales

Profit-volume Ratio

Break even point

Break Even Chart

Contribution Margin

15.9 QUESTIONS FOR DISCUSSION

1. What are the objectives of cost-volume-profit analysis?

2. What is profit-volume ratio?

3. Define break even point. How will you measure break even point?

4. Describe algebraic method of break even analysis.

15.10 MODEL ANSWER TO "CHECK YOUR PROGRESS"

Total contribution margin is defined as the difference between total revenue and total variable cost. On per unit basis, it is equal to price minus average variable cost.

Per unit contribution margin = TR - AVC

15.11 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

Bibek Debroy, *Managerial Economics*, Global Business Press, Delhi.

Shapiro, Bensen, *The Psychology of Pricing*, Harvard Business Review.

LESSON
16

INVESTMENT ANALYSIS

CONTENTS

16.0 AIMS AND OBJECTIVES

This lesson is intended to discuss various criteria for choosing investment projects. After studying this lesson you will be able to:

(i) understand various methods of project evaluation

(ii) know how public investment decisions are taken

(iii) describe social cost and benefit analysis

(iv) know what is shadow price

16.1 INTRODUCTION

The survival of a business in the competitive market involves a lot of monetary and non-monetary effort. One of the major strategies would be investing in new opportunities with changing time. Generation of capital from own resources of borrowing helps in investing in the long run. However, often the capital may be scarce and this calls for its allocation in such a manner that maximum return is obtained from the capital invested. Capital being expensive, the basic objective of the investor is to maximise the net return, i.e., revenue minus costs. Capital would then be invested in only those products where the excess of revenue over (capital) expenditure or investment is the maximum over the period of that investment, i.e., the life of the plant. This process can indeed be applied to various other areas including service industry. In setting up a management consultancy firm, for example, investment will be made in acquiring professionals. In most cases, they are very expensive. The product, here would be the service provided by these professionals in solving a client's problem. Revenue will come from the sale of their services. Accordingly, capital would be required to set up such an organisation.

16.2 MEANING AND SIGNIFICANCE OF CAPITAL BUDGETING

Capital budgeting is concerned with planning and control of capital expenditure. Capital expenditure is defined as one which involves the current outlay of cash in return for an anticipated flow of future benefits, these benefits being available in the long run. Thus, capital budgeting decisions may be defined as the decision of the firm to invest its current finances most efficiently in long-term productive activities, with expectations of flow of future benefits over a long period. It may also be defined in terms of capital projects which are expected to generate returns for more than one year. In this source, capital budgeting refers to the process of planning capital projects, raising funds and efficiently allocating resources to those capital projects. Examples of capital projects include new factories, machines, automobiles and trucks and computers. Outlays for research and development and advertising programmes are also capital expenditures if the returns on those projects will flow for more than one year.

Capital budgeting covers issues like decisions regarding the account of money for capital investment, the source of financing this investment and the allocation of the investment between different projects and over time.

Capital budgeting is used not only to plan for the replacement of worn-out capital and equipment for the expansion of production facilities or for entering new product lines but also in planning major advertising campaigns, employee training programmes, research and development, decisions to purchase or rent production facilities or equipment and any other investment project that would result in costs and revenues over a number of years. In general, firms classify investment projects into the following categories

a. **Replacement:** Investments to replace equipment that is worn out in the production process.

b. **Cost reduction:** Investments to replace working but absolute equipment with new and more efficient equipment, expenditures for training programmes aimed at reducing labour costs and expenditures to more production facilities to areas where labour and other inputs are cheaper.

c. **Output expansion of traditional products and markets:** Investment to expand production facilities in response to increased demand for the firm's traditional products in traditional or existing markets.

d. ***Expansion into new products and/or markets:*** Investment to develop, produce, and sell new products and/or enter new markets.

e. ***Government regulation:*** Investment made to comply with government regulations. These include investment projects required to meet government health and safety regulations, pollution control and to satisfy other legal requirements.

The evaluation of the worth of long-term investment necessitates a certain norm or standard against which the benefits are to be judged. The norm in this case could be any of the following: the cost of capital, hurdle rate, required rate, minimum rate of return and so on. In other words, this implies that decisions regarding financing investment are an important part of the capital budgeting exercise.

There are at least five reasons why capital budgeting decisions are among the most important for both the owners as well as managers of a firm.

a. Since capital budgeting involves long-term commitment of funds, these investments take the form of sink costs. These decisions cannot, therefore, be reversed without significant loss of capital. The long-term implications of a capital budgeting decision, thus, make it quite important.

b. The amount of finances involved in an investment proposal of capital budgeting nature are quite large, its impact on profitability of the firm is also quite significant.

c. The effect of a capital budgeting decision extends beyond the current accounting period. Consequently, its impact on the firm's profitability cannot be immediately and easily ascertained.

d. Capital budgeting decisions are quite vital for the reputation of the management. Once capital expenditure is undertaken the capital base on which the profit has to be earned also expands. The managerial team is then required to earn an expected return on total capital employed, which is the yardstick of its achievement.

e. Capital budgeting decisions involving long-term investments, are subject to uncertainties attached to it. Sound judgement, scientific analysis and product forecasting help in reducing these uncertainties and, thereby, improving profitability.

16.3 TECHNIQUES OR METHODS OF INVESTMENT EVALUATION

The essence of capital investment analysis is in comparing the benefits that accrue over a period of time with the amount invested. This comparison is made with a view to judging whether or not the benefits are at least as high as the amount invested. There are several methods available for making such comparisons.

The five commonly used methods for economic evaluation of an investment are:

i. The payback period method

ii. The average return on investment

iii. The net present value method

iv. The internal rate of return method

v. Profitability index criterion

16.3.1 The Payback Period Method

This method which is also called payout or pay off period method, is the most simple criterion commonly used in capital budgeting for evaluating investment proposals.

The payback period method calculates the period of time required to return the original investment. It enables the firm to know how quickly it can recover its invested funds from the gross earnings of the new capital asset, estimated without deducting depreciation on the new asset or what is called capital wastage.

The payback period, thus, is the ratio of the initial investment to annual net cash inflows (which comprise profit after tax plus depreciation).

That is,

$$P = \frac{I}{C} = x \text{ years.}$$

Where P is the payback period, I is the initial investment and C is the yearly net cash inflows. The above formula can be used if the cash flows are the same every year; in case they vary from year to year then we simply add the net cash flows of each year till its cumulative total equals the initial cost.

Advantages

- **Simple method:** This method is the most simple to compute and without any complication. It is more realistic and safe than other methods.

- **Liquidity:** This method offers information about liquidity. The method ignores the most distant cash inflows. This method is particularly useful in situations with a high degree of uncertainty about cash benefits to be received for a number of years.

- **Appropriate for assets with same economic life:** Where different alternative projects of capital investment have almost the same economic life and profile of benefits, then this method seems to be appropriate.

- **Screen against risky projects:** The payback period criterion acts as a screen against risky projects. It helps in selecting less risky projects at the cost of those having longer gestation periods and longer revenue stream.

- **Complications in estimation avoided:** In this method gross earnings are taken into consideration, complication in estimating capital wastage over the time period are avoided, service gross earnings are inclusive of capital wastage.

Limitations
- Profitability is not considered.
- Cash flow variation is ignored.
- Time value of money is ignored.
- There is under emphasis on liquidity.
- Other objectives are ignored.

16.3.2 The Average Rate of Return on Investment

The average return on investment (ARI) is defined as the ratio of the net average annual income from the project to the initial investment. The net income is defined as the difference between the net cash inflows generated by the project and the cash outflows resulting from the initial investment. The net average annual income is defined as the income divided by the life of the project measured in years.

In computing the average return on investment, the initial investment is deducted from the gross total income over the life of the project. This net income is then divided by the number of years of the life of the project to obtain the average income per year. The average annual income divided by the initial investment gives the return.

Symbolically,

$$\text{ROI or ARR} = \frac{\left[\sum_{t=1}^{n} Rt\right]}{n} \Big/ Co$$

Where R_t signifies the contribution to overhead and profits in each future period; t refers to time period (from year 1 to year n); n is the number of years, i.e., the life time of the project and C_o is the initial cost of the project.

Advantages

- This technique is easily understandable and computable.

- This measure, unlike the payback period, takes into account all the benefits generated during the life of the project.

- Given the date of the initial investment and returns over the life time of the project, with the help of the ARI method it is possible to calculate a number which could represent the benefits resulting from the investment.

Limitations

- Like the payback period method this method does not distinguish between cash inflows received at different points of time.

- It also does not discriminate between projects that have the same net average income but which differ in the timings of cash inflows.

- This method is inadequate for comparing projects of different duration. This may mean that a project with greater aggregate returns is given a reduced ranking.

16.3.3 The Net Present Value (NPV) Method

This method is based on the economic reasoning of discounting future cash flows to make them comparable. If we represent the discount rate by 'r' we can say that a rupee received at the end of the nth year is equivalent to $\dfrac{1}{(1+r)^n}$ now.

In other words, the present value of a rupee received at the end of the nth year is

$\dfrac{1}{(1+r)^n}$; the factor $\dfrac{1}{(1+r)^n}$ being called the discount factor. According to NPV criterion,

investment on the project is profitable if the present value of the sum of cash inflows over the life of the project is greater than the present value of its cash outflows.

The discounted present value method of investment appraisal involves two concepts: gross present value and net present value.

$$\text{Gross Present Value (GPV)} = \frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2} + \ldots\ldots + \frac{A_i}{(1+r)} + \ldots\ldots + \frac{A_n}{(1+r)^n}$$

$$= \sum_{t=1}^{n} \frac{A_t}{(1+r)^t}$$

where $A_1, A_2, A_3, \ldots\ldots, A_n$ show stream of receipts

　　　r is discount rate of the opportunity cost of capital; and

　　　t is (1, 2,....i.........n) is the notation for different time periods.

Once all future receipts have been discounted to their present value, we may find the net present value (NPV) to know whether the project is worth taking up or not.

$$NPV = GPV - C_o$$

$$= \sum_{t=1}^{n} \frac{A_t}{(1+r)^t} - C_O$$

Where C_O is initial cost of the project.

Thus, net present value refers to the sum of the discounted value of the future stream of costs and receipts associated with a particular project. If the NPV>0, the proposal passes the test. This means that if the return on the new product line exceeds the firm's cost of capital, if the investment should be made because it will increase the value of the firm. A positive net present value implies that the investment is profitable at the rate specified while a negative net present value will mean that the investment is not profitable.

16.3.4 The Internal Rate of Return (IRR) Criterion

This is another method of evaluation of projects based on discounted cash flow technique. It considers the time factor and therefore takes into account the opportunity cost of investment (say equal to current rate of interest). The IRR is the same as the MEI (marginal efficiency of capital) concept of Keynes in his *General Theory of Employment, Interest and Money*.

The internal rate of return is the rate of discount which equates the present value of the income stream over the life of the machine with the present value of the net cash investment. In other words, the net cash benefits are discounted at that rate of discount which reduces the NPV to zero. We may state it in the following equation:

$$C_O = \sum_{t=1}^{n} \frac{A_t}{(1+r)^t}$$

Where C_o is the current net investment; A_t is the income stream of the project over different years (t = 1,….., m); t = time period; r = interest rate of return.

If investments are spread over a number of years or are accompanied by additional annual expenditure, then the equation may be written as under:

The sum of discounted value cost of investment = the sum of the discounted value of gross earning.

$$\sum_{t=1}^{n} \left[\frac{C_t}{(1+r)^t} \right] = \left[\sum_{t=1}^{n} \frac{A_t}{(1+r)^t} \right]$$

Where C_t represents investment spread over a number of years and r the rate of discount to find out the present value of the sum of annual cash flows and costs of investment.

If the internal rate of rate of return is greater than the opportunity rate of interest then the project is accepted.

If the internal rate of return is less than the opportunity cost of investing available funds elsewhere, then the project is rejected.

16.3.5 The Profitability Index Criterion

It is a variant of NPV method. It is the ratio of present value of the stream of net cash flows of a project over its life span to the initial cost of the project. That is,

Benefit-Cost ratio (BCR) =

$$\frac{\text{The sum of discounted cash benefits over the life of machine}}{\text{Cash investment}}$$

While Net Benefit-Cost Ratio (NBCR) = BCR–1

As is obvious, this method highlights the benefits per rupee spent as investment. That is why it has also acquired the nomenclature of benefit-cost ratio method or "present value per rupee outlay" method.

If the value of NBCR is greater than zero, project is accepted.

If the value of NBCR is less than zero, project is rejected.

The value of NBCR > 0 implies that the project will add more to present value of receipts than it will to the cost of investment.

Check Your Progress 1

What is the difference between "The average return on investment method" and "The internal rate of return method"?

16.4 PUBLIC INVESTMENT DECISIONS

Government is an important participant in the economy and its investment is called public investment. Many activities of the state are related to its investment intentions, decisions and activities. Thus, managers have to study and understand different facts of public investment decisions. For many reasons, the government is concerned with the future economic life and well-being of society. This concern makes public investment an important economic activity with significant implications for management of every sphere of economic and social life. Many of the private and non-government activities and investment become possible on the basis of a whole range of public investments in roads, ports, bridges, universities, airports, etc. Moreover, the public goods, which result from such investments are critical for the continued reproduction of the economy and are complementary to the production of other goods. Many of them are universal intermediates like means of transport, energy supply, communication, etc. No significant managerial decision can remain uninformed of the nature and extent of the influence of public investment decisions.

16.4.1 Public Investment as a Contrast to Private Investment

Both public investment and private investment link the present to the future as both involve postponement of current consumption in order to generate the capacity to obtain a large flow of consumption in the future. However, the difference in the type of agencies brings about following dissimilarities between the two.

a.   The Motive of a private enterprise is to invest a certain amount of capital (C) to obtain a larger sum of money (C_1) such that $C_1 > C$, i.e., to obtain surplus or profit. The government investment does not have profit as its basic motive. It is for the common social purposes of the community.

b.   To earn profit, private enterprise uses well calculated strategies like market structure, degree of risk, product nature, technology, international factors.

c.   Public investments are generally complementary to a large number of private activities. If left in private hands, these goods may not be made at all, e.g., roads, or may be made on such conditions as may be harmful to the society.

d.   Public investments are large sized characterised by indivisibilities, and are useful for a large number of activities. They are treated as overhead facilities or

socio-economic infrastructure. Private investments are usually for individual wants with a price for it.

e. Public investments have a long gestation period–both in the sense of requiring a long construction/installation period and yielding benefits for a number of years. Moreover, they are based on social objectives. Large external economies of these investments make them unsuitable from the angle of private profit.

16.4.2 Organisation of Public Investment Decisions

In India, the central and state governments, along with public enterprises under their control account for an overwhelming part of public investment. Various local bodies at the level of districts, blocks, cities, towns and villages too make public investment creating a variety of assets. The planning commission makes sectoral and inter-state allocation of the investment and outlays determined as a part of the plans.

Our plans evolve various programmes involving both current outlays and long-term asset forming investment decisions. These decisions are generally taken by the concerned administrative ministries or departments or specific programme authorities in consultation with the planning commission and finance ministry as a part of the exercise of preparing annual budgets.

A number of projects for expansion and diversification or modernisation are sanctioned by various public enterprises. A good number of investments are financed by loans, by various public financial institutions (like IDBI, ICICI, SFCs, etc.) either directly to the public sector or to private units.

Two major agencies for appraising public investment projects are Project Appraisal Division (PAD) of the planning commission and Public Investment Board (PIB).

16.5 SOCIAL COST BENEFIT ANALYSIS

Cost benefit analysis is an extension of capital budgeting analysis to the public sector. The public sector also faces the problem of choice from amongst a large number of alternative projects each having social costs and benefits. Social welfare of the society is increased after proper screening of these projects.

16.5.1 Steps Involved in Cost Benefit Analysis

A cost benefit analysis is done in the following steps:

a. Identifying objectives and constraints

b. Identifying alternative projects

c. Estimation of cost and benefit of each alternative

d. Choice of the best alternative on the basis of social cost and benefit.

Objectives of a public sector project can be stated easily but the problem is to quantify them. Specific constraints can also not be identified easily. Many legal, financial or constitutional constraints may hinder the project even if it can satisfy all objectives.

Alternative projects thus become important and it becomes necessary to enumerate their social costs and benefits before their implementation. Social costs and benefit are of two types:

a.   Direct

b.   Indirect

The cost of the project in terms of its financial outlay is called the direct or financial cost. It also has two parts – fixed investment and working capital. The first covers the payment made for fixed capital goods, machinery, plant building, equipment, etc. The other covers the operational and maintenance costs over the life of the project. The social costs are the costs of the foregone uses of physical and human resources used in the construction and maintenance of the project.

Indirect costs or external diseconomies and intangible costs are not easy to identify. For example, pollution caused to the residential area. The best one can do is to estimate such costs using the figure closest to the market value of their negative effect. For example, average rise in medical bills of the area may give a rough estimate of the indirect cost of pollution.

16.5.2 Shadow or Social Price

From the point of view of social welfare, one has to take into account the social opportunity cost of using a certain input for the public investment project. This is the accounting shadow or social price of a commodity. The social costs and benefits have to be valued in terms of these shadow prices. In the computation of these prices, one may assign weights reflecting social objectives. For example, the shadow price of labour used in project would not be the money wage paid to a skilled or unskilled worker but the sacrifice of output in the use from which labour is withdrawn or prevacated from being allocated. The device of valuation in terms of shadow prices is an important means for forming a micro social perspective.

16.5.3 Social Discount Rate

Social evaluation of various cost/benefit elements in terms of shadow price does not enable one to obtain a correct, social picture of the implications of alternative project decisions unless account is also taken of the fact that various costs are incurred and benefits are obtained at various points of time. In fact, it would be wrong to add up the cost benefit which refers to say 1988 to one which refers to 1992. Many factors affect social valuation, especially when the society is underdeveloped at the moment and hopes to enjoy a higher standard of well-being in the future. This factor may be called the rate at which a society prefers the present over the future. It is called the social rate of discount.

The stream of social costs and benefits calculated in terms of shadow prices have to be discounted using a social rate of discount in order to convert the quantities involved into a common temporal perspective.

Social benefits of a project too have to be computed on the basis of the following steps – identification of direct and indirect (external) benefits, quantification of a rising or the non-quantifiable (intangible) benefits, social valuation in terms of shadow prices and conversion of these into a common time perspective by means of discounting at the social rate of discount. In the determination of this discount, instead of structure of market interest rates, social values, objectives, attitude towards risk and uncertainty and political factors play their roles. The time horizon adopted in the process of plan formulation and concern for the interests of the future generations exert an important influence on the choice of social rate of discount.

16.6 COMPARING COSTS AND BENEFITS: DECISION RULES

Important methods of comparing discounted costs and benefits are:

a.   Benefit Cost Ratio

b. Net Present Value

c. Internal Rate of Return

However, two factors must be kept in mind while making an investment decision:

- There is no one best technique for estimating the social worth of a project.

- These criteria of investment are only tools of decision making providing synoptic, systematic guidance; there are many non-quantitative and non-economic, non-tangible criteria for making project choices.

Four major aspects of a project have to be taken into account before applying the investment criteria.

These are:

a. Technology

b. Scale or Size

c. Location

d. Timing in terms of economic direction and budgeting position.

The Benefit Cost Ratio

It is exclusively used for economic analysis of the project or cost benefit analysis only.

$$\text{Benefit Cost (BC) Ratio} = \frac{\text{Present Worth of Benefits}}{\text{Present Worth of Costs}}$$

The practical application is limited because of the interest character of the ratio. This will be clear from a comparison of two projects A and B, as done in Table 8.1. The BC ratio of project A is higher and net present value of B is higher but the benefit per unit of cost is higher in A as compared to B. We cannot make a comparison using BC ratio. Its use is limited to see the return from per unit of social cost.

Table 16.1

Project	Total Discounted Social Cost (Rs in lakhs)	Total Discounted Social Benefit (Rs in lakhs)	Benefit Cost Ratio	Net Present Worth (Rs. in lakhs)
A	100	150	1.5	50
B	1000	1300	1.5	300

Net Present Value

The most straightforward discounted measure of a project's worth which aids in the choice of project is its net present value. It is simply the value of the surplus generated by the project minus the discounted value of the costs incurred by the project.

Internal Rate of Return

This measure, used by the World Bank and other international financial agencies, determines the rate of discount at which the present worth of a project is zero. Economic return is the same as internal rate of return. This term is used to distinguish between the financial calculation and economic appraisal of the project.

16.7 LET US SUM UP

This chapter discuss in detail about the rational of investment. Capital being expensive, the basic objective of the investor is to maximize the net return. Capital budgeting is concerned with planning and control of capital expenditure. This chapter discuss the various methods of investment analysis , prominent among them are : - The payback period method, the average return on investment, the net present value method, the internal rate of return method, profitability index criterion. This chapter further discuss the Social Cost Benefit Analysis.

