
**NATURE AND SCOPE OF MANAGERIAL ECONOMICS: THE
OBJECTIVES OF THE FIRM**

OBJECTIVES

After reading this unit students should be able to:

- Distinguish between 'microeconomics' and 'Managerial Economics'.
- Students should be able to understand the nature and scope of managerial economics and the responsibilities of a managerial economist.
- The students must have clarity regarding the various objectives of the firm.

STRUCTURE

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- 1.3 Firms, Inputs and Output
- 1.4 Self-Check Questions
- 1.5 Objectives of the Firm:
 - (a) Profit Maximization
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1.1 Introduction

To define economics is somewhat difficult, but meaning of the economics can be well explained in terms of allocation of scarce resources among competing ends. It helps us to fix the priorities and to meet the urgent targets/wants first. Managerial economics is concerned with decisionmaking at the managerial level. Managerial economics is application of microeconomics tools and principles in organizational decision-making. Managerial economics can be used by goal-oriented managers in many ways:

- Given an existing economic environment, the principles of managerial economics provide a framework for evaluating that whether resources are being allocated efficiently within a firm. Is there any scope to increase the profit or to reduce the cost by using microeconomics tools?

- The microeconomics principles help managers to respond to various economic signals. For example, how to meet with the increased demand? How to clear the bulk supply from the market? What to do if labour is expensive or the capital is scarce? That is, it helps the firm to achieve least cost combination of factor inputs.
- These tools help the managers to choose the best solution to a managerial problem
- in the decision-making process.
- No major investment decision is to be taken by the firms without considering the economics behind that. For private enterprises profit maximization is the prime objective and for government firms its welfare maximization. Both the objectives cannot be attained without the understanding of fundamentals of economics.
- The working knowledge of economic tools and principles can increase the value of both, the firm and the manager.

Thus, managerial economics draws heavily from microeconomics econometrics and operations research. Accordingly, the manager borrows the relevant concepts from all these disciplines and also some from microeconomics. Manager accords a synthesis of all the relevant aspects of the related subjects to arrive at answers for decision-making problems faced by firms. In its modern meaning, economics renders help in various matters of decision making like:

- (a)** Production Decisions: What to produce, how much of a good to produce and how to produce a given quantity of a specific good?
- (b)** Exchange Decisions: What price to charge for a particular good and to whom to sell?
- (c)** Consumption Decisions: What to consume and how much to consume?

On closer scrutiny, all these questions involve the problem of allocation of scarce resources among alternative ends. For example, the answer what to produce, involves allocation of limited funds among alternative investment projects, what and how much of various goods to consume, requires distribution of scarce resource among unlimited and competing needs. For this reason, economics is considered to be a science of choice making. However, in addition to dealing with such choice related questions, it also encompasses subjects like economic development, public finance, unemployment, poverty, inflation, and therefore, it is wrong to identify economics with the science of choice alone.

1.2 SCOPE OF MANAGERIAL ECONOMICS

Managerial Economics covers the following areas as its scope:

- (a)** Decision Variable for Firms
- (b)** Micro Economics Principles
- (c)** Techniques from Decision Sciences.

The 'firm' here includes both business and non-business ones. This is because the decision problems are more or less the same for both the groups of firms and the two groups may pursue different objectives. For example, like a business firm has to choose one or more production lines from amongst many alternative lines available to it, even a non-business firm like a university has to decide what kind of disciplines (faculties) it should open and to what extent each discipline should be operated, from amongst a host of disciplines available in the field of education today. Similarly, managerial economics includes decision-making by all other groupings of firms, small, medium and large; proprietorship, partnership, and public sector and private sector firms. The

$$MRTS_{LC} = \frac{PL}{PC}$$
 Since $MRTC_{LC} = \frac{MPP_L}{MPP_C}$ therefore at equilibrium

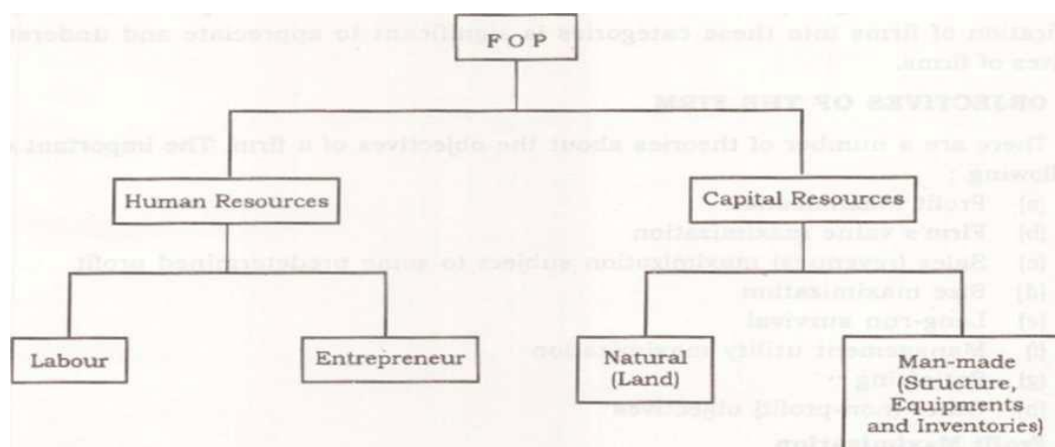
$$\frac{MPP_L}{MPP_C} = \frac{PL}{PC}$$

relevant microeconomics principles for the firms decision making include those found in the demand theory, production and cost theory, pricing theory, and the theory of investment decisions. Macroeconomics is not altogether irrelevant for decision making at the level of the firm. This is because the macroeconomics environment, which includes the behaviour of national aggregates (such as, income, price, unemployment, poverty) and, macroeconomic policy making aspects (such as industrial policy, import quota, export promotion and tariffs, administered prices and controls) affect firms' decisions. Nevertheless, because there is little that an individual firm can do to affect the aggregate economics courses. Managers of firms are assumed to take the economic environment as given.

Any meaningful application of microeconomic principles necessitates use of some quantitative techniques. Some of the important techniques include methods of estimation, optimization, and discounted cash flow techniques. These techniques have come from the fields of statistics, operations research and finance, and thus a good manager of a firm needs to have a good knowledge not only of economics but also of these disciplines.

1.3 FIRMS, INPUTS AND OUTPUTS

A firm is understood as an organization which converts inputs, which it hires, into outputs, which it sells. The inputs, called the factors of production (FOP), are classified as follows:



Under human resources, labour input includes both physical and mental labour i.e. both unskilled (blue collar) and skilled (white collar) labour and it is that part of human effort in an organization which is paid wages and salaries as its remuneration. The other kind of human resource is entrepreneurial resources. Land resource has a rather broad meaning in economics it includes all the resources created (gifted) by God. Thus, it consists of the barren land, minerals, forests, rivers, sea, mountains, etc., as initially discovered by mankind. Any development work which mankind has carried over all these is part of man-made capital. It includes all construction on land, like roads, bridges and buildings (residential as well as commercial), all the equipment, such as plant, machines, and tools, and inventories, which consist of

unsold finished and semifinished goods, and raw-materials. In economic terms, the four factors of production are referred to as land, labour, capital (man-made), and entrepreneur (organization), and the remuneration they receive as rent, wage, interest (capital rental) and profit, respectively.

The output of firms if almost any good and services they produce includes production in various sectors such as agriculture, industry, trade, transport, banking and communication; and perishable as well as durable goods.

Today, production of almost any good (tangible or non-tangible) requires services of almost all the four factors of production. However, there are more than one input combinations to produce a given quantity of any good. Thus, the firm has to decide the best input-mix from all the alternatives it has. In other words, there is a problem of a choice of technique of production. Also, the firm must decide what goods to produce? Such decisions depend heavily on the objectives the firm has decided to pursue.

The firms are also classified into categories like private sector firms, public (government) sector firms, joint sector firms and not-for-profit (non-business) firms. They are also classified according to the number of owners of a firm. On this basis, firms are known proprietorship, partnership and corporations. The meaning of each of these types of firms, barring perhaps notfor-profits firms, is self-explanatory, the somewhat less well-understood group of firms include universities, public libraries, hospitals, performing arts groups, museums, churches, voluntary organizations, cooperatives, credit unions, labour unions, professional societies, foundations, and fraternal organizations. Some of these organizations provide services to a group of clients such as the members of a cooperative or a club. The classification of firms into these categories is significant to appreciate and understand the objectives of firms.

1.4 Self-Check Questions

1.4(a) Name Factors of Production.

1.4(b) Name the author who advanced a theory of firm behaviour.

1.5 OBJECTIVES OF THE FIRM

There are a number of theories about the objectives of a firm. The important ones are the following:

- (a) Profit maximization
 - (b) Firm's value maximization
 - (c) Sales (revenues) maximization subject to some predetermined profit
 - (d) Size maximization
 - (e) Long-run survival
 - (f) Management utility maximization
 - (g) Satisfying
 - (h) Other (non-profit) objectives
- (a) Profit Maximization

The traditional theory of firm's behaviour assumes that the objectives of firm owners is to maximize the amount of short-run profits. Before discussing on the pros and cons of this theory, it is imperative to understand the meaning of profits. Profits are defined differently in business and economics. The public and business community defines profit as an accounting concept, where it is the difference between total receipts and the explicit (accounting) costs of carrying out the business; explicit cost is the payments made to the hired factors of production. This profit concept is gross of the implicit cost, which stands for the imputed cost of the selfowned factors of production employed in the business. The economic profit is the residual after both the explicit and implicit costs are deducted from the total receipts.

Economic profits are a powerful guiding force in the free enterprise system, particularly for a proprietorship firm. However, the present-day world has both the private sector firms operating simultaneously, and most firms are either on a partnership basis or are corporations. The public sector firms are known to pursue social objectives, such as factor productivity and the supply of essential goods at reasonable price. The partnership firms and corporations on the other hand care for non-profit criteria as well. Further, a firm is expected to continue for a number of years and it would be unwise for it to care for today's profit is at least one of the factors on the basis of which the performances of firms is evaluated there are various theories to explain profit-making by firms, the important ones are presented in what follows:

Innovation Theory: Firms make innovations in new products, new production techniques, new marketing strategies, etc. These innovations are costly and must be rewarding for them to flow continuously. For this reason, innovating firms are sometimes awarded patent rights for a specific period of time, during which time no other firm is permitted to copy the product and/or technology. Profits are thus considered a reward for innovation.

Risk Bearing Theory: Firms invest large sums in the production system, expecting to produce goods and make profits on it. However, the production may run into difficulties, be delayed and there may not be an adequate market when production is ready. The firms take these risks and must be adequately rewarded.

Monopoly Theory: Some firms are able to enjoy certain monopoly powers in view of being in possession of a huge capital, economies of scale, patent protection or socio-political powers. As a result, there is a lack of perfect competition and such firms are able to reap economic profits.

Friction Theory: According to this theory, there is long-run equilibrium of economic profit, which is zero (adjusted for risk). However, markets are seldom in equilibrium and that gives rise to economic profits or losses. For example, if winter is too severe and too prolonged, firms dealing in woollen garments would reap large economic profits while those dealing in items like ice cream, or fans may run into losses.

Managerial Efficiency Theory: This theory argues that economic profits can arise because of exceptional managerial skills of well-managed firms. For example, if firms that operate at an average level must reap economic profits. Thus, existence of profit is essential to ensure good performance.

Each of these five theories has an element of truth and one or more of these may be valid in an individual case. An automobile firm might make profit for 'all the above reasons operating simultaneously, while an ice cream vendor might make profit on a rainy day just because there is a heavy rush of tourists in his town on that particular (i.e., Frictional Theory) day.

While/firms must or could make some profit, they may not aim to earn maximum profit in the short-run. This leads to the Alternative Theories of the Firm.

(b) Firm's Value Maximization

Since most firms are expected to operate for a long period, these are postulated to aim for maximum long-term profits instead of maximum short-run profit. Thus, if π_1 denotes expected profit in period 1, π_2 expected profit in period 2, and so on, a firm aims at is not to seek

the maximum value of any of these profits (π 's) but the maximum value of their sum, adjusted properly for the time value of money. Thus,

$$\text{Value of the Firm} = \frac{\pi_1}{(1+i)} + \frac{\pi_2}{(1+i)^2} + \frac{\pi_n}{(1+i)^n}$$

The parameter i denotes the appropriate interest rate, and n the number of years the firm is expected to last. If n 's are interpreted as dividend per share, nn is inclusive of capital gains, if any, and i the cost of equity capital, then the value of the firm just equals the present value of a share of the firm.