16.8 LESSON END ACTIVITY

1. The Fiasio Co. has got up to Rs 20,000 to invest. The following proposals are under consideration:

Project	Initial Outlay (Rs)	Annual Cash Flow (Rs)	Life (years)
A	10,000	2,500	5
B	8,000	2,600	7
C	4,000	1,000	15
D	10,000	2,400	20
E	5,000	1,125	15
F	6,000	2,400	6
G	2,000	1,000	2

a. Rank these projects under the payback method.

b. Rank these projects under net present value method.

c. Are there striking contrasts between (a) and (b)?

16.9 KEYWORDS

Capital Budgeting: It is concerned with planning and control of capital expenditure.

The Payback Period Method: The payback period method calculates the period of time required to return the original investment.

The Average Rate of Return on Investment: The average rate of return on investment is defined as the ratio of the net average annual income from the project to the initial investment.

The Net Present Value Method: It is a method of investment analysis which is based on the economic reasoning of discounting future cash flows to make them comparable.

The Profitability Index Criterion: It is variant of NPV method.

Shadow or Social Price: An accounting procedure where one has to take account the social opportunity cost of using a certain input for the public investment projects.

16.10 QUESTIONS FOR DISCUSSION

1. What is capital budgeting? Explain its nature.

2. Discuss the considerations in various kinds of capital investment decisions.

3. What is "internal rate of return"? How is it different from "net present value"? Under what conditions would the two methods provide the same results?

4. Discuss some of the principal problems involved in an attempt to rank several alternative investment proposals in order of their profitability.

5. Review the appropriateness of the following criteria of appraising investment:

   i. Payback Period   ii. Net Present Value

6. Given three investment projects, each with a life of two years, described in the following table:

Project	Initial Capital Cost	Ist year pay off	IInd year pay off
A	300	600	0
B	300	200	400
C	300	300	333

   a. Calculate the payback period for each project.

   b. Calculate the internal rate of return for the three projects.

   c. Assuming the rate of discount to be 10 per cent capital, calculate the net present value for the three projects.

   d. Which project would you prefer?

7. Discuss the meaning and nature of cost of capital.

   Calculate the average cost of capital before tax and after tax from the following information. Assume that the tax is 55%.

Type of Capital	Proportion in the New Capital Structure	Before Tax Cost of Capital (%)
Equity capital	25	24.44
Preference capital	10	22.29
Debt capital	50	7.99
Retained earnings	15	18.33

8. How do the determinants of private investment differ from those bearing on public investment?

9. How does social cost benefit analysis differ from financial analysis?

10. Why are market prices not found suitable for use in social cost benefit analysis?

16.11 MODEL ANSWER TO "CHECK YOUR PROGRESS"

In computing the average return on investment, the initial investment is deducted from the gross total income over the life of the project. This net income is then divided by the number of years of the life of the project to obtain the average income per year. The average annual income divided by the initial investment gives the return.

$$ARR = \frac{\sum_{k=1}^{n} R_t}{n/C_o}$$

Whereas, the internal rate of return is the rate of discount which equates the present value of the income stream over the life of the machine with the present value of the net cast investment.

$$C_o = \sum_{t=o}^{n} \frac{A_t}{(1+r)^t}$$

16.12 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books.

F.S. Brooman, *Macroeconomics*, George Allen & Unwin Ltd.

Bo Sodersten and Geoffrey Reed, *International Economics*, Macmillan.

UNIT-V

LESSON
17

NATIONAL INCOME

CONTENTS

17.0 AIMS AND OBJECTIVES

This lesson is intended to study the fundamental of national income accounting and methods to estimate national income. After studying this lesson you will be able to:

(i)   define national income, gross and net domestic products, gross and net national products

(ii)   describe national income identities

(iii) explain three methods of measuring national income.

17.1 INTRODUCTION

Macroeconomics is concerned with the determination of the economy's total output, the price level, the level of employment, interest rates and other variables. A necessary step in understanding how these variables are determined is "national income accounting".

The national income accounts give us regular estimates of GNP – the basic measure of the economy's performance in producing goods and services.

National income is the most comprehensive measure of the level of the aggregate economic activity in an economy. It is the total income of a nation as against the income of an individual but the term national income is not as simple and self-explanatory as the concept of individual income maybe. For example, not all the income received by individuals during a given period can be included in the national income, similarly not all the income that is generated in the process of production in an economy during a given period is received by the individuals in the economy.

To begin with, we may define national income as the aggregate of money value of the annual flow of final goods and services in the national economy during a given period.

The well-known writer, Paul Studenski, writes: "National income is both a flow of goods and services and a flow of money incomes. It is therefore called national product as often as national income". The flow of national income begins when production units combine capital and labour and turn out goods and services. We call this Gross National Product GNP, it is the value of all final goods and services produced by domestically owned factors of production within a given period. It includes the value of goods produced such as houses and food grains and the value of services such as broker's services and economist's lectures. The output of each of these is valued at its market price and the values are added together to give GNP. GNP accounts for the Indian economy since 1951 are available on a systematic basis. GNP grew annually at a little less than 4% during the first half of nineties. This is significantly less than 5.6% average annual growth recorded during 1980.

At the same time, the production units which produce goods and services distribute money incomes to all who help in production in the form of wages, rent, interest and profit – we call this as Gross National Income.

GNI is the sum of the money incomes derived from activities involving current production in an economy in a given time period. We can say that:

●   National income is an aggregating value concept: it makes use of the value determined by the measuring rod of money as the common denominator for the purpose of aggregating the diverse output resulting from different types of economic activities.

●   National income is a flow concept: it represents a given amount of aggregate production per unit of time, conventionally represented by one year. Thus, national income usually relates to a particular year and indicates the output during that year.

●   National income represents the aggregate value of final products rather than the total value of all kinds of products produced in the economy. The insistence on final goods and services is simply to make sure that we do not double count.

For example, we would not want to include the full price of an automobile producer to put on the car. The components of the car that are sold to the manufacturers are "intermediate goods" and their value is not included in GNP. Similarly, the wheat that is used to make bread is an "intermediate good". The value of the bread only is counted as

part of GNP and we do not count the value of wheat sold to the miller and the value of flour sold to the baker.

In practice, double counting is avoided by working with the "value-added: at each stage of manufacture of goods only the value added to the good at that stage of manufacture is counted as part of GNP." The value of wheat produced by the farmer is counted as part of GNP. Then the value of the flour sold by the miller minus the cost of the wheat is the miller's value added. It should be noted that the sum of the value added at each stage of processing will be equal to the final value of the bread sold. The flour that is directly purchased by households for baking in the home is counted as the contribution towards GNP since it represents a final sale. It indicates that national income is an unduplicated total that does not involve any double counting. Obviously there are three different stages or phases in the flow of output and income in the national economy.

- There is production of goods and services by all production units by the use of labour, capital and enterprise,

- There is distribution of incomes to all the factors who are suppliers of labour, capital, etc.; this distribution takes the form of wages, interest, rent and profit, and

- There is spending of incomes on the goods and services produced by the economy; this expenditure is classified into consumption goods (c) and expenditure on investment goods (I).

  So, we have three kinds of national income estimates:

  ❖ National income as net aggregate output

  ❖ National income as sum of distributive shares

  ❖ National income as aggregate value of final products

17.2 DEFINITION OF NATIONAL PRODUCT, INCOME AND EXPENDITURE

National product by definition is a measure in monetary terms of the volume of all goods and services produced by an economy during a given period of time accounted for without duplication. The measure obviously has to be in value terms as the different units of production and different measures of services are not directly additive. An important characteristic of this measure is its comprehensiveness. The measure covers all the final goods and services produced by the residents of a country. Thus, the goods cover all possible items produced, as for example, agricultural crops, livestock products, forest products, mineral products, manufacturing of various consumer items for consumption, machinery, transport equipment, defense equipment, etc., construction of buildings, roads, dams, bridges, etc. The services similarly cover a wide spectrum including medical and educational services, defense services, financial services, transport and trading services, sanitary services, government services, etc.

All the final goods and services produced during the period have to be included whether they are marketed, that is exchanged for money or bartered or produced for own use. For example some of the products of agriculture and forestry and fishing are used for own consumption of producers and therefore imputed values of these products are also to be included. Similarly, account must also be taken of the rental of buildings, which are owned and occupied by the owners themselves. Own account construction activities are also similarly to be included. However, certain other activities like services of housewives are excluded from production mainly due to the problems of measurement. Also excluded are illegal activities such as smuggling, black marketing, etc.

Another important feature of the measure is that it is an unduplicated value of output or in other words only the value added at each stage of processing is taken into account while measuring the total, i.e., in the measurement of national output. A distinction is

made between final and intermediate products and unduplicated total is one that is confined to the value of the final products and excludes all intermediate products. For example, if the production process during the year involves the production of wheat, its milling into flour and the baking of bread which is sold to consumers, then the value of the national output should equal the final value of the bread and should not count the separate value of the wheat and flour which have been used in the course of producing bread. Thus the national product is not the total value of goods and services produced, but only final products excluding the value of inputs of raw materials and services used in the process of production. Thus value added by the activities in an enterprise during an accounting period is an important national income concept. We illustrate the computation of the value added in the case of a bakery. The following are the relevant data:

	Rs.
Gross value of the output of the bakery in 1999-2000	2,25,000
Value of flour and other intermediate inputs	1,20,000
Depreciation	20,000
Gross value added = 2,25,000 - 1,20,000 =	1,05,000
Net value added = Gross value added - depreciation	
= (1,05,000 - 20,000)	= Rs 85,000/-

The national product measures value of all final goods and services arising out of economic activity while the national income is the sum of all incomes generated as a result of the economic activity. These two are synonymous. Since the production of goods and services is the result of the use of primary factors of production namely capital and labour along with the raw material and other intermediate inputs, the process automatically generates income. This income is in the form of rewards for capital and labour used in the production process. For example, the total product originating in a firm making steel could be obtained by adding the value of the final products and then deducting the value of intermediate inputs to obtain the value added. The value added of this firm consists of the income that accrues in the course of production, namely, wages and salaries and operating surplus. The surplus includes rent and interest, rewards for the factors of production land and capital respectively. Thus total income is given by rent + wages/salaries + interest + profits. Hence, the unduplicated production (value added) is equivalent to the income which accrues to the factors of production. In other words, national income of a country can also be viewed in terms of the income flowing from the producing units to factors of production. National income is not simply an aggregate of all incomes. It includes only those incomes which are derived directly from the current production of goods and services called factor incomes. Other forms of income such as old age pensions, educational grants, unemployment benefits, etc., cannot be regarded as payments for current services to production. They are paid out of factor incomes and are called transfer payments. Payments for which no goods or services are received in return are transfer payments.

The production within the economy over a given period of time is spent either for consumption of its members or for additions to fixed assets or for additions to the stock of existing productive assets within the country. Hence, production can also be measured by considering the expenditure of those who purchase the finished or final goods and services. The national expenditure is the sum of expenditure of all economic agents namely, households enterprises and government. Here, is also it necessary to include only the expenditures on final use in order to avoid duplication, i.e., one has to omit the network of intermediate sales of all products needed in further production. The expenditure on final goods and services may be purely for consumption purposes like consumption of food, clothing, shelter, services, etc., or for capital formation such as addition to buildings, plant, machinery, transport equipment, etc. Some goods may not be immediately sold and may be kept aside as stocks. These goods which are added to stocks are also accounted for as final expenditure (inventory investment).

It is clear from the above discussion that the national income of a country can be measured in three different ways – from the angle of production, from the angle of income generation and from final utilization. The significance of each arises from the fact that they reflect total operations of an economy at the levels of three basic economic functions, namely, production, distribution and disposition.

17.3 MEASURES OF AGGREGATE INCOME

For the purpose of measurement and analysis, national income can be viewed as an aggregate of various component flows. To begin with let us consider the most comprehensive and broad-based measure of aggregate income widely known as Gross National Product at market prices or GNP at market prices.

Two important words are "gross" and "national". Similarly the phrase "at market prices" is also significant because it specifies the criterion of valuation. The main alternatives to these three specifications are 'net', 'domestic' and at 'falter cost'.

17.3.1 Gross and Net Concept

Gross emphasizes that no allowance for capital consumption has been made or that depreciation has yet to be deducted.

Net indicates that provision for capital consumption has already been made or that depreciation has already been deducted.

Thus the difference between the gross aggregate and the net aggregate is depreciation.

i.e.,

GNP at market price/factor cost = NNP at market price/factor cost + depreciation.

17.3.2 National and Domestic Concepts

The term national denotes that the aggregate under consideration represents the total income which accrues to the normal residents of a country due to their participation in world production during the current year. Thus, the term 'national' is used to emphasize that the aggregate under consideration covers all types of factor incomes accruing to normal residents of a country irrespective of whether the factors of production supplied by them are located at home or abroad.

As against this, it is also possible to measure the value of the total output or income originating within the specified geographical boundary of a country known as "domestic territory". The resulting measure is called "domestic product".

In other words, the distinction between "national" and "domestic" aggregates lies in the frame of reference - the former takes the normal residents of a country, the latter takes a given "geographical area". Here, national product differs from domestic product by the amount of net factor income from abroad.

GNP at market price/factor cost = GDP at market price/factor cost + Net factor income from abroad

NNP at market price/factor cost = NDP at market price/factor cost + Net factor income from abroad

Net factor income from abroad = Factor income received from abroad - Factor income paid abroad.

17.3.3 Market Prices and Factor Costs

The valuation of the national product at market prices indicates the total amount actually paid by the final buyers while the valuation of national product at factor cost is a measure of the total amount earned by the factors of production for their contribution to the final output.

GNP at market price = GNP at factor cost + indirect taxes-Subsidies.

NNP at market price = NNP at factor cost + indirect taxes-Subsidies.

And vice versa.

	Category A	Category B
Type 1	GNP at market price	GDP at market price
	NNP at market price	NDP at market price
Type 2	GNP at factor cost	GDP at factor cost
	NNP at factor cost	NDP at factor cost

- Difference between the aggregates in category A and aggregates in category B is net factor income from abroad.

- Difference between the aggregates of type 1 and aggregates of type 2 is indirect taxes less subsidies.

- The difference between the two aggregates of each type in each category is depreciation.

17.3.4 Gross National Product and Gross Domestic Product

For some purposes we need to find the total income generated from production within the territorial boundaries of an economy, irrespective of whether it belongs to the inhabitants of that nation or not. Such an income is known as Gross Domestic Product (GDP) and found as:

 GDP = GNP - Net factor income from abroad

Net factor income from abroad = Factor income received from abroad - Factor income paid abroad.

For example, if in 1986 the GNP is Rs 8,00,000 million, the income (including tax on such incomes) received from and paid abroad Rs 60,000 million, and Rs 70,000 million respectively, then, the GDP in 1986 would be:

(Rs 8,00,000 - 70,000 + 60,000) million = Rs 7,90,000 million

17.3.5 GNP as a Sum of Expenditures on Final Products

Expenditure on final products in an economy can be classified into the following categories:

- Personal consumption expenditure (c):- The sum of expenditure on both the durable and non-durable goods as well as services for consumption purposes

- Gross Private Investment (Ig) is the total expenditure incurred for the replacement of capital goods and for additional investment

- Government expenditure (G) is the sum of expenditure on consumption and capital goods by the government, and

- Net Exports (Exports – Imports) (X – M) constitute the difference between the expenditure or rest of the world on output of the national economy and the expenditure of the national economy on output of the rest of the world.

GNP is the aggregate of the above mentioned four categories of consumption expenditure. That is,

GNP = C + Ig + G + (X – M)

17.3.6 GNP as the Total of Factor Incomes

As mentioned above, national product gives a measure of a nation's productive activity, irrespective of the fact whether this activity takes place at home or abroad. When national income is calculated after excluding indirect taxes like excise duty, sales tax, etc. and including subsidies we get GNP at factor cost as this is the amount received by all the factors of production (indirect taxes being the amount claimed by the government and subsidies becoming a part of factor income).

GNP at factor cost = GNP at market prices – Indirect taxes + Subsidies

17.3.7 Net National Product

The NNP is an alternative and closely related measure of the national income. It differs from GNP in only one respect. GNP is the sum of final products. It includes consumption goods plus gross investment plus government expenditures on goods and services plus net exports. Here gross investment (I_g) is the increase in investment plus fixed assets like buildings and equipment and thus exceeds net investment (I_n) by depreciation.

GNP = NNP + Depreciation

NNP includes net private investment while GNP includes gross private domestic investment.

We know that during the process of production, assets get consumed or depreciated. So, during a year the net contribution to output is the production of goods and services minus the depreciation during the year. This is known as NNP at market prices because it is the net money value of final goods and services produced at current prices during the year after depreciation.

17.3.8 NNP at Factor Cost (or National Income)

Goods and services are produced with the help of factors of production. National income or NNP at factor cost is the sum of all the income payments received by these factors of production.

NI = GNP – Depreciation – Indirect taxes + Subsidies

Since factors receive subsidies, they are added while indirect taxes are subtracted as these do not form part of the factor income.

NNP at factor cost = NNP at market prices – Indirect taxes + Subsidies

17.3.9 Personal Income

National income is the total income accruing to the factors of production for their contribution to current production. It does not represent the total income that individuals actually receive. Personal income is calculated by subtracting from national income those types of incomes which are earned but not received and adding those types which are received but not currently earned. So

Personal Income = NNP at factor cost - Undistributed profits - Corporate taxes + transfer payments

17.3.10 Disposable Income

Disposable income is the total income that actually remains with individuals to dispose off as they wish. It differs from personal income by the amount of direct taxes paid by individuals.

Disposable Income = Personal Income - Personal taxes

17.3.11 Value Added

The concept of value added is a useful device to find out the exact amount that is added at each stage of production to the value of the final product. Value added can be defined as the difference between the value of output produced by that firm and the total expenditure incurred by it on the materials and intermediate products purchased from other business firms. Thus, value added is obtained by deducting the value of material inputs or intermediate products from the corresponding value of output.

Value added = Total sales + Closing stock of finished and semi-finished goods - Total expenditure on raw materials and intermediate products - Opening stock of finished and semi-finished goods

The table below summaries the relationships among all of the above national income accounting concepts.

	Gross National Product (GNP)
Less depreciation or capital consumption allowances	
	Net National Product (NNP)
Less indirect taxes Plus subsidies	
	National Income (NI)

Less government income from property and entrepreneurship
    Social security taxes
    Corporate profit taxes
    Retained earnings
Plus transfer payments	

	Personal Income (PI)
Less personal taxes	
	Disposable Personal Income (DPI)
Which is available for Personal consumption expenditure	

A Review

GDP can be measured in two ways: the expenditure approach and the income approach.

Using the expenditure approach, GDP = C + I + G + (X - M).

A lot of investment is replacement investment since it is made to cover depreciation and is a cost of production. When one subtracts depreciation from GDP, one arrives at NDP

NDP = GDP - Depreciation

To move from net domestic product to net national product one must add net foreign factor income (foreign earnings of citizens minus domestic earnings of foreigners) to net domestic product

NNP = NDP + Net foreign factor income

The income approach adds up compensation to employees, rent, interest, and profits to arrive at national income.

NI = Compensation to employees + Rent + Interest + Profits

One then adds net indirect taxes to national income to arrive at NNP at market price.

NNP = NI + net indirect business taxes

Adding depreciation to NNP, we arrive at GNP.

GNP = NNP + Depreciation

Finally, subtracting net foreign factor income,

GDP = GNP – Net foreign factor income
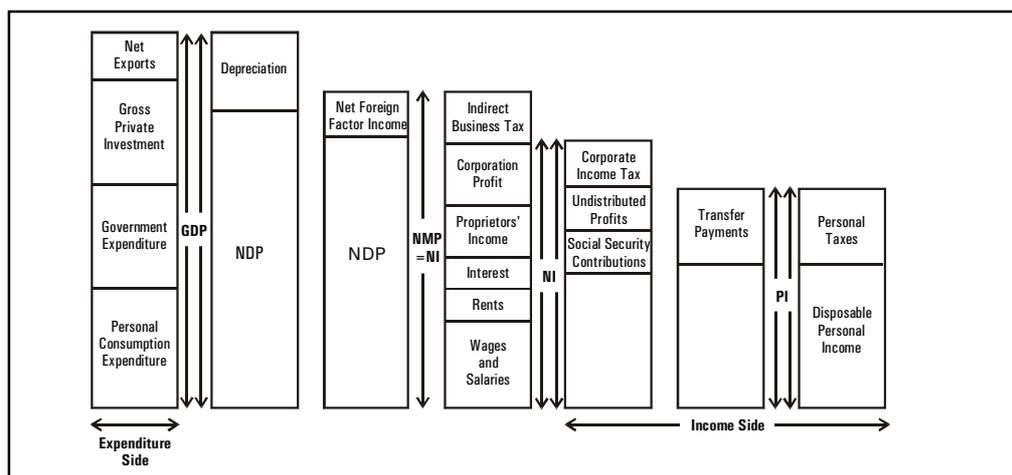
Figure 17.1: From GDP to Disposable Personal Income

17.4 NATIONAL INCOME IDENTITIES

There are many important concepts and measures in national income accounts. National income identities are formulated in terms of these concepts and measures. For proper understanding of macroeconomic theory one is to be clear about the distinction between identity and an equation or an equilibrium condition. Several national income identities can be identified which are very useful in macroeconomic discussions. National income accounting is also referred to as social accounting. The identities explained below take care of national income and other social accounts.

1. Net National Product (NNP) at market prices = NNP at factor cost (or National income) + Indirect taxes - Subsidies.

    The above identity gives the relationship between NNP at factor cost and NNP at market prices.

2. Market price of a unit of a commodity = factor cost per unit + net indirect taxes, net indirect taxes being indirect taxes minus subsidies.

3. Net National Disposable Income = NNP at market prices + Other current transfer from rest of the world.

4. Net Domestic Product at Market Prices = NNP at market prices - Net factor income from abroad.

5. Net Domestic Disposable Product at market = Net national disposable income - Net factor income from abroad minus other current transfers from rest of the world.

6. Net Domestic Product at factor cost = Net domestic product at market prices - indirect taxes + Subsides.

7. Private income = Income accruing to private sector from domestic product + Interest on public debt + Current transfers from government administrative departments + Other current transfers from rest of the world + Net factor income from abroad.

8. Personal income = Private income - Saving of private corporate sector net of retained earnings of foreign companies - Corporation tax.

9. Personal Disposable income = Personal income - Direct taxes paid by households - Miscellaneous receipts of government administrative departments.

    What is gross national product (GNP)? The following identity tells us about GNP.

GNP = NNP + depreciation

Thus GNP is gross of depreciation and the NNP is net of depreciation. As there are no ways to determine precisely the amount of depreciation, the usual national income measure used is GNP. For similar reasons gross domestic product (GDP) is used instead of NDP.

10. GDP at market prices = NDP at factor cost + Consumption of fixed capital + (indirect taxes - subsidies)

11. Expenditure on GDP = Government final consumption expenditure + Private consumption expenditure + Gross fixed capital formation + change in stocks + exports of goods and services - imports of goods and services + statistical discrepancies = GDP.

12. Appropriation of disposable income = Government final consumption expenditure + Private final consumption expenditure + Saving + Statistical discrepancy.

13. Disposable income = NDP at factor cost + Compensation of employees from the rest of the world (Net) + Property and entrepreneurial income + indirect taxes - subsidies + other current transfers from the rest of the world (net).

14. Gross accumulation = Domestic saving + Consumption of fixed capital + capital transfers from the rest of the world (net).

15. Value of current transactions = Exports of goods and services + compensation of employees from the rest of the world + property and entrepreneurial income from the rest of the world + other current transfers from the rest of the world + adjustment of merchandise exports to the change of ownership basis.

16. Disposal of current receipts = imports of goods and services + compensation of employees to the rest of the world + Property and entrepreneurial income to the rest of the world + other current transfers to the rest of the world + adjustment of merchandise imports to the change of ownership basis - surplus of the nation on current account.

17. Capital receipts = surplus of the nation on current account + capital transfers from the rest of the world (net) + net incurrence of foreign liabilities.

18. Capital account disbursements = purchases of intangible assets from the rest of world (net) + acquisition of foreign financial assets.

Check Your Progress 1

1. Fill in the blanks.

   (a) Personal Income = Private income-_____-Corporate savings.

   (b) _____= Gross Domestic Product at market prices - Depreciation.

   (c) _____= Personal income- Personal direct taxes- fines.

   (d) NNP at factor cost = _____ - Indirect taxes + Subsidies.

   (e) _____= GDP at market price + Net factor income from abroad.

   (f) Net factor income from abroad = Factor income received from abroad - _____.

2. Using the following data, calculate:

   (a) GNP_{FC}

   (b) NNP_{FC}

   (c) NNP_{MP}

Contd...

Components	Rs in crores
GNP$_{MP}$	51,589
Indirect taxes less subsidies	8,671
Depreciation	3,589
Profits from government enterprises	896
National debt interest	629
Transfer payments	864
Current transfers from abroad	769

3. State whether true or false.

   a) NNP= C+G+X+M.

   b) Disposable income includes personal taxes.

   c) Value added = Total sales + total expenditure on raw materials and intermediate products - closing stock of finished and semi-finished gods.

   d) GDP= GNP+ Net factor income from abroad.

   e) NNP$_{MP}$=NNP$_{FC}$+ Indirect taxes - Subsidies.

   f) Under product approach, the factors of production used in the production of a product are added up.

   g) The three approaches to national income will all lead to different results.

17.5 APPROACHES TO MEASUREMENT OF NATIONAL INCOME

It is evident that the measurement of national income involves the measurement of the size of the circular flow. Basically there are three ways of looking at the circular flow of income. It arises out of the process of activity chain in which production creates income, income generates spending and spending in turn induces production. Accordingly there are three different ways in which we can measure the size of the circular flow. We can measure it either at the production stage by measuring the value of output or at the income accrual stage by measuring the amount of factor income earned or at the expenditure stage by measuring the size of total expenditure incurred in the economy.

- Product Approach

- Income Approach

- Expenditure Approach

17.5.1 Product Approach

According to this method, the sum of net value of goods and services produced at market prices is found. Three steps are involved in calculation of national income through this method:

- Gross product is calculated by sensing up the money value of output in the different sectors of the economy.

- Money value of raw material and services used and the amount of depreciation of physical assets involved in the production process are summed up.

- The net output or value added is found by subtracting the aggregate of the cost of raw material, services and depreciation from the gross product found in first step.

This approach is used to estimate gross and net value added in the following sectors of the Indian economy:

- Agriculture and allied activities (e.g., animal husbandry)

- Forestry and Logging

- Fishing

- Mining and Quarrying

- Registered Manufacturing

17.5.2 Income Approach

This approach is also known as the income-distributed method. According to this method, the incomes received by all the basic factors of production used in the production process are summed up. The basic factors for the purposes of national income are categorized as labour and capital. We have three incomes.

- Labour income which includes wages, salaries, bonus, social security and welfare contributions.

- Capital income which includes dividends, pre-tax retained earnings, interest on saving and bonus, rent, royalties and profits of government enterprises.

- Mixed income, i.e., earnings from professions, farming enterprises, etc.

These three components of income are added together to get national income.

The approach is used for following activities:

- Railways

- Electricity, gas and water supply

- Transport, storage and communication

- Banking, finance and insurance

- Real estate

- Public administration and defence

For the first three groups almost complete data are available from annual accounts. Such data are also available for parts of latter three – the part that is in the organized sector. For the rest the indirect approach has to be employed.

Database is the weakest for unorganized sectors of the economy such as unregistered manufacturing, trade, hotels and restaurants and a variety of personal services. For these sectors rough and ready estimates based sometimes on production approach, sometimes on income approach are used. Most often estimates are obtained for a benchmark year during which a major survey had been conducted and then these benchmark estimates are brought up to date using a variety of indicators.

Constant price estimates using the income approach are obtained by updating the base year estimates using some physical indices such as amount of electricity sold, tonne-kilometres of freight transport, etc.

17.5.3 Expenditure Approach

This method is known as the final product method. According to this method, the total national expenditure is the sum of the expenditure incurred by the society in a particular

year. The expenditures are classified as personal consumption expenditure, net domestic investment, government expenditure on goods and services and net foreign investment (imports - exports).

These three approaches to the measurement of national income yield identical results. They provide three alternative methods of measuring essentially the same magnitude. If we follow the product approach or the expenditure approach, we are in effect trying to measure national income by the size of the income flow in the upper half of the circle. As against this if we follow income approach, we are actually trying to measure the flow in the lower half of the circle.

Check Your Progress 2

1. Briefly describe the Product Approach , Income Approach, Expenditure Approach of measuring the national income.

2. Comment on the following statements in light of your study of income method and expenditure method of national income measurement.

   (a) Income from the sales proceeds of second-hand goods will be included in the national income under the income method.

   (b) Government final consumption expenditure under the expenditure method includes compensation of employees, net purchases of goods and services in the domestic market and net purchases of goods and services abroad.

   (c) Corporate tax is a separate entity included in the national income under the income method.

   (d) Production for self-consumption should be included in the national income under the income method.

   (e) Changes in inventories of manufacturing companies will not be included in the national income under the expenditure method.

   (f) Net exports of goods and services will be included in the national income under the expenditure method.

17.6 INTERPRETING NATIONAL INCOME MEASURES

17.6.1 Real vs Money National Product

Measurement of national income depends upon two types of factors: (a) quantities of different products actually produced during the given year, and (b) the corresponding set of money prices used for converting diverse physical quantities into standardized values for aggregation. If the latter also relates to the same year as the former, the resulting aggregate is called national product at current prices or money national product (money NNP). If one has the figures for two years, say 1960 and 1970, a direct comparison of the two figures will show the direction and magnitude of change in the aggregate flow of factor incomes originating in the economy between 1960 and 1970. However, it will not give us any indication regarding magnitude and direction of change in volume of physical output produced between 1960 and 1970. Both the types of factors determine money NNP. Physical output and money price might have undergone a change between 1960 and 1970. To measure the change in the physical output, we should eliminate the effect of changes in the price levels.

The measure that is devised for the purpose of comparing the volume of physical output produced during different years is known as Real National Product (Real NNP). This is desired by "deflating" the money NNP with an "index number of prices". Deflation is the procedure by which the effect of variations in the measuring rod of money prices is "eliminated".

The formula is

$$\text{Real NNP} = \frac{\text{Money NNP}}{\text{Price Index}} \times 100$$

17.6.2 Problem of Computation of per capita Income

Per capita income is arrived at by dividing GNP by the total population. It is actually the per head average share in national income.

increase in per capita income is determined by

- rate of increase in GNP and

- rate of growth of population

In case growth rate of GNP is lower than that of the growth of population, an increase in GNP does not necessarily mean increase in per capita income. Per capita income is given emphasis as a better measure of individual economic welfare than GNP, which does not take into account the distribution aspect. Growth in GNP cannot be used as an indicator of economic welfare since welfare is to be related to individual's share in the national cake, namely, the per capita disposable income.

17.7 LET US SUM UP

This chapter introduces you to the concept and calculation of income at the national level. It defines the various measures of calculating national income and the underlying philosophies like the income approach, the product approach and the expenditure approach. It provides the tools not only to calculate national income but also interpret them for business use. Concepts like the price indexes and national income deflators enable the students to analyse the performance of the economy through various measures.

17.8 LESSON END ACTIVITY

1. What is the impact (if any) on the national income of India in each of the following cases?

    a. Shyam receives Rs 5000 as a gift from his father who is also a resident of India.

    b. Aggregate inventories in Indian companies go down by Rs 20,000.

    c. A receives 100 dollars as dividend from a company based in the USA.

    d. A sells shares and reaps capital gains worth Rs 1,000. Give reasons for your answers.

17.9 KEYWORDS

National income: Aggregate of money value of the annual flow of final goods and services in the national economy during a given period.

Gross national product: Value of all final goods and services produced by domestically owned factors of production within a given period.

GNI: Sum of the money incomes derived from activities involving current production in an economy in a given time period.

Gross national product at market prices: Market value of the aggregate final product before the deduction of provisions for the consumption of fixed capital, attributable to the factors of production supplied by the normal residents of a country.

Personal consumption expenditure: The sum of expenditure on both the durable and non-durable goods as well as services for consumption purposes.

Gross private investment: Total expenditure incurred for the replacement of capital goods and for additional investment.

Government expenditure: The sum of expenditure on consumption and capital goods by the government.

Net exports: Difference between the expenditure of rest of the world on output of the national economy and the expenditure of the national economy on output of the rest of the world.

Disposable income: total income that actually remains with individuals to dispose off as they wish.

Value added: Difference between the value of output produced by that firm and the total expenditure incurred by it on the materials and intermediate products purchased from other business firms.

GNP deflator: Ratio of nominal GNP to real GNP.

17.10 QUESTIONS FOR DISCUSSION

1.   Given the following data about the economy:

	Rs
Consumption	7000
Investment	5000
Proprietor's income	2500
Corporate income taxes	2150
Govt expenditure	3000
Profits	2500
Wages	7000
Net exports	2750
Rents	250
Depreciation	250
Indirect business taxes	1000
Undistributed corporate profits	600
Net foreign factor income	30
Interest	1500
Social security contribution	0
Transfer payments	0
Personal taxes	1650

  a. Calculate GDP and GNP with both the expenditure and income approach.

  b. Calculate NDP, NNP, NI and domestic income.

2. In an economy the following transactions have taken place:

  A sells to B for Rs 50 and to C for Rs 30; B sells to private consumption for Rs 40 and to export for Rs 80; C sells to capital formation for Rs 50. Calculate GNP (a) by category of final demand at market prices and (b) industry of origin at factor cost. (Since no mention of taxes is there, market price and factor cost valuations are identical).

3. Suppose capital stock of an economy is worth Rs 200 million and it depreciates at the rate of 10 per cent per annum. Indirect taxes amount to Rs 30 million, subsidies

amount to Rs 15 million. Its GNP at market prices is Rs 1200 million. Calculate the national income. (NNP at factor cost is termed national income).

4. Calculate national income from the following figures (in Rs crores):

Consumption	200
Depreciation	20
Retained earning	12
Gross investment	30
Import	40
Provident fund contributions	25
Exports	50
Indirect business taxes	15
Government purchases	60
Personal income taxes	40

a. If there were 10 crores people in this country

b. If all prices were to double overnight, what would happen to the value of real and nominal GDP per capita?

17.11 MODEL ANSWER TO "CHECK YOUR PROGRESS"

Check Your Progress 1

(a) Corporate Taxes

(b) Net Domestic Product at Market Prices

(c) Personal disposable income

(d) NNP at market price

(e) GNP at market

(f) Factor income paid abroad

Check Your Progress 2

(a) $GNP_{FC} = GNP_{MP} - $ Net indirect taxes

$= 51,589 - 8,671 = 42918$

(b) $NNP_{FC} = GNP_{FC} - $ Depreciation

$= 44918 - 3,589 = 41329$

(c) $NNP_{MP} = NNP_{FC} + $ Net indirect taxes

$= 41329 + 8671 = 50,000$

17.12 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books.

F.S. Brooman, *Macroeconomic*, George Allen & Unwin Ltd.

Bo Sodersten and Geoffrey Reed, *International Economics*, Macmillan.

LESSON
18

INFLATION & MONETARY POLICY

CONTENTS

18.0 AIMS AND OBJECTIVES

The purpose of this lesson is to discuss meaning, types and effects of inflation and the role of monetary policy in controlling inflation. After studying this lesson you will be able to:

(i) describe meaning and types of inflation

(ii) explain the effects of inflation

(iii) discuss measures to control inflation

(iv) define deflation

(v) describe meaning, objectives and tools of monetary policy

(vi) explain various phases of business cycle.

18.1 INTRODUCTION

Inflation is defined as a sustained increase in the price level or a sustained fall in the value of money. Inflation in India is explained by various factors, viz., excessive aggregate demand, imbalance between the sectoral demand and supply, cost factors including rising import prices and rate of expansion of money. To understand the type of inflation, we analyse the price trends, the rate of expansion of money supply and the rate of increase in demand. To quantify the amount of inflation in the economy, indicators such as the Wholesale Price Index, the Consumer Price Index and the GDP Deflator are used. The Wholesale Price Index is defined as the measure of the cost of a given basket of goods. It includes raw materials and semi-finished goods. It is designed to measure prices at an early stage of the distribution system. The Consumer Price Index measures the cost of buying a fixed basket of goods and services. It is representative of the purchases of urban consumers. The GDP deflator is a ratio of nominal GDP in a given year to the real GDP in that year. Thus, it measures the changes in prices that have occurred between the base year and the current year. But it is paradoxical that often when these indicators show a small growth in the rate of inflation, for the layman prices keep increasing and show little inclination of ever coming down. This is primarily because the CPI is not realistically based. The computation does not include costs like housing, electricity charges, communication costs and educational expenses. Thus, the indicators of inflation will be influenced primarily by changes in money supply, financing of the money supply by the government and the influence of money wages. Inflation affects the private corporate sector through its impact on the interest rate, credit offtake and globalization of savings.

18.2 RATE OF INFLATION

While inflation means a rise in the general price level, the rate of inflation is the rate of change of the general price level. It is measured by a simple formula as follows:

$$\text{Rate of inflation } t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100$$

Where, P_t is the price level in year t, P_{t-1} is the price level in year t-1, the base year. If there is a decline in the rate of inflation, such a situation is called DISINFLATION. The most recent period of disinflation in India occurred in India since the middle of 1991 when the high rate of inflation which had crossed double digit levels and was around 17 per cent, was brought down to around 7 per cent, thanks to a package of macroeconomic stabilization policies introduced by the government.

18.3 TYPES OF INFLATION

In a free market economy, prices go up freely due to supply-demand imbalances leading to open inflation.

Suppressed inflation occurs in a controlled economy where the upward pressure on prices is not allowed to influence the quoted or managed prices. But inflation reveals itself in other forms. For example, government may introduce rationing of goods leading to long queues in front of ration shops. There is very likely to be a black market for such goods whose prices are far above the quoted prices. In India, suppressed inflation manifests itself in the prices of essential goods sold through PDS. The ration prices are deliberately maintained at a certain level while the open market prices are above this level.

18.3.1 Creeping Inflation, Galloping Inflation and Hyper Inflation

These three categories of inflation are recognized on the basis of severity of inflation, as measured in terms of rate of rise in prices.

There is moderate rise in prices of 2-3 per cent per annum in creeping inflation. It is generally considered good for a growing economy. Mildly rising prices result in faster

growth of output in that they raise the profit margins of firms and encourage them to produce more. Creeping inflation does not severely distort relative prices nor does it destabilize price expectations. A single digit inflation is also considered as moderate inflation which most countries have come to put up with.

In galloping inflation prices rise at double or treble digit rates per annum (20-100%). It tends to distort relative prices and results in disquieting changes in distribution of purchasing power of different groups of income earners. There is often a flight of capital from the country since people tend to send their investment funds abroad and domestic investment withers away.

Hyper inflation or run-away inflation is of a severe type in which prices rise a thousand or a million or even a billion per cent per year. It seriously cripples the economy. Prices and money supply rise alarmingly. Germany experienced hyper inflation during 1920-23. It is generally a result of war, political revolution or some other catastrophic event.

18.3.2 Demand Pull Inflation

Such an inflation occurs when aggregate demand rises more rapidly than the economy's productive potential, pulling prices up to equilibrate aggregate supply and demand. It is characterized by a situation in which there is "too much money chasing too few goods".

Keynes maintains that demand pull inflation could be caused by excessive fiscal deficit leading to increase in government expenditure. An increase in government expenditure, especially during a war, raises the demand for output well above the supply and ignites a rapid inflation.

This type of inflation was first explained by Keynes. He introduced the concept of 'inflationary gap' to substantiate his approach to demand pull inflation. He defines inflationary gap as an excess of planned (or anticipated) expenditure over the available output at pre-inflation or base prices. Lipsey adds that this gap is the amount by which aggregate expenditure would exceed aggregate output at the full employment level of income.

In the absence of government expenditure, the economy will be in equilibrium at income level Y_o, at which aggregate income equals aggregate demand E_o (Figure 18.1).
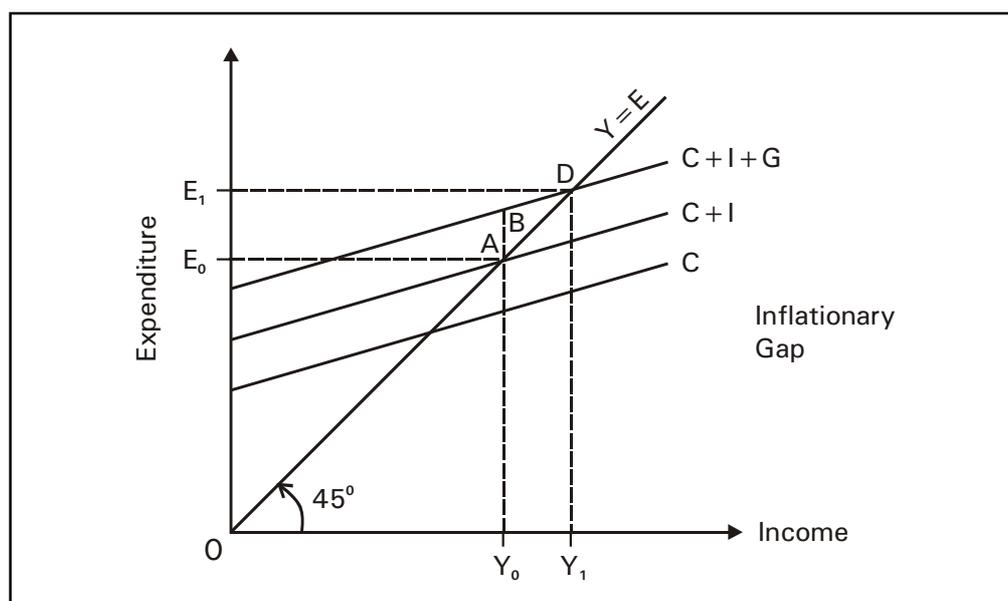

Figure 18.1

Aggregate expenditure is the sum of consumption expenditure of households and investment expenditure of the firms. Thus, at point A, the equilibrium point $Y = C + I$.