The goal of value or wealth maximization is recognized today as the primary objective of a business firm. However, most firms have multiple objectives in the modern world and business firms are no exception to this rule. Further, non-business firms do pursue non-value maximization objectives.

(c) Sales Maximization subject to some Pre-Determined Profit

William J. Baumol has advanced a theory of firm behaviour in which he argues that a firm seeks a certain level of profit and within that constraint aims at maximum sales. The certain level of profit' presumably means the level of profit considered satisfactory by the shareholders. The constrained variable for maximization, viz., sales in terms of revenue (rupees) and not in terms of physical units of goods and services. This is because; many firms are engaged in multiple products, and these products may not be additive in physical terms or/and may have different values per unit. Also, just as in the short-term profit maximization and long-run-profit (or value) maximization theories, one could postulate the constrained short-run sales or constrained long-run sales maximization theories, and choose the long-run alternatives only.

The constrained sales revenue maximization theory rests on the premise that a dichotomy exists between owners and management. In the corporate world, a firm is owned by numerous small shareholders, who hardly have any say in the day-to-day management of the firm. They might attend annual general body meetings and are content if the decisions on dividends are fair in relation to dividends declared by similar enterprises. On the other hand, the firm is managed by salary earning-professional managers who take decisions which serve their interests best, while ensuring 'no serious objection' from the owners at the annual meeting. In general, paid managers' interests rest in their salary packages and perquisites which they enjoy. Quite often the salary and perquisites of decision-makers are linked directly with sales in the form of commissions as well. For all these reasons, Baumol has advanced the hypothesis that firms seek maximization sales subject to a profit constraint, which is satisfactory to the shareholders.

(d) Size Maximization

Some experts have suggested growth or size maximization as an alternative goal for firms. By growth they mean, an increase in sales, assets and/or the number of employees. Edith Penrose argues that managers have a vital interest in growth because "individuals gain prestige, personal satisfaction in the successful growth of the firm with which they are connected, more responsible and better-paid positions, and wider scope for their ambitions and abilities"

(Penrose, 1959)².

(e) Long-Run Survival

Another alternative goal for the firm to pursue that is, assuring long-run survival for the firm. Under this objective, the firm seeks to maximize the probability of its survival into the future. Such an objective would commensurate with the interests of the share-holders and management. Through this objective, owners of today would be able to provide security and business to their next generations. Likewise, management would be happy with this objective, for their present and future compensation depends on the firm's continued existence. A short career in a bankrupt firm would hardly provide a strong basis for a successful job mobility or job security.

Unlike other objectives of the firm, the objective of long-run survival is hard to measure and difficult to practice and achieve.

(d) Management Utility Maximization

O.E. Williamson's model of firm behaviour (1981)³ "focuses on the self-interest-seeking behaviour of corporate managers. The theory basically ignores the owner's interest whenever there is a dichotomy

between owners and managers. To this extent, it goes even beyond Baumol's hypothesis, where managers at least ensure some minimum profit for the owners.

There are many variables in an organisation which affect the management utility. Among these, the prominent ones are the salary including bonus, if any, perquisites, number of subordinates and the management's role in investment decisions. Again, the theory is somewhat vague since the numerous dimensions of management's utility may not always be in harmony and there is no perfect method of developing a combined yardstick which could merge all these into a single variable.

(e) Satisfying

As per this objective, firms do not aim at maximizing anything (profits, sales, etc.) due to imperfections in data and incompatibility of interests of various constituents of an organization. Instead, they set up for themselves some minimum standards of achievement which they hope will assure the firm's viability over a long period of time. This would require satisfying all the constituents of the firm, including stockholders, management, employees, customers, suppliers and government.

The satisfying objective, in fact, is a multiple goal and it is very difficult to practice and achieve. This is because, human-being by nature want satisfaction not only in an absolute sense, but in a relative sense as well. In other words, stockholders may be satisfied by, say, a dividend rate of 20% if the top management's salary, including perquisites are no more than rupees one lakh a year, but if the latter stand at rupees two lakhs a year, even a dividend rate of 40 per cent may be unsatisfactory. Similarly, employees may be content with a bonus of 8 per cent if the dividend rate is, say, 10 per cent and the profit rate on capital employed is around 10 per cent.

1.6.SUMMARY

It can be concluded that the more close a firm is to the proprietorship and private sector unit, the more inclined it would to aim for the maximum long-term profit or the maximum value of the firm. Conversely, the more close a firm is towards a big corporation and public sector unit, the more inclined it would be towards looking for maximum benefits to the management and factor productivity, which go generally hand-in-hand with maximum sales. Not-for-profit firms look for product quality and service to its member/clients. Notwithstanding this, profits are the most important yardstick for judging the success of a firm, and firms (particularly business firms) are designed to make profits and no firm can afford to go without any profits in the long-run. The non-profit objective includes goals such as, maximization of quantity and quality of output subject to a break-even budget constraint, administrator's utility maximization, maximization of factor productivity, and maximization of cash flows. The rationale for these objectives is inherent in the nature of the public sector firms and not-for-profit organization. These units are engaged in the production of essential goods (such as gas, electricity, transport and public goods (such as national parks, museums, national defences and flood control), and render services to a group of clients (such as patients of a hospital) and to their members/contributors (such as the members of a trade union, of a cooperative firm or of a country club). The funds for such organizations come from general government funds, donations and members' contributions. Since there is no unambiguous objective function for these managers to maximize, they look for a level of service that satisfies those paying for it or those who deserve them most in the public eye and thereby protect the job of the management.

1.7Keywords

- Managerial Economics an application of microeconomics tools and principles in organizational decision making.
- Firm is understood as an organization which converts inputs, which it hires, into outputs which it sells.
- Economic Profit is the residual after both the explicit and implicit costs are deducted from the total receipts.

1.8 Answer to Self-check questions:

1.4 (a) There are 2 types of factors of production:

- Human Resources
- Capital Resources

1.4 (b) William J. Baumol advanced a theory of firm behaviour.

1.9 Short Questions:

- (a) Explain Innovation Theory.
- (b) Explain Friction Theory.

1.10 Long Questions:

- (1) Discuss the nature and scope of managerial economics.
- (2) Profit-Maximization Objective of the firm is relevant to which organization and why?
- (3) Critically discuss the Alternative Objectives of the Firm.

1.10 REFERENCES

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- (2) Penrose, E. (1959), *The Theory of the Growth of the Firm*. Oxford University Press.
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FUNDAMENTAL ECONOMIC CONCEPTS

OBJECTIVES

Students should be able to answer the following questions after reading this topic:

- (a) Definitions of Economics, Scope of Economics and Limitations of Economics
- (b) Economic Laws
- (c) Market Mechanism
- (d) Factors of Production

STRUCTURE

- 2.1 Introduction
- 2.2 Economics
- 2.3 Scope of Economics
- 2.4 Limitations of Economics
- 2.5 Economic Laws
- 2.6 Market Mechanism
 - Circular Flow of Income
- 2.7 Self Check Questions
- 2.8 Factors of Production
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 - (a) Opportunity Cost Principle
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 - (c) Marginal or Incremental Principle
 - (d) Equi-Marginal Principle
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- 2.10 Summary
- 2.11 Answers to Self Check Questions
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2.1 INTRODUCTION

The economic activities of men living in an organized society are concerned with the production, distribution, exchange of various goods and services. The understanding regarding the general principles regarding how these activities are to be carried on is very important. Generally speaking, there operations to a large extent depend upon the economic system (Capitalist, Socialist or Mixed Economy) of the country.

2.2 ECONOMICS

It was formally called POLITICAL ECONOMY. In its original sense economy means

management of wealth, the term political economy is, therefore, the management of the wealth of the State. The study of economics as a subject started after the publication of Adam Smith's epoch making "*An Enquiry into the Nature and the Causes of the Wealth of the Nations*". Classical economists like, J.S. Mill and J.B. Say defined economics as '*Science of Wealth*'.

Alfred Marshall was the pioneer of the *Welfare School*. He defined Economics as 'A study of mankind in ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of wellbeing. Thus, on one side, it is the study of wealth and on the other side, a part of study of man'.

Canon said, "Economics is the study of causes of material welfare*."

Pigou said, 'Economics deals with that part of the social welfare that can be brought directly or indirectly into relation with the measuring rod of money'.

Robbins explained economics as Science of Scarcity. He defined economics as, "the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses".

G.J. Stigler and Paul Samuelson provided Growth Oriented Definitions of Economics, "Economics is the study of how men and society choose, with or without the use of money, to employ scarce productive resources which could have alternative uses, to produce various commodities over time, and distribute them for consumption now and in future among various people and groups of society".

The Growth Oriented Definition appears to be most satisfactory. It presents the choice problem in its dynamic setting and also widens the scope of subject by including such important problems as those of income, output, employment and growth, etc. It also has a universal appeal.

2.3 SCOPE OF ECONOMICS

Broadly speaking, Economics can be categorized as Micro Economics and Macro Economics. *Micro Economics* is the study of individual units, whereas *Macro Economics* is the study of aggregates.

Economics is also analysed from the point of view of Science as well as Art. It is taken as; *Positive Science* concerns with what is-things as they are. *Normative Science* deals with what ought to be.

Applied Science describes the ways and means to improve upon economic activities. Economics gives us knowledge and fruit. It is light bearing and fruit bearing. Thus, it is both a science and an art.

2.4 LIMITATIONS OF ECONOMICS

(a) Economics is not a complete study of all human activities. It studies only those activities of human beings which are related with wealth.

(b) The measuring rod of economics is money. Thus, the activities that are not measured approximately in terms of money are not studied in economics. (i) Real (not fictitious) activities of normal human beings are part of the study of economics.

2.5 ECONOMIC LAWS

A law is a statement of causal relationship between two sets of facts. One set is the cause and the other is the effect. "Economic laws or statements of economic tendencies are those social laws which relate to branches of conduct in which the strength of the motives chiefly concerned can be measured by money prices".

(a) Economic Laws are essentially hypothetical: At large, economic laws or statements are based on certain unrealistic assumptions like *ceteris paribus*.

(b) Economic Laws Are Relative: Economic Laws are of two types; universal and relative laws. The Law of Demand and the Law of Supply are applicable everywhere and true in all times, thus, universal in nature. But other Economic Laws related to banking, trade, commerce, insurance, etc. vary from organization to organization and country to country. These are relative laws.

(c) Economic Laws cannot have laboratory experimentation.

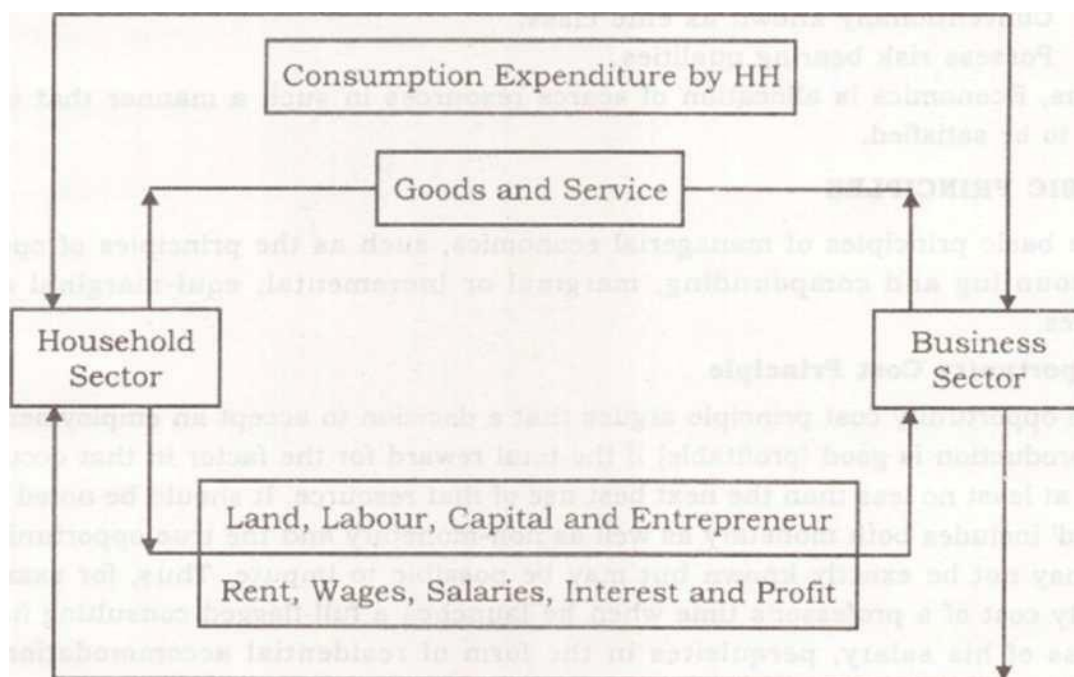
(d) Money is not an accurate measuring rod.