If government decides to incur an expenditure, G, the aggregate expenditure curve (C+1+G) shifts upwards and new equilibrium is D where the level of income is Y, and expenditure E.

However, suppose Y_0 is full employment equilibrium and the real output cannot increase. Thus there is an excess demand equal to AB which will be purely inflationary and this represents the inflationary gap (Keynesians recommend that in such situations the government should follow deflationary policy to bring down aggregate demand to the equilibrium level).

According to Keynes, at full employment, the excess demand for goods and services cannot be met in real terms and, therefore, it is met by rise in the price of goods. Demand pull inflation occurs only when there is an inflationary gap in the economy. The aggregate demand line AD intersects the 45^0 line at point E, which is to the right of the full employment line. Thus, at full employment there is excess demand which pulls up prices (Figure 18.2).

Samuelson says that demand pull inflation simply means that increasing quantities of money are competing for the limited supply of commodities and bid up their prices.

As the rate of employment falls and labour markets become light (i.e., markets become scarce) wages are bid up and the inflationary process accelerates.

Factors on Demand Side

On the demand side, the major inflationary factors are:

● money supply;

● disposable income and consumer expenditures;

● business outlays; and

● foreign demand.
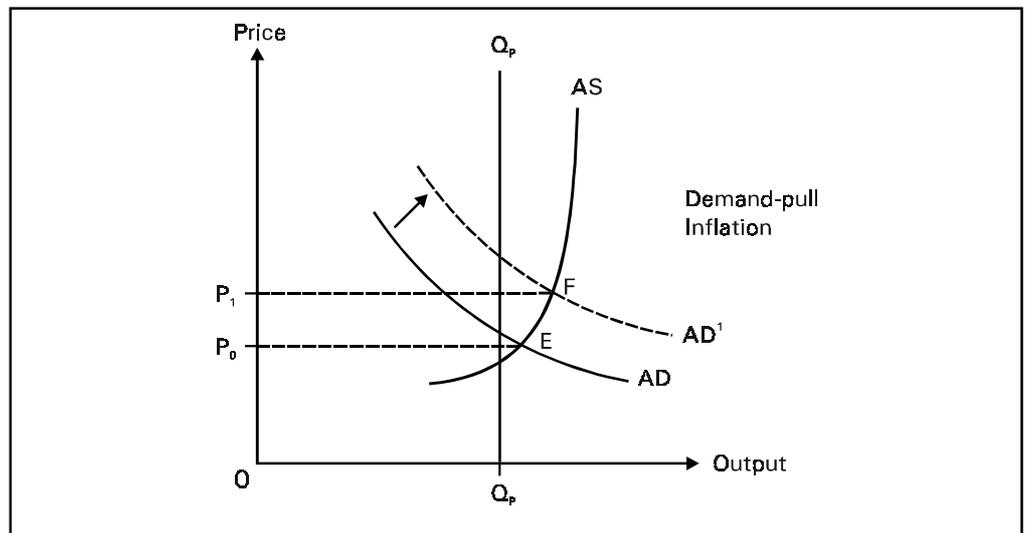
Figure 18.2

Money Supply: The first major source of inflation is an increase in money supply in the economy. Increase in money supply results primarily from an increase in demand deposits and expansion of loans and investments by the commercial banks. Expansion of bank credit is at once a cause and an effect of inflationary pressures since it reflects an enlarged income stream resulting from the use of bank credit and parting a growing business and personal demand for funds due to higher prices and costs.

Disposable Income: This refers to the income payments to factors after personal taxes have been paid. An increase in disposable income results in an increase in the absolute

amount of consumption expenditure in the economy. Such an increase is inflationary in character.

Increase in Business Outlays: Increase in business outlays or capital expansion takes on a speculative character during an inflationary boom. New equipment and plants and excessive inventories are often financed by speculative borrowing, not to mention an increase in replacement demand. Most of business expenditure find their way into the income stream dividends, wages and other income payments. These are often inflationary in character.

Increased Foreign Demand: Another factor responsible for increased demand is foreign expenditure for domestic goods and services. This factor is particularly significant if a country maintains an export surplus on its balance of trade. Foreign demand exerts considerable inflationary pressures on domestic areas of shortages which may be a focal point of spreading inflation.

It is the cumulative effect of all or most of these factors that the aggregate demand function in an economy shifts upwards, resulting in inflation in prices.

18.3.3 Cost Push Inflation

Modern information is far more complex than what can be explained by the simple demand pull theory. Prices and wages start rising before the economy reaches full employment. They rise even under conditions of a large idle capacity and a sizeable portion of the labour force being unemployed. This is known as "cost push" or "supply-shock" inflation.

The supply or cost analysis of inflation, also known as the "new-inflation theory", maintains that inflation occurs due to an increase in the cost or supply price of goods caused by increases in the prices of inputs. Rapidly rising money wages with no corresponding rise in labour productivity in certain key sectors of the economy result in higher prices in these same sectors, particularly as demand rises. This leads to further erosion of real wages forcing organized labour, including trade unions not involved in the initial round of wage increases, to seek a further rise in money wages. This is what is commonly referred to as wage price spiral.

The notion of cost push inflation is not new. As Bronfen-Bparting Benner and Holzman have observed, "cost inflation" has been the layman's instinctive explanation of general price increases since the dawn of the monetary system. We know of no inflationary movement that has not been blamed by some people on "profiteers", "speculators", "hoarders", or workers and peasants, "living" beyond their station.

Thus, cost push inflation occurs due to non-wage factors also. For instance, monopolistic or oligopolistic firms often attempt to maintain their profit margins steady by raising the prices of their products in proportion to the rise in other cost elements. Such a cost push inflation is sometimes called "mark-up" inflation.

Cost push inflation is shown in the Figure 18.3.
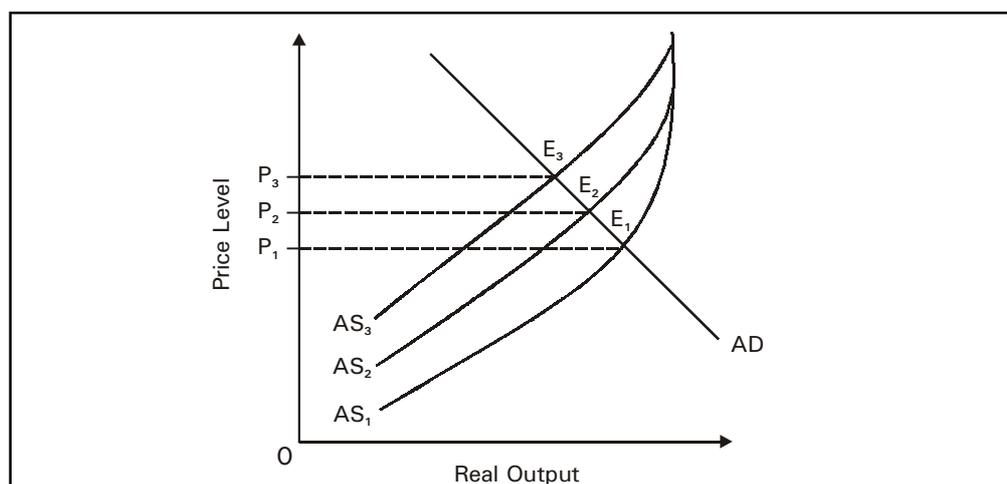
Figure 18.3

Given the demand curve AD, supply curve shifts to the left from AS_1 to AS_2 to AS_3 as a result of rise in wages and other cost elements. Leftward shifts in the supply curve result in rise in the price level from P_1 to P_2 to P_3 and so on.

The causes of such inflation are as follows:

Wage-push Pressures

Cost push inflation is often attributed to wage push or profit push pressures. Wage push pressures are created by labour unions and workers who are often able to increase their wages faster than their productivity. It is widely believed that powerful trade unions cause inflation by pushing up wages. This variant of cost push inflation, called wage-push inflation, occurs when wages rise faster than labour productivity; statistical studies indeed corroborate this view. Empirical evidence shows that there is indeed a correlation between earnings and the general price level. However, such correlation is not always perfect.

Profit-Push and Mark-up Pricing

Suppose all business firms have the practice of pricing the goods and services which they sell on the basis of standard mark-up over their direct cost of materials and labour. In such a situation when the firms follow cost plus pricing either an increase in costs or an increase in the mark-up as a percentage of the costs or both will lead to a rise in the price level. Such a mark-up inflation is because of dynamic price expectations of consumers and speculative activities of traders.

Import Prices

Since no country in the present day world is self-sufficient, imports play an important part in cost push inflation. Thus, inflation is often transmitted from country to country. The sharp increase in the world commodity prices, especially oil, in the 1970s undoubtedly contributed to inflation. Sine inflation is a global phenomenon, it cannot be avoided. It is not possible for a country to cut itself off completely from rising prices in the rest of the world.

Exchange Rates

Exchange rate movements also cause price level changes. This is, in fact, the essence of the purchasing power parity theory of exchange rate determination. As far as the Indian economy is concerned the depreciation of the external value of the rupee since the floating of rupee in 1975 has certainly been an inflationary factor.

18.3.4 Demand Pull vs Cost Push Inflation

The issue whether inflation is due to demand pull or cost push is being intensely debated since the late 1950s. If demand pull is the correct diagnosis of inflation, the "government" must bear the balance for excessive spending and too little taxing while the monetary authorities (the central bank) are to be blamed for pursuing a "cheap money policy". If, on the contrary, cost push is the real cause of inflation "trade unions" are to be blamed for excessive wage-claim, industry for acceding to them, and business firms for "marking-up" profits under conditions of monopoly or oligopoly.

Some economists argue that there cannot be such a thing as a cost push inflation because any increase in costs without an increase in purchasing power and demand would lead to unemployment and depression, and not to inflation. It is impossible to think of a process of continuous price rise, it is argued, if there is no increase in demand or the quantity of money and bank credit. On the contrary, many economists subscribe to the view that demand pull is no cause of inflation, only a cost push can produce it. But it seems unrealistic to view the demand pull and cost push in exclusion of each other. Prices

increase as a consequence of complex interactions among wages, costs and excess demand in goods markets, labour market and money market.

Empirical studies have also pointed to difficulties in the proper identification of demand and cost inflation. Prof. Harry G Johnson considers the entire controversy between demand pull and cost push as spurious for three reasons. First, the advocates of the two theories fail to investigate the monetary assumption upon which the two theories are based. A sustained inflation cannot be generated either by cost push or by demand pull unless the behaviour of the monetary authority is taken into account under the varying circumstances. Johnson remarks: "The two theories are, therefore, not independent and self-contained theories of inflation, but rather theories concurring the mechanism of inflation in a monetary environment that permits it." Johnson has stressed that the real issue between the two is not what causes inflation but whether inflation can be checked through the mechanism of cost and price determination or by checking the aggregate demand through monetary and fiscal restraints.

Secondly, Johnson says there is difference between the two theories about the definition of full employment. If full employment is defined as a situation when the demand for goods is just sufficient so that the price level neither rises nor falls, then inflation must be associated with excess demand by reference to the level of unemployment at which the unfilled vacancies are just equal to the number of job seekers or by reference to some percentage of unemployment regarded as normal – inflation will co exist with some unemployment. This type of inflation can be explained only by reference to the forces that push up prices in spite of the absence of excess demand. So the whole controversy boils down to the policy issue whether the present level of unemployment is to be regarded as too great or too small.

Thirdly, Johnson points out that it is almost impossible to devise a test capable of determining whether a particular inflation is of cost push or demand pull variety. Most of the available tests are extremely superficial in nature.

The debate between the two theories goes on unresolved. The crux of the entire matter is that price movements are consequences of complex interactions of cost and demand adjustments which are extremely difficult to identify and disentangle.

Check Your Progress 1

1. Who, according to you, are the losers and gainers when inflation exceeds expectation level?

2. State whether the following statements are true or false.

   (a) Inflation can be defined as a sustained increase in prices.

   (b) Too much money chasing too few goods is a characteristic of inflation.

   (c) Inflation takes into account the present periods' prices only.

   (d) Exchange rates do not affect domestic prices.

18.4 MEASUREMENT OF INFLATION

18.4.1 The GNP Deflator

The GNP deflator is the ratio of nominal GNP in a given year to real GNP and it is a measure of inflation from the period for which the base prices for calculating the real GNP are taken to the current period.

Since the GNP deflator is based on a calculation involving all the goods produced in the economy, it is a widely based price index that is frequently used to measure inflation. Thus the calculation of real GNP gives us a useful measure of inflation – the GNP deflator. Using the example in the table above (bananas, oranges), inflation between 1982 and 1990 can be measured by comparing the value of 1990 GNP in 1990 prices and 1982 prices. The ratio of nominal to real GNP in 1990 is 1.22 (=21/17.2). In other words, output is 22% higher in 1990 when it is valued in the lower prices of 1982. The 22% increase is ascribed to be the price increase, or inflation over the 1982-1990 period.

18.4.2 The Consumer Price Index

The Consumer Price Index (CPI) measures the cost of buying a fixed basket of goods and services representative of the purchases of urban consumers.

CPI is a compromise. Instead of a given standard of living, we compare, over time, the money outlays required to purchase a given basket of consumption goods and services. The basket represents the actual consumption pattern of a typical family from a specific group for which the CPI is being constructed. Since tastes vary across families and relative prices can also vary geographically, a separate CPI is constructed for each of a few well defined population groups. Typical groupings are urban industrial workers, agricultural labourers, urban non-manual employees, etc.

To construct the index for a given year with reference to a base year we need: (a) consumption basket in the base year (b) prices of items in the basket in the base, and (c) price relatives for each item in the given year. From (a) and (b) we can get the weights $W_1.....W_n$.

In practice it is not feasible to include each and every consumption item individually. Items are grouped together into a small number of groups, e.g., 'food', 'pan, supari, tobacco and intoxicants', 'fuel and light', 'housing', etc., with further subgroupings, e.g., within food we can have 'cereals', 'pulses and products', 'oils and fats', etc. Even after this, it is not necessary to include all items in the calculation; if prices of a group of items show closely similar movements only one of them needs to be included in the index calculation. For instance, in the 'vegetables and fruits' group only a couple of vegetables and a couple of fruits can be selected for monitoring price movements; prices of others would presumably move more or less in unison with the selected items. The weights for the non-selected items are then appropriately distributed over the selected items.

The consumption basket data come from family budget surveys which are carried out from time to time. These surveys yield estimates of commodity composition of consumption expenditures of a typical family in a specified population group. Price data are obtained from retail outlets by a large staff of field investigators. The base year is changed every few years so that account can be taken of changes in tastes, appearance of new items in the consumption baskets, etc. Without such updating the index would lose its usefulness as an approximate measure of cost of living.

CPIs for various population groups are calculated and published by the Bureau of Labour. They are reproduced in a variety of government and non-government publications. The reader who is interested in knowing the statistical details of CPI construction can consult Working Class Consumer Price Index Numbers in India – A Monograph (1972), published by the Labour Bureau. A hypothetical example of CPI construction follows.

Assume that a typical urban working class family had only five items in its consumption basket. The items, quantities purchased in 1970-71 per month at 1970-71 prices and 1980-81 prices are given below:

Item	Qty 1970-71	Prices 1970-71	Prices1980-81	Price Relative 1980-81 $= \dfrac{\text{Price } 80\text{-}81 \times 100}{\text{Price } 70\text{-}71}$
Rice	15 kg	Rs 3 / kg	Rs 4 / kg	133
Wheat	10 kg	Rs 2 / kg	Rs 3 / kg	150
Milk	30 ltrs	Rs 3 / ltr	Rs 5 / ltr	167
Cotton Cloth	5 mtrs	Rs 8 / mtr	Rs 12 / mtr	150
Housing	A two room house	Rs 100 / p.m.	Rs 200 / p.m.	200

a.   Total expenditure in 1970-71

$$p_i^0 q_i^0 = \text{Rs } 295$$

b.   Weights

Consider milk. Expenditure on milk in 1970-71 was Rs 90. Its share in total expenditure was $\dfrac{90}{295} = 0.30$

$$W_{milk} = \frac{p^0_{milk} q^0_{milk}}{p_i^0 q_i^0} = \frac{90}{295} = 0.30$$

Other weights are

Rice : 0.15; Wheat : 0.07; Cloth : 0.14; Housing : 0.34

The weights sum to unity as they should.

c.   Price Relatives

Price relative for cotton cloth

$$\frac{p^t cloth}{p^0 cloth} \times 100 = \frac{12}{8} \times 100 = 150$$

Other price relatives are given below:

d.   Laspeyre's CPI

$$I_t = \sum w_i \frac{p_i^t}{p_i^0} \times 100 = 169.55$$

18.4.3 The Wholesale Price Index (WPI)

The principles of construction of WPI are quite analogous to those behind CPI. The differences between the two are:

●   The items included in WPI are quite different. They include items like fertilizers, minerals, industrial raw materials and semi-finished goods, machinery and equipment, etc., apart from items in the food group and in the fuel, light and power group. The WPI can be interpreted as an index of prices paid by producers for their inputs.

●   Wholesale prices rather than retail prices are used. Thus for minerals ex-mine prices, for manufactured products ex-factory prices, for agricultural commodities the first wholesaler's prices, etc., are used.

●   Weights are based on value of transaction in the various items in the base year. For manufactured products it is the value of production, for agricultural products the value of marketable surplus, etc.

The main groups of items are:

- Primary articles which include food (rice, wheat, etc.), non-food (raw cotton, jute, etc.), minerals (iron ore, manganese ore, etc). In all 80 primary articles are covered.

- Manufactured articles include 270 items.

- Fuel, power, light and lubricants include 10 items.

Wholesale price indices for individual commodities, commodity groups and the overall WPI are published monthly by the Office of the Economic Adviser to the Government of India. They are reported in a number of other publications.

18.4.4 Control of Inflation

To control the inflation the governing authorities have to regulate the supply of money in the economy. The instruments that are used to regulate the supply of money is Monetary and Fiscal Policy. Through monetary policy RBI regulates the supply of money in the economy by regulating the CRR, SLR etc. Through these instruments RBI can directly regulate the interest rates of Banks. Through fiscal policies govt. influences the supply of money and prices of goods by bringing changes in the tax structure.

18.5 DEFLATION

Deflation is a decrease in the general price level over a period of time. Deflation is the opposite of inflation. For economists especially, the term has been and is sometimes used to refer to a decrease in the size of the money supply (as a proximate cause of the decrease in the general price level). The latter is now more often referred to as a 'contraction' of the money supply. During deflation the demand for liquidity goes up, in preference to goods or interest. During deflation the purchasing power of money increases.

Deflation is considered a problem in a modern economy because of the potential of a deflationary spiral and its association with the Great Depression, although not all episodes of deflation correspond to periods of poor economic growth historically.

18.5.1 Definition

The 'general price level' comprises the price of wages, consumption goods and services. As with inflation, there are economists who regard deflation as a purely monetary effect, when the monetary authority and the banks constrict the money supply, and there are those who believe that price deflation follows dramatic falls in business confidence, which reduces the velocity of money, i.e. the speed with which money is circulating. However, it is at least theoretically possible to have a falling money supply but stable or rising prices, if the rate of increase of the velocity of money is substantially greater than the rate at which the money supply is falling. Presumably, this is what happens in the early stages of a hyperinflation as the monetary authorities lose control over the money supply (but are initially, at least, trying to put on the brakes by the usual remedy of restricting money supply).

18.5.2 Effects of deflation

In economic theory deflation is a general reduction in the level of prices, or of the prices of an entire kind of asset or commodity. Deflation should not be confused with temporarily falling prices; instead, it is a sustained fall in general prices. In the IS-LM model this is caused by a shift in the supply and demand curve for goods and interest, particularly a fall in the aggregate level of demand. That is, there is a fall in how much the whole economy is willing to buy, and the going price for goods. Since this idles capacity, investment also falls, leading to further reductions in aggregate demand. This is the deflationary spiral. The solution to falling aggregate demand is stimulus either from the central bank,

by expanding the money supply, or by the fiscal authority to increase demand, and borrow at interest rates, which are below those available to private entities.