Thus, we can say that Economic Laws are statements of tendencies. They only indicate what is likely to happen and now what must happen. Hence, economic laws are statements of tendencies or statistical probabilities.

2.6. MARKET MECHANISM

Market may or may not be a geographical place in today's business scenario. Buyers, Sellers and Products are important elements of a Market. Market can be of two types: Product Market and Factor Market. Interaction between *Market Forces*, i.e. *demand and supply*, results into price determination of products and factor inputs as per the nature of the market. Relationship between market and factor market can be explained in terms of Circular Flow of Income.

Circular Flow of Income



The above diagram shows two-sector model of circular flow of income. Household sector provides all factor-inputs to business sector. Business sector produces goods and services with the help of these factor inputs and supplies those products to household sector through market. Factor-inputs get reward for their services in the form of rent, wages, interest and profits respectively for land, labour, capital and entrepreneur. Part of this income is spent by the HH sector on the purchase of goods and services and eventually becomes the income of the business sector. Partially, this money is reinvested in the process of production.

2.7 Self Check Questions

2.7a Explain Micro and Macroeconomics.

2.7b Name the components of two sector model of Circular flow of income.

2.8 FACTORS OF PRODUCTION

1. Land

- (a) Free gift of nature.
- (b) Supply of land is fixed.
- (c) Land is imperishable and immobile.
- (d) Land differs in fertility and situation, but it has indestructible qualities.
- (e) Land is a passive factor of production.

2. Labour

- (a) Inseparable from owner.
- (b) Labour is highly perishable and highly heterogeneous.
- (c) Labour has weaker bargaining power.
- (d) Supply of labour is comparatively elastic as per the nature of the work.
- (e) Labour is an active factor of production.

3. Capital

- (a) Manmade factor.
- (b) Inelastic supply in short runs, but elastic supply in the long run. c)Capital is mobile factor of production.

4. Entrepreneur

- (a) Conventionally known as elite class.
- (b) Possess risk bearing qualities.

Thus, Economics is allocation of scarce resources in such a manner that maximum wants are to be satisfied.

2.9 BASIC PRINCIPLES

The basic principles of managerial economics, such as the principles of opportunity cost, discounting and compounding, marginal or incremental, equi-marginal and time perspectives.

(a) Opportunity Cost Principle

The opportunity cost principle argues that a decision to accept an employment for any factor of production is good (profitable) if the total reward for the factor in that occupation is greater or at least no less than the next best use of that resource. It should be noted here that the 'reward' includes both monetary as well as non-monetary and the opportunity cost of a factor may not be exactly known but may be possible to impute. Thus, for example, the opportunity cost of a professor's time when he launches a full-flagged consulting firm would be the loss of his salary, perquisites in the form of residential accommodation, if any, provident fund, etc. and the academic environment for carrying on research projects and publications. According to the opportunity cost principle then, his profit-gross of his salary alone, should not be less than the sum of all the benefits he was deriving when he was a professor. In other words, his economic profit should not be negative.

This principle is emphasized by economics because most economic resources have more than one use and therefore have opportunity costs. Traditional business and accounting executives ignore opportunity cost of a resource while computing their business cost or profits.

In the above example of a professor turned into a consultant, it was not difficult to compute his opportunity cost. However, in most cases, it does pose serious problems and one has to be content with some sort of imputation. For example, an entrepreneur who has never had a job or who has not had a paid job for several years would rarely know his exact opportunity. Similarly, an entrepreneur may not know the precise opportunity cost of his equity capital, for he does not know where he would have invested that money had he not done so in his own business, the cases of opportunity cost of family labour, own land own buildings are similar. In all these situations, one must estimate the opportunity cost as accurately as possible and use it in decision making, no decision would be right if the opportunity costs are ignored,

b) Discounting and Compounding Principle.

The discounting and compounding Principle (DCP) states that when a decision involves money receipts or payments over a period of time, all the money transactions must be valued at a common period to be meaningful for decision analysis. This is because money has time value for their reasons: earning power, changing prices, and uncertainty, money has earning power, for it can earn at least an interest rate even if it is deposited in a bank. On this count, a rupee today is worth more than a rupee at a future date. Money has a derived demand, in the sense that it is wanted not for its own sake but for its purchasing power, which depends inversely on the price level. Thus, during inflation, a rupee today is worth more than a rupee at a future date. Similarly, today's money is certain but a promise to give it tomorrow is uncertain, for the promise may not be honoured either because the payee has no money or because he is dishonest. This point could be driven home more forcefully through the proverb, "A bird in hand is worth two in the bush".

Only simple arithmetic is needed to apply this principle. Suppose an investment costs Rs. 100 lakhs this year and is expected to yield net returns of Rs. 30 lakhs, Rs. 40 lakhs and Rs. 60 lakhs, in the next three years, respectively. Assume, further, that the interest cost of the money is 10 per cent; there is no inflation/deflation and no uncertainty about these cash flows. Then, whether the investment should be made or not depends upon whether the following equation yields a positive or negative value:

$$\frac{30}{(1+1)} + \frac{40}{(1+1)^2} + \frac{60}{(1+1)^3} - 100$$

The solution to this yields an amount of Rs. 6.51 lakhs, and so the investment is desirable. Incidentally, it should be noted here that interest is compounded once a year but any frequency of compounding can easily be handled through this technique. Also, the method can easily be extended to take account of inflation or deflation and uncertainty. The method is discussed in detail in the chapter on investment analysis.

(c) Marginal or Incremental Principle

The Marginal or Incremental Principle (MIP) states that given the objectives of-profit maximization, a decision is sound if and only if it leads to increase in profit, which would arise in either of the following cases:

- (i) If it causes total revenue to increase more than the total cost.
- (ii) If it causes total revenue to decline less than the total cost.