In more recent economic thinking, deflation is related to risk, where the risk adjusted return of assets drops to negative, investors and buyers will hoard currency rather than invest it, even in the most solid of securities. This can produce the theoretical condition, much debated as to its practical possibility, of a liquidity trap. A central bank cannot, normally, charge negative interest for money, and even charging zero interest often produces less stimulative effect than slightly higher rates of interest. In a closed economy, this is because charging zero interest also means having zero return on government securities, or even negative return on short maturities. In an open economy it creates a carry trade and devalues the currency producing higher prices for imports without necessarily stimulating exports to a like degree. The experience of Japan during its 1988-2004 depression is thought to illustrate both of these problems.

In monetarist theory deflation is related to a sustained reduction in the velocity of money or number of transactions. This is attributed to a dramatic contraction of the money supply, perhaps in response to a falling exchange rate, or to adhere to a gold standard or other external monetary base requirement.

Deflation is generally regarded negatively, as it is a tax on borrowers and on holders of illiquid assets, which accrues to the benefit of savers and of holders of liquid assets and currency. In this sense it is the opposite of inflation (or in the extreme, hyperinflation), which is a tax on currency holders and lenders (savers) in favor of borrowers and short-term consumption. In modern economies, deflation is caused by a collapse in demand (usually brought on by high interest rates), and is associated with recession and (more rarely) long-term economic depressions.

In modern economies, as loan terms have grown in length and financing is integral to building and general business, the penalties associated with deflation have grown larger. Since deflation discourages investment and spending, because there is no reason to risk on future profits when the expectation of profits may be negative and the expectation of future prices is lower, it generally leads to, or is associated with a collapse in aggregate demand. Without the "hidden risk of inflation", it may become more prudent just to hold onto money, and not to spend or invest it.

Deflation is, however, the natural condition of hard currency economies when the rate of increase in the supply of money is not maintained at a rate commensurate to positive population (and general economic) growth. When this happens, the available amount of hard currency per person falls, in effect making money scarcer; and consequently, the purchasing power of each unit of currency increases. The late 19th century provides an example of sustained deflation combined with economic development under these conditions.

Deflation also occurs when improvements in production efficiency lowers the overall price of goods. Improvements in production efficiency generally happen because economic producers of goods and services are motivated by a promise of increased profit margins, resulting from the production improvements that they make. But despite their profit motive, competition in the marketplace often prompts those producers to apply at least some portion of these cost savings into reducing the asking price for their goods. When this happens, consumers pay less for those goods; and consequently deflation has occurred, since purchasing power has increased.

While an increase in the purchasing power of one's money sounds beneficial, it can actually cause hardship when the majority of one's net worth is held in illiquid assets such as homes, land, and other forms of private property. It also amplifies the sting of debt, since-- after some period of significant deflation-- the payments one is making in

the service of a debt represent a larger amount of purchasing power than they did when the debt was first incurred. Consequently, deflation can be thought of as a phantom amplification of a loan's interest rate. (But, conversely, inflation may be thought of as a regressive, across the board general tax.)

This lesson about protracted deflationary cycles and their attendant hardships has been felt several times in modern history. During the 19th century, the Industrial Revolution brought about a huge increase in production efficiency, that happened to coincide with a relatively flat money-supply. These two deflationary catalysts led, simultaneously, not only to tremendous capital development, but also to tremendous deprivation for millions of people who were ill-equipped to deal with the dark side of deflation. Business owners- - on average, better educated in economic theory than their unfortunate cohorts (or just better able to withstand the economic stresses) -- recognized the deflation cycle as it unfolded, and positioned themselves to leverage its beneficial aspects.

Hard money advocates argue that if there were no "rigidities" in an economy, then deflation should be a welcome effect, as the lowering of prices would allow more of the economy's effort to be moved to other areas of activity, thus increasing the total output of the economy. However, while there have been periods of 'beneficial' deflation (especially in industry segments, such as computers), more often it has led to the more severe form with negative impact to large segments of the populace and economy.

Since deflationary periods favor those who hold currency over those who do not, they are often matched with periods of rising populist sentiment, as in the late 19th century, when populists in the United States wanted to move off hard money standards and back to a money standard based on the more inflationary (because more abundantly available) metal silver.

Most economists agree that the effects of modest long-term inflation are less damaging than deflation (which, even at best, is very hard to control). Deflation raises real wages, which are both difficult and costly for management to lower. This frequently leads to layoffs and makes employers reluctant to hire new workers, increasing unemployment. However, in the last 5 years or so, real wages for the average worker has remained fixed or actually decreased, with little effect on unemployment.

18.6 MONETARY POLICY

By monetary policy, we mean the policy concerned with changes in the supply of money. Correspondingly, it appears natural to define credit policy as policy concerned with changes in the supply of credit. But it can be and is much more than this and it is so for several reasons. Firstly, unlike money, credit is not merely a matter of aggregate supply. It is also a matter of its allocation among competing uses (for agriculture, for industry, for trade and so on) and users (consuming households, private sector enterprises and so on). Then there are different sources of credit, institutional and non-institutional. Even among institutional sources, banks are only one, though primary source. Further, besides quality and other aspects of credit such as its cost and other terms and conditions, duration, renewal, risk factors, etc., are also important for both the borrower and the lender. Thus the potential domain of credit policy is very wide, much wider than that of monetary policy. We also need to note other points of difference between monetary policy and credit policy which will throw further light on the nature of the two policies. Fundamental among them is the point that money is an asset of the holding public but liability of the producers of money-the government and the central bank for currency and banks for deposit money. While this is so in the case of money, bank credit is an asset of banks and liability of the borrowing public and the government. This asset-liability distinction is not purely of accounting value; it underlies much of monetary theorizing.
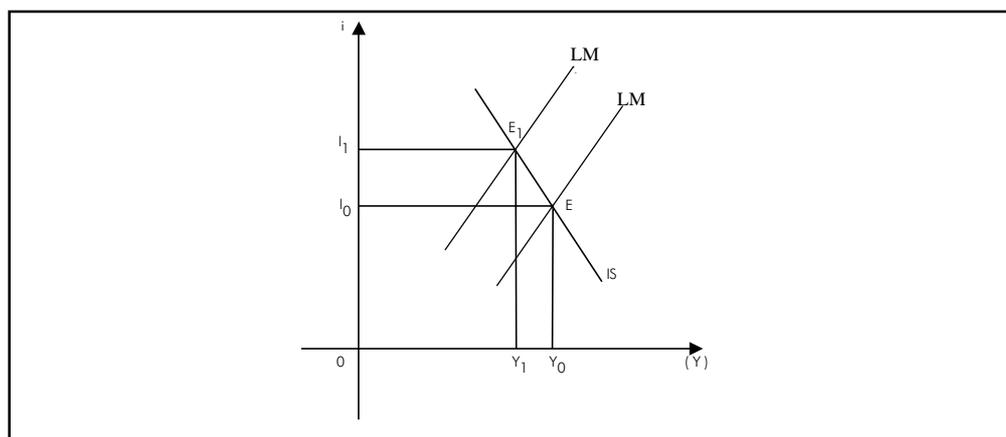
Figure 18.4: Contractionary Monetary Policy

However, on the supply side of money and bank credit, there are several common points. Firstly, the same authority, the central bank (RBI in India), administers both kinds of policy. Secondly, the instruments of control at the aggregate level are the same. Thirdly, same forces determine the supply of money as well as the supply of bank credit. Perhaps, it is these common points which stand against any distinction between monetary and bank credit policy. But for reasons mentioned earlier, such as distinction is very much warranted and is essential for analytical clarity, correct policy formulation and proper evaluation. This should not, however, be mistaken to say that monetary policy and credit policy are totally unrelated. In fact, in this chapter we shall study the two policies together. Keeping in mind the scope of the present book we ignore issues that pertain only to the credit policy.

18.6.1 Objectives of Monetary Policy

Broadly speaking the objectives of monetary policy include short run stabilization goal and long term economic growth and development goal. The following are the specific objectives of monetary policy:

1.   High level of output (or national income)

2.   High rate of economic growth.

3.   High employment.

4.   Price stability (or optimal rate of inflation – inflation rate is nominal anchor for monetary policy).

5.   Low inequality in the distribution of income and wealth (equity objective).

6.   External stability or healthy balance of payment position (stability of external value of domestic currency).

As noted before, monetary policy operates through changes in the stock of money. Money stock changes will influences the level of aggregate demand and so the level of output or income. Two characteristics of monetary policy are noteworthy. One is that it is an aggregative policy. Any allocational or sectoral problems are beyond its domain and these are the concerns of credit policy. Second is that it operates on the demand side and not on the supply side of the goods market (credit policy can affect even the supply side of goods market).

The objectives stated above may come into conflict with each other. A high rate of economic growth objective may involve sacrificing to some extent the objective of high level of employment. The objective of low inflation rate may call for accepting relatively

higher rate of unemployment (the trade-off implied by the Phillips curve). High growth rate objective may come into conflict with equity objective. This is so because higher degree of inequalities in income and wealth distribution are conducive to higher rate of saving and economic growth rate.

The trade-offs are economy-specific and change with the situation in which an economy finds itself.

18.6.2 Instruments of Monetary Policy

To achieve the above objectives, modern central banks have several instruments of monetary policy. One is the open market operations. Expansionary monetary policy requires purchasing of government securities in the open market by the central banks. This will augment the supply of base or reserve money. This increase in reverse money enables banks to increase deposit money and hence money stock. Because the banks are required to maintain reserves of only a fraction of their demand and time deposit liabilities, the expansion of the money stock which can result from an increase in reserves is a multiple of the increase in the reserves.

A contractionary monetary policy involves selling government securities by central bank in the open market. The reserve money will decrease and the reduction in reserve money will eventually result in reduction in money stock.

Thus open market operations constitute the most important method of monetary control. The monetary base can be increased by the central bank by open market purchases or decreased by open market sales if increasing demand threatens to cause inflation. But this is not the only weapon in the armory of modern central bank.

The amount of money that will be created on any given base money depends on a number of variables (currency, demand deposit ratio, required reserve ratio applying to demand deposits, time deposit-demand deposit ratio, required reserves ratio applying to time deposits and excess reserves banks hold as a fraction of their demand deposits), prominent among which are the reverse ratios required for demand and time deposits.

As an alternative to open market operations or as a supporting action, the central bank can change the reserve requirements. Given the reserve money, the higher the reserve ratios, the lower would be the maximum money stock.

Banks always keep a certain proportion of their total assets in the form of cash, partly to meet the statutory reserve requirements and partly to meet their own day-to-day needs for making cash payments. Cash is held partly in the form of 'cash on hand' (vault cash) and partly in the form of balances with the central bank. All such cash is called cash reserves of banks. They are usually divided under two heads, namely required reserves and excess reserves. Required reserves are reserves which banks are required statutorily to hold with the central bank. Expansionary monetary policy calls for reduction in required reserve ratio and contractionary monetary policy calls for increase in required reserve ratio.

Another major instrument of monetary policy is the central bank's discount rate or bank rate. This is the rate at which the central bank gives loans to the member banks against eligible security, such as government securities or rediscount eligible bills of exchange or other commercial paper. Such loans increase the reserve base. Thus expansionary monetary policy calls for reduction in bank rate or discount rate and contractionary monetary policy calls for an increase in the bank rate.

A central bank can use the monetary control measure called moral suasion. Moral suasion is a combination of persuasion and pressure which a central bank is always in a position

to use on banks in general and erring banks in particular. This instrument is exercised through discussions, official speeches and hints thrown to banks. Moral suasion can be used both for quantitative control of money supply and credit and for qualitative control of credit, that is, control over the distribution of bank credit.

Finally, the selective credit controls. While the instruments of control discussed so far are commonly known as general or quantitative methods of monetary control, the regulation of credit for specific purposes is termed as selective or qualitative credit control. While the general credit controls relate to the total volume of credit (via changes in high-powered or base money) and the cost of credit, selective credit controls operate on the distribution of total credit. These measures can be used to encourage greater channeling of credit to certain sectors (for example, priority sector lending) or discourage or restrict the credit flows to some sectors (for example credit for speculative holding of essential commodities like food grains).

We listed and explained above the instruments of monetary policy. The effectiveness of these instruments depends on several factors such as the level of financial development of an economy, the functioning of individual markets in the financial system and the number of participants in these markets.

18.6.3 Monetary Policy in IS-LM Framework

Consider the expansionary case shown in Figure 18.5. Money supply is sought to be increased (say) through open market purchase of government securities. At a given price level an increase in nominal supply of money also mean increase in real quantity of money. The LM schedule will shift to downword to the right as LM^1. The new equilibrium will be at point E^1 with lower interest rate and a higher level of income. The equilibrium income rises because the open market purchase reduces the interest rate and thereby increase spending, particularly investment.
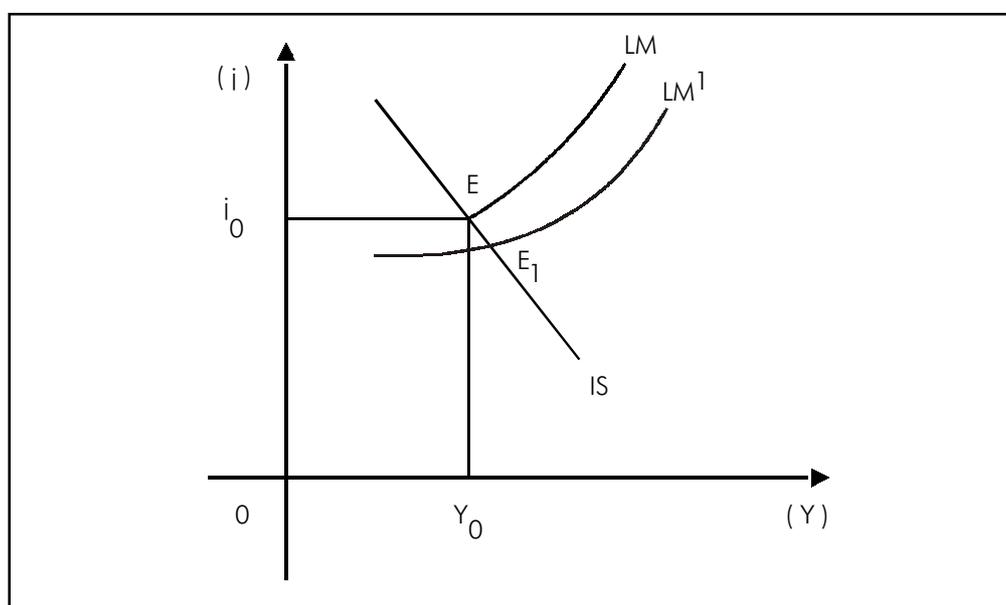
Figure 18.5: Liquidity Trap Case-monetary Policy Becomes Ineffective

What is the process of adjustment to the monetary expansion? At the initial equilibrium point E, the increase in money supply creates an excess supply of many to which the public responds, by trying to buy the other assets. In the process, asset prices increase and yields decline. Because money and asset markets adjust rapidly to change in money supply, in the Figure 18.5 equilibrium shifts from points E to E^1 where the money market clears and where the public is willing to hold the larger real quantity of money because

the interest rate has declined significantly. At point E^1 however, there is an excess demand for goods. The decline in the interest rates gives the initial income Y_0, has raised aggregate demand and is causing inventories to run down. In response, output expands and we start moving up along the LM schedule. The interest rate rises during the adjustment process because the increase in output raises the demand for money, and the greater demand for money needs to be checked by higher interest rates. At the new equilibrium point E^1, the level of income is higher (Y_1) and the interest rate is lower (i_1).

Two steps in the monetary transmission mechanism—the process by which changes in monetary policy affect aggregate demand and hence output—are essential. In the first step, an increase in real balances generates a portfolio disequilibrium. That is, at the prevailing interest rate and income, people are holding more money than they want (actual money holding exceeds the optimal money holding). This induces portfolio holders to reduce their money holdings by buying other assets, thereby changing asset prices and yields. In brief, the change in the money supply changes interest rates. The second stage of the transmission process occurs when the change in interest rate affects aggregate demand. These two stages of transmission process appear in almost every analysis of the effects of changes in the money supply on the economy. The details of the analysis will often differ some analyses will have more assets and more than one interest rate, some will include an influence of interest rate on other categories of demand, in particular consumption and spending by local governments. Some analyses also include a mechanism by which changes in the real balances have a direct effect on aggregate demand through real balance effect. The real balance effect (also called Pigou effect) argument is that wealth affects consumption demand and that an increase in real money balances increases wealth and therefore consumption demand (we consider in detail this mechanism a little later). Schematically, the transmission mechanism can be represented in the following manner.

(1)	(2)	(3)	(4)
Change in money supply	Portfolio adjustments lead to a change in asset prices and interest rates	Spending adjusts to changes in interest rates	Output adjusts to change in aggregate demand.
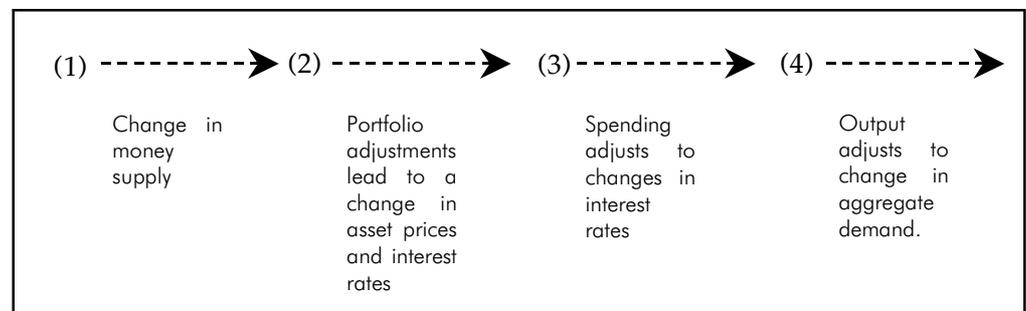
Figure 18.6

The above scheme illustrates the steps involved in the monetary transmission mechanism.

But there can be many a slip between the cup and the lip. In discussing the effects of monetary policy on the economy, two extreme cases have received significant attention. The first is the liquidity trap, a situation in which the public is prepared, at some sufficiently low interest rate to hold as idle balance whatever amount of money is supplied. This implies that the LM curve is horizontal and changes in the quantity of money do not have any effect on income (Figure 18.6). In that case, monetary policy carried out through open market operations has no effect on either the interest rate or the level of income (See Figure 18.6). Thus in the liquidity trap situation, monetary policy is totally ineffective. In a manner of speaking the proposition "money does not matter" holds good. This possibility of liquidity trap at some low interest rate is attributed to John Maynard Keynes. It is worth noting a relevant passage from Keynes' 'General Theory, "there is the possibility, for the reason.., that after the rate of interest has fallen to a certain level, liquidity preference may become virtually absolute in the sense that almost every one prefers cash to holding a debt which yields so low a rate of interest. In this event the

monetary authority would have lost effective control over the rate of interest. But whilst this limiting case might become practically important in future, I know of no example of it hitherto. Indeed owing to the unwillingness of most monetary authorities to deal boldly in debts of long term, there has not been much opportunity for a test. Moreover, if such a situation were to arise, it would mean that the public authority itself could borrow through the banking system on an unlimited scale at a nominal rate of interest".

Thus Keynes himself stated clearly his position regarding the possibility of the liquidity trap.

Another slip in the transmission process may be because of interest-insensitivity or interest-inelasticity of investment and other expenditure. If investment is interest-inelastic, again monetary policy becomes totally ineffective.

The polar opposite of the horizontal LM curve (which implies ineffectiveness of monetary policy) is the vertical LM curve. The LM curve is vertical when the demand for money is entirely unresponsive to the interest rate. The equation of the LM curve is given by

$$\frac{\overline{M}}{\overline{P}} = Ky - hi$$

If demand for money is entirely unresponsive to the interest rate in the above equation

$h = 0$, then corresponding to a given real money supply, $\dfrac{\overline{M}}{\overline{P}}$, there is unique level of

income, which implies that the LM curve is vertical at that level of income. The vertical LM curve is called the classical case. Rewriting the above equation, with h set equal to 0 and with   moved to the right hand side we obtain.

$$\overline{M} = k\,(\overline{P}Xy)$$

We see that the classical case implies that nominal income ($\overline{P}Xy$) depends only on the quantity of money.

When the LM curve is vertical, a given change in the quantity of money has a significant effect on the level of income. This is shown in the following Figure 18.7.
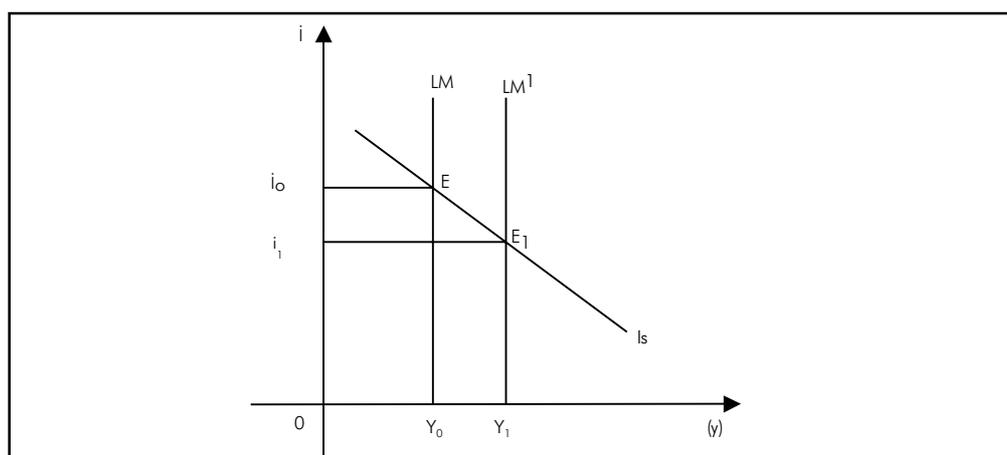
Figure 18.7: Expansive Monetary Policy

In this case monetary policy is very effective and in a manner of speaking the proposition "money alone matters" holds good (in this connection it is worth noting the words of Samuelson in one of his articles on monetarism." The bearing of all this on monetarism is well illustrated by an incident a few years ago at an American Bankers Association symposium where leading academic economists were commenting upon Professor

Friedman's writings. Professor James Tobin went to the blackboard and wrote down three sentences:

1.   Money does not matter

2.   Money matters

3.   Money alone matters

He went on to say: Professor Friedman produces evidence to prove that the first proposition money does not matter, is false; he purports to have demonstrated from this that the third proposition, money alone matters, is true; whereas the correct logical conclusion is that the second proposition, money matters, is all that follows. And on that there is, no quarrel among leading modern macroeconomic mosts".

It is interesting to note that when LM curve is vertical, while monetary policy is very effective, fiscal policy becomes totally ineffective. The following Figure shows the ineffectiveness of fiscal policy when LM curve is vertical.
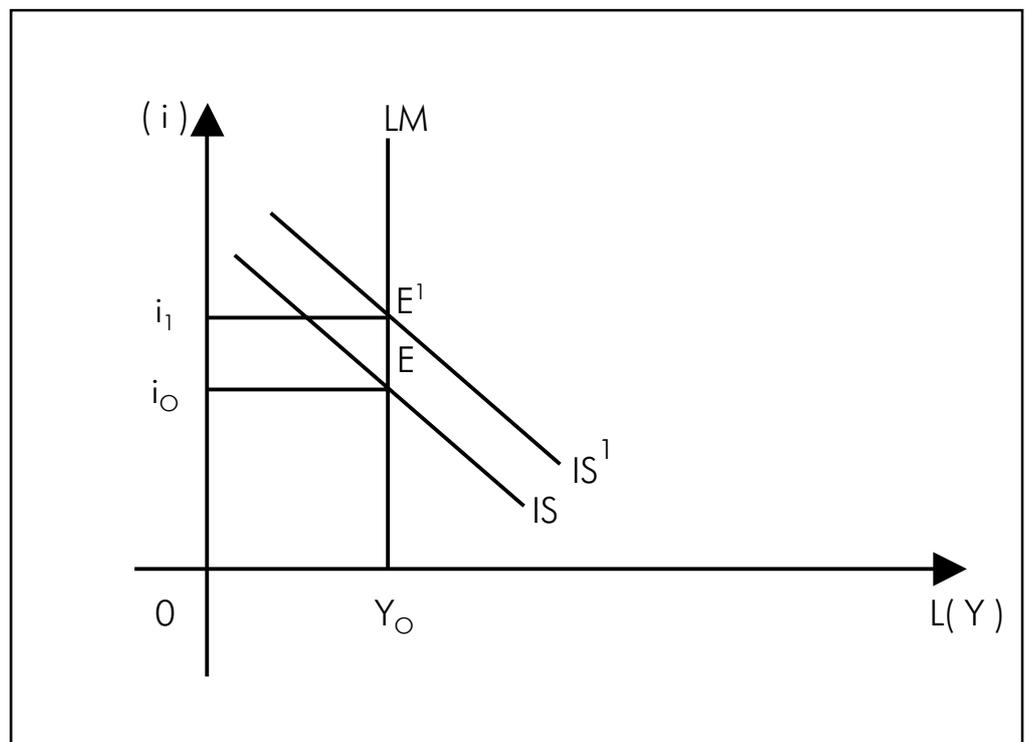

Figure 18.8: Ineffectiveness of Fiscal Policy

The above Figure shows that expansionary fiscal policy shifts the IS curve to the right but there is no change in the income level. There is change in the interest rate from i_0 to i_1. The vertical LM curve implying the comparative effectiveness of monetary over fiscal policy is associated with the view that "money alone matters" for the determination of output. Since the LM curve is vertical only when the demand for money does not depends on the interest rates, the interest-elasticity of the demand for money turns out to be an important issue in determining the effectives of alternative policies.

We noted before that the monetary policy is ineffective when an economy is caught in liquidity trap situation. But Pigou (later Pattinkin paid significant attention to this) invoked real balance effect to show the effectiveness of monetary policy. The effect of a change in the real stock of money on the level of consumption is known by a variety of names: the real-balance effect, the wealth effect, or the Pigou effect. The theoretical significance of the real-balance effect is fundamental. If increase in the (real) money supply do indeed stimulate consumption, then the Keynesian liquidity trap is invalid. Additional quantities of money are not caught in this trap and prevented from affecting the level of

aggregate demand rather, they stimulate aggregate demand by shifting the consumption function upward. When we introduce a real balance effect into the IS-LM framework, the liquidity trap situation cannot prevent the effect of increase in money supply on output.

Once the IS function is permitted to shift in response to changes in the money supply the Keynesian range of the LM function ceases to act as a trap preventing any increase in the money stock from increasing aggregate demand. Rather, an increase in the money stock will cause both LM and the IS functions to move to the right. The LM curve shifts because the money supply is used directly in the derivation of this function, and the IS function shifts because of the real balance effect on the consumption function (Figure 18. 9)
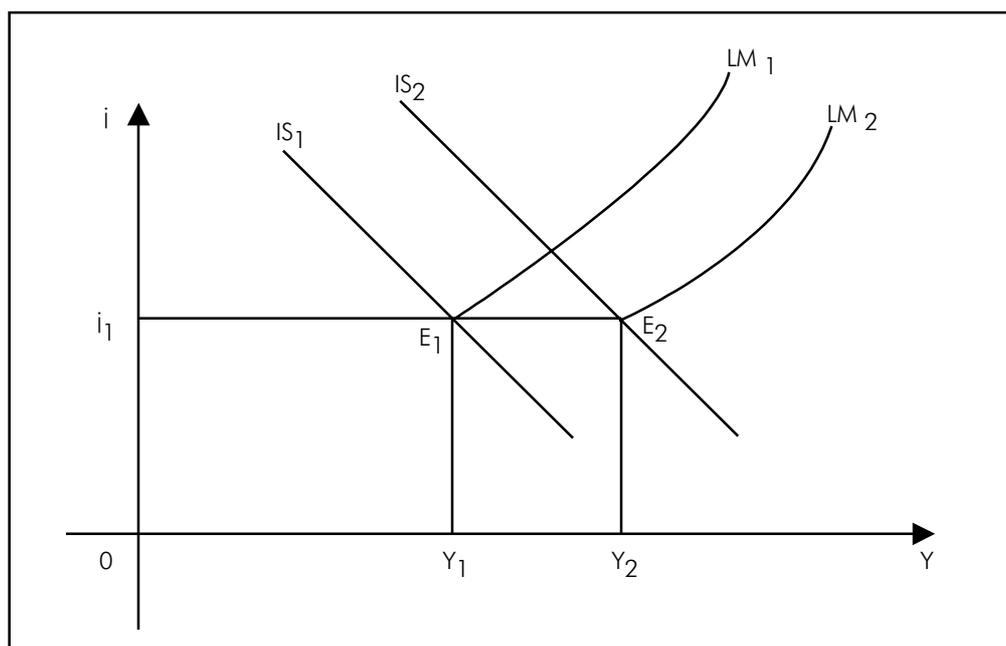
Figure 18.9: The Real Balance Effect IN IS-LM Framework

In the classical theoretical system, wants are unlimited, and there is therefore no limit to how far the IS curve can be shifted to the right if there is a sufficient increase in the quantity of money. Unemployment cannot exist in equilibrium if the money supply is increased enough. Classical economist have a powerful theoretical rebuttal to Keynes demonstration of an unemployment equilibrium.

However the real balance effect is not very important empirically, because the relevant real balances are only a small part of wealth.

The relation of monetary policy to economic growth and development is indirect through the effect it has on: (1) the rate of saving and investment in the economy, and (2) the allocation of resources.

In the developing country context monetary policy also encompasses institutional changes in the banking and credit structure. While the level of savings is basically a function of the level of income, the absence or underdeveloped state of financial institutions inhibits the effective mobilization of savings for purposes of development. The effective institutionalization of savings provides the potential saver with a choice of financial assets with varying degrees of safety, liquidity and yield. In this context, wider geographical and functional coverage of institutional credit facilities, especially that of banking (both commercial and development banking), and the filling in of gaps in the financial structure become necessary. The Indian experience in the post-independence period brings out

this point clearly. RBI played an important part in expanding the banking and the financial system of the country. With the establishment of the Industrial Finance Corporation of India in 1948, an era of rapid financial development of the country in the post-independence period began in a big way. Presently, there exists an impressive set of development banks and other term lending, investment and other specialized institutions to cater to the medium and long term credit and other needs of the productive enterprises in different sectors of the expanding Indian economy. Indian capital markets have recorded impressive progress during the post-independence period, thanks to the initiative and efforts of the government and the Reserve Bank of India. The money and capital markets have achieved significant financial sophistication. When a country which started with an aggregate saving rate of around 5 per cent achieved a saving rate (saving-income ratio) of around 30 per cent in about six decades, a part of the credit for this development rightfully belongs to the financial system and rapid strides made by it during the period.

18.7 BUSINESS CYCLE

The business cycle or economic cycle refers to the fluctuations of economic activity about its long term growth trend. The cycle involves shifts over time between periods of relatively rapid growth of output (recovery and prosperity), and periods of relative stagnation or decline contraction or recession. These fluctuations are often measured using the real gross domestic product. Despite being named cycles, these fluctuations in economic growth and decline do not follow a purely mechanical or predictable periodic pattern.

The National Bureau of Economic Research (NBER), founded in New York in 1920, pioneered research into understanding the repetitive sequences that underlie business cycles. Wesley C. Mitchell, one of its founders, first established a working definition of the business cycle that he, along with Arthur F. Burns (1946), later characterized as follows:

"Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own."

A business cycle is not a regular, predictable, or repeating phenomenon like the swing of the pendulum of a clock. Its timing is random and, to a large degress, unpredictable. A business cycle is identified as a sequence of four phases:

1. Revival

2. Expansion

3. Recession

4. Contraction
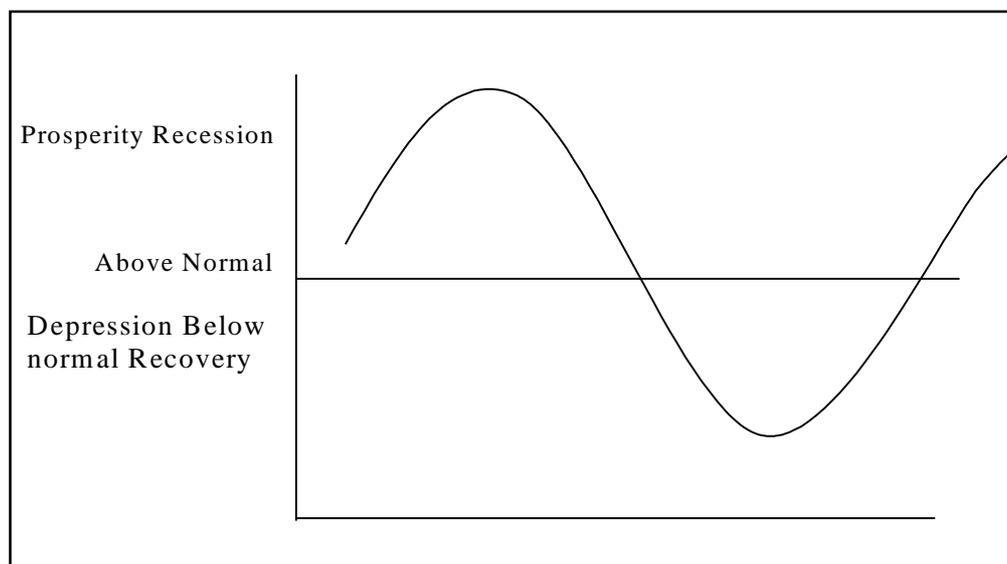
Figure 18.10: Phases of Business Cycle

Expansion: Expansion symbolizes the upswing and prosperity in the economic activities. Expansion begins as entrepreneur expects rise in profits in near future. Expectations of profits induces the investment in economy. This investment begets employment and demand for raw material, which further increases the purchasing power of the people which results in increase market demand, which further induces the investment in economy the cycle continues. Rise in prices is particular phenomena of expansion, as increase in supply couldn't match the increase in demand. Thus the gap between demand and supply increase which results in increase in price. During expansion period bank deposits and supply of currency also increases.

End of Expansion: During peak of expansion there is phenomenal growth of fixed capital as machinery, plants, equipment etc, of debt, as there is a significant difference between interest rates and profit margins, inventory and finished goods stock as in hope of future sales organization keeps stock of inventory and finished goods.

Big profits of expansion attracts investment which also increases the competition, gradually competition becomes severs and pressure rises both on cost and price which results in squeezing profits. Cost of all the factors of production rises but it is difficult to increase the price at the same ratio, infact as competition increases organizations are compelled to decrease the price. All this led to the shut down of few uneconomical units and recession begins.

Recession: A recession occurs when a decline – however initiated or instigated – occurs in some measure of aggregate economic activity and causes cascading declines in the other key measures of activity. The Business Cycle Dating Committee at the National Bureau of Economic Research (NBER) provides a better way to find out if there is a recession is taking place. This committee determines the amount of business activity in the economy by looking at things like employment, industrial production, real income and wholesale-retail sales. They define a recession as the time when business activity has reached its peak and starts to fall until the time when business activity bottoms out. When the business activity starts to rise again it's called an expansionary period. By this definition, the average recession lasts about a year.

Thus, when a dip in sales causes a drop in production, triggering declines in employment and income, which in turn feed back into a further fall in sales, a vicious cycle results and a recession ensues. This domino effect of the transmission of economic weakness from sales to output to employment to income, feeding back into further weakness in all of these measures in turn, is what characterizes a recessionary downturn.

Depressions/Contraction: A depression is a severe downturn in economic activity. These are considerably worse than recessions. Depression is a phase of extreme pessimism. Entrepreneurs do not have any hope profits infact there is fear of severe losses in future. They not only suspends any new investment but also try to liquidate present stock and even to liquidate the fixed capital investments. In a depression unemployment increases and demand decreases. One could well imagine a period of depressed economic activity associated with falling output and employment and with unemployment climbing.

Recovery: At some point, the vicious cycle is broken and an analogous self-reinforcing virtuous cycle begins, with increases in output, employment, income and sales feeding into each other. That is the hallmark of a business cycle recovery. The transition points between the vicious and virtuous cycles mark the start and end dates of recessions. The recovery gradually starts when prices stop falling. Some innovative and young entrepreneurs brings fresh investment. During recovery there is a correction of distortion in cost price relation. During this period the cost of capital is very low as financial institutions are in search of fresh investment/lending opportunities. Some time recovery is marked with rise all together new industry. Which boosts the investment in traditional industry.

18.8 LET US SUM UP

This chapter introduces you to the broader concepts concerning the economy, namely trade cycles, inflation, unemployment, and the measures to rectify such situations. The chapter details out the monetary and fiscal policy as tools of economic stability and growth. Theories related to the quantity of money in the economy as well as Keynesian Theory of Inflation discuss the effect of money and price increases on the economy. Inflation and various other concepts related to inflation are also discussed in detail.

18.9 LESSON END ACTIVITY

1. Explain the difference between recession and depression ?

2. In what stage of business cycle you put India. Support your arguments with valid data.

18.10 KEYWORDS

Business cycles: A type of fluctuations found in the aggregate economic activity of nations that organize their work mainly in business enterprises.

Contraction: Time period for which the actual rate of growth is less than the trend rate of growth.

Expansion: Time period for which the actual rate of growth exceeds the trend rate of growth.

Monetary policy: Policy concerned with changes in the supply of money.

Inflation: A rise in the general price level.

Rate of inflation: Rate of change of the general price level.

Suppressed inflation: A type of inflation where the upward pressure on prices is not allowed to influence the quoted or managed prices.

Creeping inflation: A moderate rise in prices i.e. 2-3 per cent per annum.

Galloping inflation: Prices rise at double or treble digit rates per annum (20-100%).

Hyper inflation or run-away inflation: Price rise to the tune of a thousand or a million or even a billion per cent per year.

Wage-push inflation: When wages rise faster than labour productivity.

18.11 QUESTIONS FOR DISCUSSION

1. What are the consequences of inflation?

2. Suggest various control measures for inflation.

3. Explain the various theories of inflation.

4. Examine a trade off between wage inflation and unemployment. Why will attempts to bring the unemployment rate below the natural rate result in accelerating rates of inflation.

5. Compare the demand pull inflation with cost push inflation.

6. What are the major objectives of monetary policy?

7. Discuss the effectiveness of monetary policy in case of liquidity trap.

8. What is a trade cycle?

9. Describe the various phases of trade cycle. Discuss the steps a businessman may take to safeguard himself against the evil effects of trade cycle.

18.12 MODEL ANSWER TO "CHECK YOUR PROGRESS"

1. *Losers:* Salaried class, wage earners, creditors

   Gainers: Investors, Debtors, business enterprises.

2. (a) True

   (b) True

   (c) False

   (d) True

18.13 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

R. L. Varshney, K. L. Maheshwari, *Managerial Economics*, Sultan Chand & Sons, New Delhi

S. K. Misra, V. K. Puri, *Economic Environment of Business*, Himalaya Publishing House, New Delhi.

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LESSON
19

BALANCE OF PAYMENTS

CONTENTS

19.0 AIMS AND OBJECTIVES

In this lesson we will discuss the concepts of balance of payments and policies for correcting disequilibrium in balance of payments. After studying this lesson you will be able to:

(i)   define balance of payments

(ii)   describe current account, capital account and aggregate balance of payments account

(iii) explain causes and effect of disequilibrium in balance of payments

(iv)   understand methods for adjusting the adverse balance of payments.

19.1 INTRODUCTION

The BOP is a statistical account of the transactions between residents of one country and residents of the rest of the world for a period of one year or fraction thereof.

It is a systematized procedure for measuring, summarizing and stating the effects of all financial and economic transactions.

The BOP statistics reflect all the economic transactions of a country vis-à-vis rest of the world for which payment may or may not be involved. These transactions may include exchange of goods and services or there may be loan transactions, gifts and grants, or short-term, long-term and portfolio investments.

For all these transactions, except gifts and grants, payment is involved in foreign currency.

A transaction is recorded as being either a credit or a debit depending on the direction of the payment. If the transaction results in a cash outflow, it is recorded as a debit. Likewise, if the transaction results in a cash inflow it is recorded as a credit.

The BOP is divided into three different accounts.

19.2 THE CURRENT ACCOUNT

The current account records the net flow of goods, services and unilateral transfers, or in other words, gifts. This includes inflows and outflows of items such as tourism, transportation, military expenditures and investment income. The nature of this account is reflected by its name, i.e., the BOP resulting from activity during the period under consideration.

19.3 THE CAPITAL ACCOUNT

The capital account records the net flow of FDI in plant, equipment and long-term, short-term portfolio (debt and equity) investment. FDI are those investments in which management control of the asset is retained. An investment by a firm into a subsidiary operation overseas, which the parent firm controls, would be considered a transaction in this category. Long-term investments are those having a maturity time of greater than one year. Likewise, short-term investments are those having a maturity of less than one year. Additionally, the borrowings and lendings of government are included in the capital account.

19.4 THE TOTAL BALANCE OF PAYMENTS

The BOP is just the sum of these three accounts and is calculated as follows

BOP = Current +   Capital Account   +   Change in Official

Account Balance   Balance   Reserves Account

BOP = BCRA +   CPA   +   ORA

The BOP must always equals 0, i.e., balance since it is an accounting identity in a fixed exchange rate system. If for some reason, the CRA and CPA do not sum to 0, then the government must take action by adjusting the ORA so that BOP equals 0. The government does this by buying or selling foreign currency and gold, depending on the situation, upto a total that equals the CRA and CPA.