The MIP is significant; for some businessmen take an erroneous view that: o makes maximum profit they must make a profit on every job. The result is that they refuse orders that do not cover full cost plus some profit. This could be better explained through a numerical example. Consider a firm whose output-cost relationship is as follows:

<i>Output</i>	<i>Rs.</i>		
	<i>Total Coat</i>	<i>Marginal Cost</i>	<i>Average Cost</i>
0			20.00
1	28	8	28.00
2	37	9	18.50
3	47	10	15.70
4	58	11	14.50
5	68	10	13.60

Suppose Firm A is producing three units and selling them at a price of Rs.25 per units, making a total profit of Rs.28. If the customer for its fourth unit of output is offering Rs.14 only, should the firm accept this offer? According to the full cost principle, the offer must be rejected since the average cost of four units equals Rs. 14.50, which exceeds the offered price. However, the marginal or incremental principle would argue that the cost of the fourth unit (MC) equals Rs. 11, which is less than the price offered, thereby his profit would increase, and so the order must be accepted; profit would increase from Rs.28 to Rs.31. True, there is a catch in this argument.

In the above example, marginal cost is less than the average cost, i.e. there is excess capacity in production. In other words, the fixed resources are not optimally exploited. Thus, it is profitable to sell below the full cost (average cost) because of the existence of excess capacity in production. In the absence of excess capacity, such would not be the case even under the incremental principle.

The decision to accept the offer at a price below the average cost assumes that it does not lead to any long-term repercussions. For example, if by selling the fourth unit at the price of Rs.14, the customers of the first three units, who paid Rs.25 per unit, get disturbed and there is loss in the future, the offer of Rs.14 for the fourth unit should not be accepted. Thus, while applying the principle of incremental analysis, one should bear in mind the long-run repercussion of the decision.

It is clear now that the MIP is useful particularly in situations where there exists excess capacity in production and the long-term impact is insignificant. For example, one can conceive of a situation where airlines declare two fares, one regular, say, at Rs. 1000 between Delhi and Bombay, and the other stand-by at Rs. 500 for the same trip. On the regular fare, anyone can reserve a seat while on the stand-by, accommodation would be made available if there is an empty seat at the last minute. Thus, on the one hand, passengers whose trip were not urgent and who have less or no value of time could save on air fare; Laissez-passez passengers would, of course, spend some money on extra trips between home and airport. On the other hand, the airlines could also benefit from such a pricing system as the stand by rate would be its full cost, similarly, a country might find it profitable to export a product at a price below its average cost, whereas its domestic price could be considerably higher than the average cost.

Incidentally, it is pertinent to note the difference between marginal and incremental concepts. The former has two salient characteristics. One, the marginal concept is applicable to change in revenue, cost or profit, etc. with respect to change in output only. Two, the concept requires that the change in output if infinite, simply small, to be approximated by one in case of discrete data. In contrast, the incremental concept is applicable with respect to any variable and for any extent of change. To illustrate the difference, let us examine the case of the carpenter again. The net profit was Rs. 1000 when the carpenter sold 100 chairs, and it would have been Rs.1050 if he had sold 101 chairs. Then the marginal profit = $50 (1050 - 1000) / (101 - 100)$ which is also the average incremental profit. Instead, if the profit

was Rs. 1000 when the carpenter charged a price of Rs. 150 per chair and Rs. 1200 if he had charged a price of Rs. 175, the incremental profit would equal to Rs. 200 ($1200 - 1000$) and the average incremental profit = $Rs. 8 (1200 - 1000) / (175 - 150)$. In the latter case, the concept of marginal profit is not applicable at all. Thus, while the incremental principle is versatile, the marginal concept is specific to changes in a particular variable brought about by small changes in output alone.

(d) **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 or of various resources in a given use are the same. For example, a consumer seeking maximum utility (satisfaction) from his consumption basket will allocate his consumption budget on various goods and services such that $MU_1 = MU_2 = \dots = MU_n$, $MC_1 = MC_2 = \dots = MC_n$

Where, MU_1 = marginal utility from good 1, MU_2 = marginal utility from good 2, MC_1 , marginal cost of good 1, and so on. Similarly, a producer seeking maximum profit would use that technique of production (input-mix) which would ensure.

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

When MRP_1 = marginal revenue product of input 1 (e.g. labour), MRP_2 = marginal revenue product of input 2 (e.g. capital), MC_1 = marginal cost of input 1, and so on.

The principle involves new concepts and we are not able to explain it in detail at this stage. Suffice it to say that it is easy to see that if the said equity were not true, the decisionmaker could add to his utility/profit by reshuffling his resources/inputs. MU_1, MU_2

For example, if $MC > MC'$ i.e. consumer would add to his utility by buying more of good 1 and less of good 2.

(e) Time Perspective Principle

The time perspective principle argues that the decision-maker must give due consideration both to the short-and-long-run consequences of his decision. The principle can be well explained through recalling the example cited under the marginal or incremental principle. The order for the fourth unit at Rs.14 in spite of an average cost of Rs. 14.50 was worth accepting by the producer on the short-run considerations for sure. But if that were to disturb the customers (market) in the long-run, it may have to be rejected. Similarly, we do come across many new products which are sold below cost of no relatively small margins in the beginning with the hope of commanding a good market and thereby making profits in the long-run. Nirma soap powder and Rin soap cakes perhaps fall in this category. If the managers did not have time perspective in their mind, they would never have resorted to such practices, called price penetration'.

2.10 SUMMARY

Scarcity and uncertainty are the two foundation stones of economics. Economics deals with the allocation of resources, which are scarce, in the sense that the demand for such resources at zero price exceeds their supply. Anything which commands a price is a scarce item, called an economic good, and the rest are free goods. A commodity which is a free good today in a particular society might become an economic good tomorrow in the same society or might even be an economic good today in some other society. For example, water which

was a free good all over in primitive society, has a price tag now in many cities but is still a free good in most rural areas. However, scarcity, though a necessary condition for choice, must accompany other alternatives, or versatility to cause the problem of choice. Since decisions depend on the objectives of a firm, it is important to be clear about them from the outset. If a doctor is unable to diagnose the disease, his prescriptions may not cure the patient. If there are no alternatives, there is no decision problem. However, in today's complex world, there are many alternatives available to a firm and as many constraints facing them. A clear understanding of these necessitates a thorough scanning of the environment - opportunities and constraints. Evaluation of alternatives requires more effort. It would involve collection of all relevant data and their analysis through appropriate techniques. Once these steps are completed, choosing an alternative on the basis of objectives is simple. Again, implementation of a decision might require resources, an explanation to those who are affected by it, and the courage and ability to face the consequences of that decision. Even after implementing the project, its performance must be ministered vis-a-vis expectations, so that projection errors are minimized in future. The time period under consideration will often be an important factor in our decisions analysis. Ours is a dynamic economy and decisions would have to be made within a time constraint. Things do change over time and if undue delay is made in decision making, opportunities might turn into threats, and so on. There are a number of examples where firms have suffered significant losses due to delay in decision-making or/ and implementation of decisions.