On the other hand, in a floating rate system, the government is not obligated to act. Market forces would act to adjust the exchange rate as necessary to force the BOP back to 0.

Check Your Progress 1

Balance of payments is always in balance, i.e. equals zero. Discuss.

19.5 EQUILIBRIUM AND DISEQUILIBRIUM IN BALANCE OF PAYMENTS

When payments are larger than receipts in international transactions, it is called deficit balance of payments, but when receipts are larger than payments, it is called

surplus balance of payments. There are four main ways of measuring surplus or deficit

a. *Balance on Current Account:* This includes the balance of visible and invisible items and unilateral transfers.

b. *Basic Balance:* It includes only the current account balance and the long-term capital account balance.

c. *Net Liquidity Balance:* It includes the basic balance plus the short-term private non-liquid capital balance.

d. *Official Settlement Balance:* It is the total of the net liquidity balance plus the short-term private non-liquid capital balance.

An analytical approach is to consider the balance of payments as the difference between receipts from and payments to foreigners by the residents of a country. Thus,

$$B = R - P \begin{bmatrix} B = \text{Balance of Payments} \\ R = \text{Receipts} \\ P = \text{Payments} \end{bmatrix}$$

If B = O, BP is an equilibrium

If B = (+), BP is surplus   (BP is balance of payments)

If B = (-), BP is in deficit

19.5.1 Transitory and Fundamental Disequilibrium

Transitory disequilibrium is purely temporary and self-correcting. It does not involve the complex problem of adjustment.

Disequilibrium is fundamental if it progressively deteriorates and if it is a chronic long-term problem. It requires correction and adjustment. However, there is no one clear test for fundamental disequilibrium.

19.5.2 Causes of Disequilibrium (Deficit)

● Short-term disturbances like floods, crop failures, drought and so on may raise imports and reduce exports.

● Increase in income may lead to more imports and less exports.

● Initiation of development plans may necessitate more imports, while exports of raw materials may be curtailed.

● While the prices of imports are rising for LDCs, the prices of exports are almost sticky.

● Exports of a country may reduce due to: (a) contraction of the economy, (b) government policy, (c) reduction in exportable surplus, (d) higher home consumption, (e) circulation of better quality and new goods, and (f) increase in income.

● Structural changes may change the demand for exports and imports adversely.

● High rate of growth of population may necessitate more imports and a reduction in exports.

- Import restrictions and tariffs by developed countries is another reason for disequilibrium in the balance of payments of LDCs.

19.5.3 Correction of Disequilibrium (Adverse Balance of Payments)

The following are the principal methods for adjusting the adverse balance of payments.

i. *Adjustment under Gold Standard:* In the classical gold standard system, disequilibrium was corrected by price-specific flow mechanism. A deficit leads to outflow of gold and thereby to a reduction in money supply which reduces the price level and promotes exports and discourages imports. So, deficit is corrected.

ii. *Adjustment under Flexible Exchange Rate:* Deficit is corrected automatically by a depreciation of its currency.

iii. *Income Adjustment Mechanism:* If exports go up, national income goes up, purchasing power goes up and imports also go up. If MPS=0, then increase in imports will be equal to increase in exports. MPS means marginal propensity to save.

iv. *Adjustment under Gold Exchange Standard (Fixed Exchange Rate):* The gold exchange standard was set up after World War II and lasted until 1971. Under this, the exchange rate was fixed in terms of dollar or gold. The exchange rates were then allowed to vary 1 per cent up or down. The deficit could be settled in gold or in dollar. Automatic adjustment is possible under this system. For instance, if exports increase, income increases. Therefore, prices in the surplus country go up. This discourages exports and encourages imports. The surplus nation's exchange rate may appreciate and it can get an inflow of reserves leading to greater money supply and lowering of rate of interest. All these may lead to increased imports, capital outflow and reduced exports.

If permitted to operate, the above automatic adjustment mechanisms are likely to bring about adjustment in BOP. But nations may not permit them to operate for fear of unemployment and inflation. Therefore, some policies are necessary to complete the adjustment.

v. *Expenditure Changing Policy:* Expenditure adjusting policies are monetary and fiscal tools. A restrictive monetary policy leads to a reduction in investment and income, thus reducing imports. Therefore, a restrictive monetary policy by reducing expenditure corrects an external deficit.

However, under the policy of Operation Twist, short-term rate of interest is raised to attract short-term capital from abroad which will cure the balance of payment deficit and at the same time does not disturb economic growth and capital formation (long-term rate is kept constant).

Fiscal policy may be very helpful for reducing expenditure. Taxes may be raised and public expenditure may be reduced. Both, restrictive monetary and fiscal policies, will be deflationary in character and will stimulate exports and discourage imports.

In some cases, an expenditure changing policy for internal balance will have varying effects on the external balances (balance of payments), as shown in the following chart.

Expenditure Changing Policy

S.No.	Cases	Policies for Internal Balance	Effects on External Balance
1	Recession + Deficit (BP)	Expansionary	Worsens
2	Recession + Surplus (BP)	Expansionary	Improves
3	Inflation + Surplus (BP)	Restrictive	Worsens
4	Inflation + Deficit (BP)	Restrictive	Improves

Cases (1) and (3) are the two conflicting cases. The use of monetary and fiscal policies to achieve internal balance may improve external balance but may not completely eliminate external imbalance. If external balance is given priority, internal balance may not be achieved. In order to achieve both internal and external balances simultaneously, we require the following policy instruments.

vi   *Expenditure-Switching Policy:* Expenditure switching policy primarily aims at changing relative prices and it includes variation in exchange rate, exchange control, devaluation, import control and export promotion.

vii *Devaluation:* It means an official reduction in the external value of a currency vis-à-vis gold or other currencies. Depreciation is also a fall in the external value of a country's currency, not officially, but to the influence of market forces – demand and supply. Devaluation lowers export prices and increases import prices. However, it has many limitations. If the economy is already at full employment, devaluation would be effective only if domestic expenditure or absorption were reduced automatically by cash balance effect, money illusion and income distribution or by expenditure-reducing policies.

viii *Exchange Control:* Exchange control refers to government regulation of exchange rate as well as restriction on the conversion of local currency into foreign currency. Under this system, all exporters are asked to surrender their foreign exchanges to the central bank. Then foreign exchanges are rationed out to licensed importers. The aim of exchange control is to bring about an equality between the demand for and the supply of foreign exchange through state intervention and control.

ix   *Direct Controls:* Direct controls take the form of exchange control, capital control and commodity control. Imports and exports can be directly controlled by various measures.

x   *Import Restriction and Export Promotion:* Imports may be restricted by tariff, quotas, duties, licenses and so on. Exports may be promoted by giving bounties, incentives, tax concessions, advertisement and publicity, cost reduction, quality improvement and the like.

However, every one of the above methods has its own limitations. For instance, deflation is dangerous, depreciation is temporary and retaliatory, devaluation is inflationary and exchange control is difficult to administer. Therefore, sometimes it is said that it is easy to control output and employment, but harder to control balance of payments.

19.6 LET US SUM UP

This lesson discusses the balance of payment's concept and highlights the policies for disequilibrium. BOP is a systematized procedure for measuring , summarizing and stating the effects of all financial and economic transactions. BOP is divided into three different account that is Capital Account, Current Account, and Official Reserves Account. If payments are larger than receipts. It is a case of deficit in balance of payment. On the other hand if receipts are larger than payments, it is a case of surplus in balance of payments.

19.7 LESSON END ACTIVITY

1.   Capital account is affected by long run commitments but so is the current account. How?

2. Are you aware of current account convertibility and capital account convertibility? Write a short note on both the concepts in the Indian context.

3. Write a 500 words essay on the 1991 BoP crisis that India faced and the measures taken to correct the situation.

4. How is expenditure changing policy different than expenditure switching policy?

5. State whether the following statements are true or false.

   (a) Demand of money is the only macroeconomic variable that affects the quantity of money in an economy.

   (b) Military expenditures are a part of current account.

   (c) Personal borrowings are a part of capital account.

6. Fill in the blanks

   I. Balance of Payments is a sum total of _____,_____and changes in official reserves.

      (a) Current account balance; capital account balance

      (b) Exports; imports

      (c) Government expenditure; government revenue

   II. Balance of payments should be ____.

      (a) Positive

      (b) Negative

      (c) Neutral

   III. In case of a recession in an economy and a surplus in Balance of payments, an expansionary policy aimed at internal balance leads to _____in external balance.

      (a) Worsening

      (b) Improvement

      (c) No effect

   IV. In case of inflation in an economy and a surplus in Balance of payments, a restrictive policy aimed at internal balance leads to _____in external balance.

      (a) Worsening

      (b) Improvement

      (c) No effect

19.8 KEYWORDS

GNP: Value of all final goods and services produced in an economy in a given time period.

Inflation rate: Percentage rate of increase of the level of prices during a given period.

Unemployment rate: fraction of labour force that cannot find jobs.

Business cycle: Upward and downward movement of economic activity that occurs around the growth trend.

Phillips curve: A curve depicting the trade-off between inflation and unemployment.

Output gap: The gap between the actual output and the output that the economy could produce at full employment given the existing resources.

Stock variables: A variable with no time dimension.

Flow variables: A variable with a time dimension.

Balance of payments: A statistical account of the transactions between residents of one country and residents of the rest of the world for a period of one year or a fraction thereof.

Current account: A record of the net flow of goods, services and unilateral transfers.

Capital account: A record of the net flow of FDI in plant, equipment, and long-term, short-term portfolio (debt and equity) investment.

Devaluation: An official reduction in the external value of a currency vis-à-vis gold or other currencies.

19.9 QUESTIONS FOR DISCUSSION

1.   Differentiate between macroeconomics and Micro-economics.

2.   Comment on the present macroeconomic scene of India.

3.   What are the major concepts and concerns of macroeconomics?

4.   What is meant by equilibrium and disequilibrium of payment?

5.   Critically examine the Balance of Payments in the Indian context.

19.10 MODEL ANSWER TO "CHECK YOUR PROGRESS"

The balance of payments is always in balance. If for some reason, the current account and capital account do not sum to zero, then the government must take action by adjusting the official reserve account so that BOP equals zero. In a flexible exchange rate system, market forces would act to adjust the exchange rate as necessary to force the BOP back to zero level.

19.11 SUGGESTED READINGS

Dr. Atmanand, *Managerial Economics*, Excel Books, Delhi.

R. L. Varshney, K. L. Maheshwari, *Managerial Economics*, Sultan Chand & Sons, New Delhi

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LESSON
20

FISCAL POLICY

20.0 AIMS AND OBJECTIVES

In this lesson we will study various aspects of fiscal policy. After studying this lesson you will be able to:

(i)   understand meaning and objectives of fiscal policy

(ii)   describe meaning and components of budget

(iii) know sources of revenue of central and state governments.

(iv)   describe federal finance

(v)   know the role of fiscal policy in economic growth

(vi)   describe meaning and components of deficit financing

(vii) understand impact of fiscal policy on business

20.1 INTRODUCTION

The sphere of state action is very vast and all pervading. It includes "maintaining public services, influencing, attitudes, shaping economic institutions, influencing the use of resources, influencing the distribution of income, controlling the quantity the of money, controlling fluctuations, ensuring full employment, and influencing the level of investment." W.A. Lewis . Philip V. Taylor gave a more comprehensive definition when he said, "Budget is a master financial plan of the government. It brings estimates of anticipated revenues and proposed expenditures, employing schedule of activities to be undertaken towards the direction of national objectives. It is a device for consolidating various interest, objectives, desires and needs of people into a programme whereby they provide for their safety, convenience and comforts"

It is through fiscal policy that the government tries to correct inequalities of income and wealth that increases with development in country. It expands internal market, reduces unessential imports, counteracts inflationary pressure, provides incentives for desirable types development projects, and increase the total volume of savings and investment. For all this government adopts appropriate taxation, budgetary expenditure and public borrowings policies.

Fiscal policy is the projected balance sheet of the country , prepared by Chief Finance Officer of country that is finance minister of the state. Public finance is the study of generating resources for the development of country and about allocation of resources. Fiscal policy is implemented through Budget, which is statement of state's revenue and expenditure.

20.2 MEANING & OBJECTIVES OF FISCAL POLICY

Fiscal policy is budgetary policy. It is the policy of the government in respect of its annual taxation programme, public expenditure and public debt programmes. A budget is an annual financial statement of the government which includes estimated expenditure planned for the coming year and estimated revenues to be raised through taxes and other revenue sources such as surplus of public enterprises over the year. Fiscal policy thus, refers to a policy under which the government implements its expenditure, revenue and other programmes during a year to produce favourable distributional effect and avoid undesirable effects on national income and employment. The objectives of fiscal policy are summarily stated below:

1. Mobilization of resources through deploying relevant fiscal instruments.

2. Ensuring high rate of capital formation.

3. Reallocation of resources to ensure the achievement of nation's socio-economic objectives.

4. Balanced regional growth.

5. Increased the employment opportunities.

6. Achievement of equity objective through appropriate use of fiscal instruments.

The instruments of fiscal policy are taxation, public borrowing and expenditure. Expansionary fiscal policy implies use of fiscal instruments to bring about an increase in national income. Figure 10.10 shows the effects of expansionary fiscal policy. The increase in government expenditure shifts the IS curve to the right. As a result there is increase in income and interest rate.

If the economy is initially in equilibrium at point E_1, expansionary fiscal policy (say, increase in government expenditure) will result in movement to point E_3, if the interest rate remained constant. At E_3 the goods market is in equilibrium with planned spending equal to output. But the money market is no longer in equilibrium. Income has increased, and therefore the quantity of money demanded is higher. Because there is an excess demand for real balances, the interest rate rises. Firms planned investment spending decline at higher interest rate, and thus aggregate demand falls off.
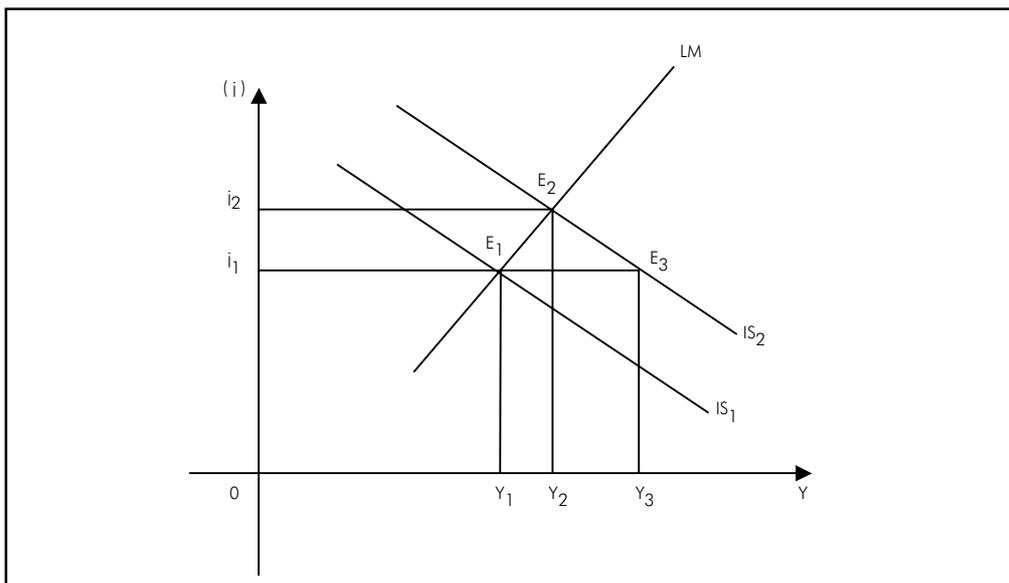
Figure 20.1: Expansionary Fiscal Policy

The complete adjustment, taking into account the expansionary effect of higher government spending the dampening effect of the higher interest rate on private spending is given by E_2, a point at which both goods and money markets are simultaneously in equilibrium. Only at point E_2 is planned spending equal to the given real money stock. The reason that income rises only to Y_2 rather than to Y_3, is that the rise in interest rate from i_1 to i_2 reduces the level of investment spending. Thus the increase in government spending crowds out investment spending. Crowding out occurs when expansionary policy causes interest rates to rise, thereby reducing private spending, particularly investment. The extent of crowding out depends on the slopes of IS and LM schedules and the extent of shift in the IS curve. One can easily demonstrate the following propositions:

1. Income increases more and interest rates increase less, the flatter is LM schedule.

2. Income increase less interest rates increase less, the flatter the IS schedule.

3. Income and interest rate increase more the larger the horizontal shift of the IS schedule (the contractionary fiscal policy explanation is left as an exercise for the students).

20.3 COMPONENTS OF A BUDGET

Typically, a budget includes the following four components:

(a) Some review of economy

(b) Major policy announcements

(c) Expenditure proposal

(d) Tax proposal

There are three major functions of fiscal policy :- First is allocation function of budget policy, that is , the provision for social goods. It is a process by which the total resources are divided between private and social goods and by which the mix of social goods is chosen. Second is the distribution function of budget policy that is distribution of income and wealth in accordance with what society consider at "fair" or "just" distribution. Third is the stabilization function of budget policy, that is marinating high employment, a reasonable degree of price stability an appropriate rate of economic growth, with due considerations of its effects on trade and the balance of payment.

The budget includes revenue and expenditure. Revenue and expenditure is divided in capital and revenue account. Thus receipts are broken into Revenue Receipts and Capital Receipts, and disbursement are broken up into Revenue expenditure and capital expenditure.

20.4 REVENUE BUDGET

It consists of revenue receipts and revenue expenditure.

20.4.1 Revenue Receipts

This includes tax revenue and other revenues:

a. *Tax revenue:* These comprise of taxes and other duties levied by the Union government

b. *Other revenue:* These receipts of the government mainly consist of interest and dividends on investment made by the government, fees and receipts for other services rendered by the government

20.4.2 Revenue Expenditure

This is expenditure for normal running of govt. departments and various services interest charges on debt incurred by government , subsidies, etc. Expenditure which does not result in the creation of assets is treated as revenue expenditure.

20.5 CAPITAL BUDGET

It consists of capital receipts and payments.

20.5.1 Capital Receipts

This includes loans raised by the government from the public called market loans, borrowings by the government from RBI and other parties through sale of treasury bills, loans received from foreign bodies and governments, and recoveries of loans granted by the union government to states and union territory governments and other parties.

20.5.2 Capital Payments

These payments consist of capital expenditure on acquisition of assets like land, buildings, machinery, equipment, infrastructure, as also investment in shares, etc. and loans and advances granted by the union government to state and union territory government companies, corporations and other parties.

20.6 MOBILISATION OF RESOURCES

The primary sources of funds to finance development expenditure of a country can be grouped under following categories:

1. Taxation.

2. Profits of the public sector (Price).

3. Domestic non-monetary borrowing.

4. External borrowing.

5. Borrowing form the RBI (monetised borrowing).

Some minor sources of revenue are Fees, Fines, Forfeitures and Escheats, Tributes, and Indemnities, Gifts, and Grants.

(a) *Taxation:* Taxed are imposed in many ways, we can distinguish taxes in following manner:

(i) Direct Tax (ii) Indirect Tax

Direct taxes are those which are imposed on individuals or householders who bear the burden as Income tax. Indirect tax are those which are imposed on an equity at some point in the system but whose burden can be shifted to some other entity or entities, as excise, customs etc.

Some important type of taxes are as follows :-

(b) *Income Tax:* There are two type of income tax that is personal income tax and corporation tax. Personal Income tax is levied on individuals by the central government and the proceeds are shared between sates and Center. It is based on principle of "ability to pay" that is who can pay more should pay more to the government. Corporation is a tax on income of the companies. The central govt. has been imposing corporation tax on the profits of the large an small companies.

(c) *Interest Tax:* The interest tax act. Provided for the levy and a special tax on the gross amount of interest accruing to the commercial banks on loans and advances made by them in India. The tax is levied on the gross interest income of "credit institutions" that is banks , financial institutions, financial companies etc.

(d) *Estate Duty:* Estate duty was imposed on the estate of a person, which was inherited by his heirs.

(e) *Wealth Tax:* Wealth tax has been impose on accumulated wealth or property of every individual.

(f) *Taxes on Commodities:* Revenue from commodity taxation is the most important source of taxation for the central govt. Central excise and custom duties are two important taxes of the central govt.

(g) *Central Excise (Indirect):* These duties are levied by the centre on commodities which is produced within country MODVAT was introduced for central excise in 1988. Now it has been converted to VAT

(h) *Customs Duties (Indirect):* These are duties or taxes imposed on commodities imported into India

(i) *VAT (Value Added Tax):* It is imposed on sales.

Price: For the development of the economy Govt. has to launch public sector. As private sector don't take interest or it is unable in some highly capital intensive and having a high gestation period projects like infrastructure projects, heavy industry etc. Some time for the rapid development also Govt. have to invest in many sector simultaneously that in consumer industry like clothes etc to meet the huge gap between demand and supply and in heavy industry to make available the resources for the economy. Govt. charges the price for the goods its manufactures or the services it provides. Income from public enterprises now constitute a substantial source of revenue.

Fee: It is a payment against the services. Though it is never more than the cost of the services. Sometime it covers only part of the services. As nominal fees in govt. hospitals, educational fees etc. Fees like license fee are much higher then the services rendered. Sometime there is no positive return in terms of services and fees is charged just to grant permission in terms of license etc. Difference between price and fees is that in fees it is public interest which is prominent that's why part of the cost is charged in most cases on the other hand in price is payment for the service of business charter. Here usually full cost is covered.

Rates: Rates are levied by local bodies, i.e., municipalities and district boards, for local purchases. They are generally imposed on the local immovable properties.

Fines: Fines are imposed as deterrent to breaking the law.

Escheat: When a person dies heirless or without a successor or leaves no will behind, his property or assets will go the State. The claim of the state to deceased's assets is called escheat.

Grants and Gifts: Grants are given by a government at a higher level to that at the lower level, e.g. from the central govt. to the state govt. or to the local district boards, municipalities etc. Gifts are sometime received from private bodies and foreign Govt. for relief in natural calamities like earthquake, floods, droughts, cyclones, for building a hospital, schools etc.

Check Your Progress 1

Fill in the blanks: -

(a) _____ is a master financial plan of the government.

(b) _____ is the study of generating resources for the development of country and about allocation of resources.

Contd...

(c) _____ are those, which are imposed on individuals or householders who bear the burden as Income tax.

(d) Income tax is based on principle of "_____" that is who can pay more should pay more to the government.

(e) _____ are duties or taxes imposed on commodities imported into India

(f) _____ is imposed on sales.

20.7 EXPENDITURE OF CENTRAL GOVERNMENT

All public expenditure is classified into:

a.   Non-Plan expenditure

b.   Plan expenditure

a.   *Non Plan Expenditure:* Non plan expenditure of the central govt. is divided into revenue expenditure and capital expenditure. Under revenue expenditure we include: interest payment, defense revenue expenditure, major subsidies(export , food and fertilizer), interest and other subsidies, debt relief to farmers, postal deficit, police, pension and other general services, social service, economic service (agriculture, industry, power , transport, communications, science and technology etc.) and grants to states and union territories, and grants to foreign government. Capital non plan expenditure includes such items as : Defense capital expenditure, loans to public enterprises, loans to states and union territories and loans to foreign govt.

b.   *Plan Expenditure:* Plan expenditure is to finance central plans, such as agriculture, rural development, irrigation and flood control energy industry and minerals transport, communications, science and technology and environment, social services and others and Central assistance for Plans of the state and Union Territories.

20.8 BUDGETS OF STATE GOVERNMENT

In India each state govt. prepares its own budget of income and expenditure every year. State govt. collects the revenue from different sources to meet their expenditure. The important source of revenue for states are VAT, (earlier sales tax), grant in aid and other contributions from the Centre, states own non tax revenue , consisting of interest receipts, dividends, and profits, general services(of which state lotteries are the most important) social services and economic services. Besides this state also collect taxes on income and commodities. State imposes income tax on agriculture and profession. State govt. receives income from taxes on property and capital transactions. The main sources are land revenue, stamps, and registration, and tax on urban and immovable property.

States also charges commodity taxes like motor vehicle tax, electricity duties etc. State is also empowered to impose tax alcoholic liquor, opium, Indian hemp, and other narcotics.

20.9 FINANCIAL POWER OF CENTRAL AND STATE GOVERNMENTS

The constitution of India divides the functions and financial powers of the Govt. into Central and State spheres together with the concurrent areas. It also provides for

sharing of taxes in various forms and system of grants-in-aids. The seventh schedule of the constitution of India divides functions and financial resources between the Center and States. It contains three lists namely, List I or Union List, List II or State List, and List III or Concurrent List.

20.9.1 List I: Union List

This comprises the following items:

Tax Revenue: The Union List contains of 97 items contains the following sources of tax revenues for the Central government:

1.   Taxes on income other than agriculture income.

2.   Duties on customs including exports duties.

3.   Duties of excise on tobacco and other goods manufactured or produced in India except (a) alcoholic liquors for human consumption and (b) opium, Indian hemp and other narcotic drugs and narcotics, but including medicinal and toilet preparations containing alcohol or any substance included this paragraph (entry 84)

4.   Corporation Tax

5.   Taxes on capital value of the assets exclusively of agriculture land of individuals and companies, taxes on the capital of companies.

6.   Estate duty in respect of succession to property other than agriculture land.

7.   Duties in respect of succession to property other than agriculture land.

8.   Terminal taxes on goods or passengers carried by railways, sea, or air taxes on railways fares and freights.

9.   Taxes other than stamp duties on transactions in stock exchanges and future markets.

10. Rates on stamp duty in respect of bills of exchange, cheque, promissory notes, bills of lading, letters of credit, policies of insurance, transfer of shares , debentures , proxies and receipts.

11. Taxes on sale or purchase of newspapers and on advertisements published therein

12. Taxes on sale or purchase of goods other than newspaper where such sale or purchase takes place in the course of inter- state trade or commerce.

13. Taxes on Inter - State consignments of goods for trade or commerce.

14. Fees in respect of any of the matters in the list but not including fees taken in any court.

15. Fees taken in supreme court.

Non Tax Revenue: Non Tax revenue includes Borrowings, both internal and external, income from various govt. undertaking and monopolies, income from govt. property etc.

20.9.2 List II: State List

Some of the financial resources as mentioned in constitution are:

Tax Revenue

1.   Land Revenue

2. Taxes on agriculture income

3. Taxes on land and buildings

4. Duties of excise on the following goods manufactured or produced in the State and countervailing duties at the same or lower rates on similar goods manufactured or produced elsewhere in India : (a) alcoholic liquors for human consumption (b) opium, Indian hemp and other narcotic drugs and narcotics but not including medicinal and toilet preparations containing alcohol or any substances included in this sub - paragraph (entry 51)

5. Taxes on the entry of goods into local area of consumption.

6. Taxes on electricity.

7. Taxes on sales and purchase of goods other than newspaper excluding inter-state sale.

8. Taxes on advertisement other than advertisements published in the newspaper.

9. Taxes on vehicles for use on roads.

10. Tolls

11. Taxes on professions, trades, callings and employment.

12. Capitation Taxes.

13. Taxes on luxuries , including taxes on entertainments, amusements, betting and gambling.

14. Fees in respect of any the matters in the State List but excluding court fees

15. Share in some specified Union Taxes.

Non-Tax Revenue

1. The State Govt. can borrow upon the security of their respective Consolidated Funds, but only with in the country, including loans form the Government of India.

2. Income from govt. undertakings owned fully or partly by State Govt.

3. Income from public property owned by the State Govt.

4. Grants in aid from the Central Govt.

5. Other Grants for the Central Govt.

Check Your Progress 2

State true and false:

(a) The important source of revenue for states is income tax

(b) The seventh schedule of the constitution of India divides functions and financial resources between the Center and States

(c) Taxes on agricultural income are collected by central govt.

(d) Excise is imposed on the export and import.

20.10 FISCAL POLICY AND ECONOMIC GROWTH

Fiscal policy is a potent tool in the hands of Govt. to regulate the economic growth. As deficit financing is the very effective tool in the hands of the govt. for increasing effective demand in recession. To fill the deficit as Govt. borrows from RBI, Market and even create additional currency and then spends it which increases the disposable income of people thus results in conducive environment for investment. Market mechanism of an underdeveloped economy is not likely to be able to generate enough of savings and investment needed for a rapid economic growth. Fiscal policy plays a leading role in effecting savings in the economy. Budgets play a direct role in capital accumulation and economic growth in an underdeveloped country. Saving potential in an underdeveloped economy is very limited partly because of shortage of several specific resources, partly due to lack of adequate demand, partly because of high cost of production. This vicious circle can be broken by the govt. with the help of saving oriented budgets.

Through the fiscal policy govt. can also encourage the growth of particular industries and in particular areas. For this industries are provided with specific tax concessions and subsidies such as tax holidays, higher depreciation allowances etc. can be designed and incorporated in the budgetary policy. Further the role of Fiscal policy in economic growth can be understood through the impact of Public Debt, Deficit Financing, and Taxes.

20.10.1 Role of Taxes in Economic Growth

Taxation is an effective tool of budget to influence the level of savings and investment in country. Abolition and reduction of various taxes pushes up profits and reduces cost of production and prices. Lower prices are expected to increase demand production and employment, which in turn add to effective demand, and so on. Similar steps can be taken in case of custom duties. Raising import duties diverts the domestic demand form imports to home produced goods, and reducing or abolishing exports duties or giving export subsidies increase the demand for export and contributes towards recovery form depression. It will be more helpful to lower tax rates on those goods which have a higher elastic demand. Demand will be very high if persons with a higher marginal propensity to consume are given a relief in direct taxation. In the same manner investment may be encouraged by specific tax concession like tax holidays, greater depreciation allowance and the like.

Taxes are also considered to be effective tool in controlling the inflation. It can do it in two ways. First as built - in stabilizers and the second relates to the common belief that taxes can be used to curb prices and demand.

20.10.2 Taxes as In-Built Stabilizers

Given the level of govt. expenditure the tax system itself tend to create a budgetary surplus during a boom and a deficit during a depression. A budgetary surplus would curb expenditure and demand while budgetary deficit would have the opposite effect and thus an anti-cyclical pressure is generated. This happens because revenue from indirect and direct taxes is dependent upon the level of economic activities. Moreover direct taxes are usually progressive. With increasing money incomes the direct taxes bill rises more than proportionately, and during a depression there is more than proportionate reduction in it. Therefore yield from these taxes also moves in line with the level of economic activities. The result is that during the depression the tax revenue falls and with given govt. expenditure, there is a budgetary deficit, which in turn has an expansionary effect. On the other hand during boom larger revenue causes a budgetary surplus, which has a contractionary effect.

20.11 PUBLIC DEBT IN INDIA

Public debt in Indian context refers to the borrowings of the Central and state government. Gross public debt is the gross financial liability of the government. Net public debt is the gross debt minus the value of capital assets of the government and loans and advances given by the government to other sectors. Debt obligation can be of many types as:

- Short term debt are the debt of which the maturity is less than one year at the time of issue and consist of items like the treasury bills.

- Some obligations may not have specific maturity but may be repayable subject to various terms and conditions they are called Floating Debt. As provident funds, small savings, reserve funds and deposits.

- Permanent of funded debt are loans having a maturity of more than one year at the time of issue. Usually there maturity is between three and thirty years. Some of them may even be non - terminable so that the govt. is only to pay the interest on such debt without ever repaying the principle amount.

- Obligations owed to foreigners – govt. institutions, firms and individuals are called external loans.

Debt obligation of the Central government are broadly divided into two categories:
- Internal Debt
- External Debt

20.11.1 Internal Debt

This includes loans raised within the country, like:

(a) Current market loans, (b) others, comprising balance of expired loans, compensation and other bonds such as National Rural Development Bonds and Capital Investment Bonds, (c) Special Bearer Bonds, (d) Treasury Bills, (e) Special floating and other loans, (f) Special securities issued to the RBI, (g) Small savings, (h) Provident funds, (i) other accounts, and (j) reserve funds and deposits.

20.11.2 External Debt

External debt is raised in foreign currency and a substantial part of it as it is also repayable in foreign currency. External debt represent loans raised by a country from outside sources includes debt raised by the Govt. and by the non - govt. sources such as NRI deposits, commercial borrowings from abroad, suppliers credit and short - term borrowings etc.

Public debt in India has grown immensely in planning period. In 1999 the total debt of central government was Rs. 8,75,925 and in 1998 debt of state government was Rs. 2,84,942. In the budget of 2005-2006 the 22% of total expenditure was only interest payment. If the debt is owned by central bank of India it increases inflation as RBI meets the growing demand by issuing additional quantity of money.

Public debt plays a important role in economy. Public debt contributes to the saving effort of the economy. LDCs are usually short of capital resources. As saving capacity of the masses is very low , so appropriate measures are taken to step up rates of saving and investment in the economy. The net effect of the borrowing also depends upon the sources from which they come:

- If Govt. goes of the borrowings from the market and public reduces its own consumption and lends its savings to the govt. the result will be a net increase in the rate of savings. But if loans are given to govt. by diverting the savings from private investment, then there will be no net increase in savings and investment activity. But even after that public loans can help economic growth by reallocation of resources.

- If money is borrowed from the central bank then it results in the addition to aggregate money supply in the country. This results in increment in demand and an upward pressure on prices.

20.12 DEFICIT FINANCING

Deficit financing can be defined as "the financing of deliberately created gap between public revenue and public expenditure or a budgetary deficit, the method of financing resorted to being borrowing of a type that results in a net addition to national outlay or aggregate expenditure". Therefore we can say deliberate unbalancing of the budget in such a way that government expenditure exceeds government revenue. In India great reliance has been placed on deficit financing for mobilizing resources for the plans. Deficit financing has been explained in different manner as follows:

20.12.1 Revenue Deficit

Revenue Deficit = Revenue Expenditure - Revenue Receipts.

20.12.2 Budget Deficit

Budget Deficit = Total Expenditure - Total Receipts.

Total expenditure includes revenue expenditure and capital expenditure and total receipts includes revenue receipts and capital receipts. This excess of total expenditure over total revenue is called budget deficit. It is also defined as the fiscal deficit minus government borrowing and other liabilities (public debt receipts). This is somewhat close to the concept of monetised deficit, which meant the printing of the new money by the Reserve Bank of India to part finance the deficit.

But this conventional definition of deficit has lost relevance as it does not meet international practice. So this concept of Budget deficit has been given up by the govt. in 1997-8. Now we follow the concept of Fiscal Deficit

20.12.3 Fiscal Deficit

In a simple terms fiscal deficit is budgetary deficit plus market borrowings and other liabilities of the Government of India. It is also refers to as difference between the total expenditure and the government's total non - debt receipts.

Fiscal Deficit = Revenue Receipts (Net tax revenue + non tax revenue) + Capital Receipts (only recoveries of loans and other receipts) – Total Expenditure (Plan and non plan)

OR

= Budget Deficit + Government's market borrowing and liabilities

20.12.4 Primary Deficit

Primary deficit is obtained by subtracting interest payment (a component of non plan expenditure) from the fiscal deficit. Therefore, the primary deficit is the deficit of the current year and it is accordingly triggered by an expansionary fiscal policy during the year.

Government of India adopted the deficit financing to obtain necessary resources for the development but deficit financing may beget many problems as it increases the public debt which increases the interest burden of the government. Most serious disadvantage of deficit financing is inflationary rise of price. Deficit financing increases the total supply of money in country and raises the aggregate demand for goods and services. In the absence of corresponding increase in supply of goods and services, deficit financing leads to rise in level of price. Inflation work as a forced saving or indirect taxation on people because of increased price now they have to pay extra to maintain same living standard.

One way for a govt. to finance a budget deficit is simply to print money – a policy that leads to higher inflation. Some economist have suggested that a high level of debt might also encourage the government to create inflation. Because Govt. Debt is specified in nominal terms, the real value of debt falls when the price level rises. This is the usual redistribution between creditors and debtors caused by unexpected inflation—here the debtor is the govt. and the creditor is the private sector. But this debtor, unlike others has access to the monetary printing press. A high level of debt might encourage govt. to print money, thereby raising the price level and reducing the real value of its debts.

20.12.5 Deficit Financing and Economic Growth

Deficit financing can be used in accelerating economic growth. The Govt. can use deficit spending for shifting productive resources of the economy into capital goods sector, developing basic and key industries and providing necessary infrastructure. Deficit financing is a very potent tool in the hands of the govt. for increasing effective demand. If deficit is financed through creation of additional currency or borrowings from the central bank of the country. Even if govt. borrows from the market and spends the borrowed sums, the aggregate expenditure is most likely to increase because during depression the investment opportunities are not much and savings of the market get spent through the govt. Though the govt.'s expenditure policy more effective when the extra purchasing power goes into the hands of those people who have a high marginal propensity to consume. That's why various security measures like unemployment relief, old-age pensions, and so on are , therefore, very helpful in raising the total demand in the market. There are two form of deficit financing which can be resorted to in combination:

1. The Govt. may borrow from the market. This procedure is equivalent to transferring of resources straight from the hands of individuals into those of the govt. The market borrowings therefore, generally amount to loans from various - institutions and this generally means diversion of investable funds from the private sector to the public sector.

2. The deficit financing namely, resorting to the printing press amounts to taking away a portion of the private sector's resources and leaving it with extra money. This technique can be used for re-allocation of the economy's resources and thus accelerating the pace of economic growth.

20.13 IMPACT OF FISCAL POLICY ON BUSINESS

If there is any single document, which has maximum impact on business then, it is Budget. Every year budgets brings opportunity and threats for business. Every budget improves the bottom line of some business and some business go in red because of budget. As recent budget compelled the organizations to work out on their Compensation plan because of Fringe Benefit Tax (FBT), the budget of year 2005 gave a big impetus to Mutual Funds and in turn to stock market by allowing tax rebate on the investment in Mutual Funds.   The introduction of VAT also have big impact on the business.

In early 1990 electronic industry was in great pressure as market growth rate was very low, understanding this the then finance minister Dr. Manmohan Sing reduce the excise on electronics specially CTVs which resulted in decrease of price and sales started rising. Not only this, but during last years government has also reduced the taxes which has increased the disposable income of the households which has increased the demand and ultimately gave birth to great Indian Middle Class and big spurt in the sale of white goods and readymade garments. Taxes on intermediary goods industry and taxes on corporate as corporate tax and dividend tax have an obvious impact on business. One of the reason which brought a big spurt in Indian consumer industry is because of relaxation in fiscal policy as last few budgets have reduced a savings rate a lot and have given free hand to banks to distribute consumer loans to consumers.

A smart business person always keep an eye on fiscal policy to reap the maximum advantage from the opportunity given by policy and to minimize the prospective losses because of threats in budget. Like budget of 2005-06 allow to invest in mutual funds to avoid tax now it is big opportunity for mutual funds, it now to them how reap maximum benefit from this step. Budget creates an atmosphere for investment.

20.14 LET US SUM UP

Fiscal policy is a statement of Govt. about its projected source of revenue and expenditure, it tells about the schedule of activities to be undertaken towards the direction of national objectives. Fiscal policy is the projected balance sheet of the country, prepared by Chief Finance Officer of the country that is finance minister of the state. Public finance is the study of generating resources for the development of the country and about allocation of resources. Fiscal policy is implemented through Budget, which is statement of state's revenue and expenditure. Typically budget includes four components: - Some review of economy, Major policy announcement, Expenditure proposal, and Tax proposal. The budget includes revenue and expenditure of the government. Revenue and expenditure is divided in capital and revenue account. Thus receipts are broken into Revenue Receipts and Capital Receipts, and disbursement are broken up into Revenue expenditure and capital expenditure.

Taxation, Profits of Public Sector (Price), Domestic non-monetary borrowing, external borrowing, borrowing form the RBI (monetised borrowing) are the main source of funds for the Govt. Expenditure of the Govt. The Government expenditure can be divided into non - plan expenditure and plan expenditure.

Fiscal policy is a potent tool in the hands of Govt. to regulate the economic growth. Through the fiscal policy govt. can influences the demand, supply and even the level of currency in the economy. It increases the supply of currency in the economy by resorting to deficit financing thus taking public debt. Through fiscal policy Govt. also influences the level of investment and saving rate.

20.15 LESSON END ACTIVITY

1. Discuss the role of fiscal policy in economic growth.

2. Describe the Deficit Financing

3. State whether the following statements are true and false:

   a. Saving potential in an underdeveloped economy is very large.

   b. Short term debt are the debt of which the maturity is less than two year.

c. Direct taxes are usually progressive.

d. Deficit financing can be used in accelerating economic growth.

e. Revenue Deficit = Revenue Expenditure - Capital Receipts.

20.16 KEYWORDS

Deficit Financing: It is the deliberate unbalancing of the budget in such a way that government expenditure exceeds government revenue.

Public Debt: In Indian context it refers to the borrowings of the Central and state government.

LDC: Least Development Countries

20.17 QUESTIONS FOR DISCUSSION

1. What is fiscal policy? Describe the components of the Budget.

2. Describe the various sources of revenue of the government.

3. Discuss the role of fiscal policy in economic growth.

4. What is public debt? Discuss its role in the economy.

5. Discuss the relation between deficit financing, public debt and inflation.

20.18 MODEL ANSWER TO "CHECK YOUR PROGRESS"

1. (a) Budget

   (b) Public Finance

   (c) Direct Taxes

   (d) Equity

   (e) Custom Duties

   (f) VAT

2. (a) False

   (b) False (It is VIIIth Schedule)

   (c) False

   (d) False

20.19 SUGGESTED READINGS

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