2.11 Answers to Self Check Questions.

2.7(a) *Micro Economics* is the study of individual units, whereas *Macro Economics* is the study of aggregates.

2.7(b) components of two sector model of Circular flow of income are Household and Business Sector.

2.12 SHORT QUESTIONS

1. Define Circular Flow of Income.
2. What do you understand by Market Mechanism?

2.13 LONG QUESTIONS

1. Define Economics. Briefly explain Economic Systems.
2. What is Opportunity Cost Principle?
3. Which Principle is best and why?
4. Take a hypothetical project and apply time perspective principle for decision making.

2.14 KEY WORDS

Economic Activities are production, distribution and consumption.

Economic Systems are Capitalist, Socialist and Mixed Economy.

Economic Laws cannot have laboratory experimentation.

Market may or may not be a geographical place in today's business scenario.

Opportunity Cost is the cost of the next best alternative.

Discounting Principle is when a decision involves money receipts or payments over a period of time, all the money transactions must be valued at a common period to be meaningful for decision analysis.

Marginal or Incremental Principle (MIP) states that given the objectives of profit maximization, a decision is sound if and only if it leads to increase in profit. 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 or of various resources in a given use is the same.

Time Perspective Principle argues that the decision-maker must give due consideration both to the short and long-run consequences of his decision.

2.15 References

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ANALYSIS OF DEMAND**STRUCTURE**

- 3.1. Introduction
- 3.2. Different Approaches of Analysis
- 3.3. Assumptions of the theory
 - (a) General Assumptions
 - (b) Analytical Assumptions
 - (c) Assumptions Concerning the Notion of Utility
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- 3.11. Long Questions
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3.1 INTRODUCTION

The economic problem arises out of dis-equilibrium between human wants and means available to satisfy these wants. Economics concerns itself with the problem of allocation of scarce resources to alternative uses so as to achieve the greatest fulfilment of society's unlimited wants. The allocation of resources takes place at three levels: at the level of household (consumer), at the level of the firm (producer) and at the level of the economy. The Theory of Demand is the name given to that branch of Economics which explains allocation of resources by households.

The theory sets up a functional relationship between the economic factors and an individual consumption pattern. As it is believed that economic factors operate only through income and prices, economists concentrate on these two variables alone the other noneconomic determinants of demand such as climate, culture, age, education, occupation etc. are grouped together as tastes which are assumed to be relatively stable during the period to which demand relates.

Demand refers to the quantity of a commodity which consumers are willing and able to purchase at a specific price during a given period of time: The basic proposition of the theory of demand is the law of demand. According to the law, consumer will ordinarily buy more a commodity at a low price and less of commodity at a high price, given tastes, money income and price of related goods. The relationship between price and quantity demanded is inverse. If we draw a two dimensional diagram, measuring price on Y-axis and quantity demanded on X-axis, the demand curve will slope downward. The main aim of theory of demand is to explain the conditions in which a consumer is in equilibrium in respect of purchases to consumer goods and from this to derive the law of demand. The theory seeks to explain how the consumer achieves his equilibrium with regard to his purchases and how he reacts to changes in the price of the commodity, he purchases.

3.2 DIFFERENT APPROACHES OF ANALYSIS

The theory of demand has been developed from three different hypotheses: marginal utility hypothesis, indifference preference hypothesis and related preference hypothesis. These alternative formulations investigate the logical basis of demand and seek to drive the demand function of the consumer. They come into being one after another because of the shortcomings in and dissatisfaction with the earlier approaches). The development of the theory of demand has been from psychological to behaviouristic explanation of the consumer behaviour in economic markets. These alternative explanations of the consumer behaviour from the subject matter of the present and next two lessons. The present lesson is confined to marginal utility analysis of demand. It will provide subjective explanation of the down sloping nature of the demand curve.

Before we start elucidating marginal utility analysis of demand, it would be helpful to have a look at its development. Many economists have contributed to the development of the marginal utility theory of demand, but the most important contributions were made by:

- J. Dupuil (French), 1844;
- H. H. Gossen (German), 1854;
- W.S. Jevons (Englishman), 1870;
- C. Menger (Austrian), 1870;
- L. Warlas (French), 1873; and
- A. Marshall (Englishman), 1890.

Dupuit is the first economist to derive logically the law of demand. He called it 'the law of consumption and the demand curve 'the curve of consumption'. Gossen developed the Law of diminishing marginal utility (pleasure) and the principle of equi-marginal utility (pleasure) and for the first time stated conditions of consumer equilibrium. However, no notice was taken of Dupuit's and Gossen's works for a long time. It was mainly the writings, and efforts of Jevons, Menger and Warlas that set off the Marginal Revolution in 1870s. Their pioneering works established the marginal utility theory and gave a new impetus to economic thinking in terms of incremental changes.¹ It were they who turned the scattered fragments of earlier utility analysis into a comprehensive theory of value and distribution. Unlike classicists, they made a central and important use of their utility functions in connection with the problem of exchange. Before they emerged on the scene 'the idea that maximisation of such a concept as Utility plays a weightily part in determining such economic quantities as value, output and input had not dawned on many people in classical economics the supply factor was of prime importance. The classicists did not have any theory of demand which could employ use value to explain exchange value. They hold utility as a necessary condition for the existence of exchange value, but they failed to clarify the relationship between the utility and demand largely because they were not in possession of the concept of margin. Classical theorists resorted to different factors on the side of supply for the explanation of exchange value taking implicitly the influence of demand as given. Marginal utility theorists rejected the emphasis which classical theory of value placed on supply. Jevons, Menger and Warlas developed independently a theory of utility as a diminishing, and a sacrifice as an increasing function of the quantity of commodity. The conspicuous novelty in the works was the replacement of the labour/cost of production theory of value by the marginal utility theory of value. They were finally able to secure for demand its rightful place. Prof. Marshall was also one of the originator of the marginal utility theory of demand. Although he did not publish his theory till 1890, he had earlier developed it independently and was teaching to his students as far back as 1869. Marshall's statements of the theory are the most perfect of all the formulations.

1.R. S. Hovcy, *The Rise of Marginal Utility School*, 1870-1890 (U.S.A., 1960. p.57.)

He logically lined marginal utility with demand and showed how demand was relevant to the determination of market price. The founders of the theory - Jevons, Menger, Walras and Marshall were thus able to derive relationship between price and quantity demanded from the law of diminishing marginal utility. Prof. Marshall also clearly formulated the concept of elasticity of demand, the embryos of which are to be found in Cournot's and Mill's analysis. Because of Prof. Marshall's great contribution, the marginal utility theory is sometimes referred to as the Marshallian Theory of Demand.

The method of utility theorists is abstract. They made assumptions about the behaviour of the individual consumer and his economic environment. Then they set up propositions which are tested logically. Therefore, they became theories.

3.3. ASSUMPTIONS OF THE THEORY

There are three types of assumptions underlying the marginal utility theory: general analytical and those concerning the notion of utility.

(a) General Assumptions

There are three general assumptions:

1. The consumer is a composite consumption unit. It means that his choice represents the preference of all the members of the household.
- 2.. The consumer is a rational being. The concept of rationality in marginal utility theory means four things:

(a) The consumer has a clear perception of utilities of various quantities of the object of desire. Prof. Jevons, one of the originators of the theory (*Theory of Political Economy*, 1870) defined utilities as a relationship between a consumer's want and the attribute of a consumer's object to satisfy that want.

(b) Utilities from commodities are capable of measurement in money terms. (c)The consumer is capable of comparing marginal utilities of various commodities of exchange.

(d)The consumer will choose that alternative from the various alternatives available that gives him maximum utility. It is assumed that the consumer behaves rationally: he calculates, chooses consistently and maximises utility.

3. *Ceteris Paribus* (other things remaining the same): There are four possible determinants of demand for a commodity: Tastes, money income, prices related goods (complements and substitutes) introduced the *Ceteris Paribus* assumption in his analysis and he argued that tastes, money income and prices of related goods change only in the long run and thus these may be held constant for the purpose as utility theory is essentially a short period theory. He thus made demand dependent only on the price of the commodity. $D_x = (P_x)$.

(b) Analytical Assumptions

There are three analytical assumptions:

1. The consumer has perfect knowledge.
2. All the quantities involved i.e. utilities, units of commodities, money, income (prices) are infinitely divisible.
3. The consumer is infinitely sensitive and reacts to the smallest discernible change in the market.

(c) Assumptions concerning the Notion of Utility

(1) The most important assumption here is that the utility can be measured on an interval scale. It means that the utility is cardinal and can be expressed as a quantity.² It means that the utility derived by the consumer from the use of a certain commodity can be expressed in quantitative terms. It also implies that utility is quantitatively measurable comparable.

The concept of ordinal and cardinal (interval) scale of utility have been borrowed from the vocabulary of logic. The number 1, 2, 3, etc. are cardinal numbers. The number 2, for example, is twice the size of number 1. As a contrast the numbers 1st, 2nd and 3rd, etc. are ordinal numbers. Such numbers are ordered, or ranked and there is no way of knowing, just from ranking, that is the size relation of the numbers. The second one might or might not be twice as big as the first one. Thus in the ordinal scale we

simply rank or order commodities according to our preferences in terms of more and less. In the interval scale we also measure preferences.

An example would help us to illustrate the point. Suppose there are two commodities, tea and coffee. It is said that the consumer prefers tea than coffee, then we are simply ranking his preference. It is ordinal measurement. Ordinal measurement does not permit us to measure and compare quantities of satisfaction or utility. If, on the other hand, we can say that a consumer prefers tea twice as much as coffee we are then measuring his preference. This is cardinal measurement.

The cardinal utility theorists assume that utility is measurable. The units of measurement are imaginary; they are called utilities. Prof Marshall considered utility as measurable in money terms. According to him, whatever the consumer pays for a certain thing rather than go without it represents the money measure of the utility obtained by the consumer.

(2) The second important assumption is the Law of Diminishing Marginal Utility. Utility is the want satisfying power of a commodity or a service. Marginal utility is the addition made to total utility derived from the consumption of commodity by the purchase of an additional unit of it. The law states that the marginal utility derived by a consumer from the consumption of a commodity goes on diminishing as he consumes more and more units of it. It implies that when a consumer increases his stock of a commodity, the total utility of a commodity will increase, but at a diminishing rate. In Prof. Marshall's words, "There is an endless variety of wants but there is a limit to each separate want. This familiar and fundamental tendency of human nature may be seated in the law of satiable wants or of diminishing utility. The total utility of a thing to any one (that is the total pleasure or other benefit it yields him) increases with every increase in the stock of it, but not as fast as his stock increases".³ This tendency derives from two facts: (1) although human wants are unlimited, yet any particular want is satiable, (2) different commodities are imperfect substitutes for one another so far as satisfaction of a particular want by a particular commodity is concerned. If we are to graph this law, then marginal utility curve will slope downward to right and total utility curve will be concave from below:

2. 'A quantity can be defined as anything that is estimable as greater or smaller than some other thing. This property implies transitivity and 'asymmetry', but not measurability. A quantity to be measurable must satisfy two additional requirements |a) it should be possible to define a unit and <b) should be possible to define increments operationally." H.K.M.Singh, *Demand Theory and Economic Calculation in Mixed Economy*, pp. 21-22.3.A. Marshall, *Principles of Economics*, p. 93

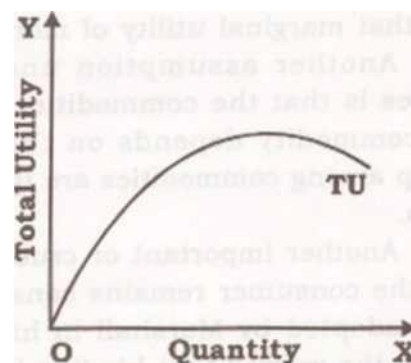
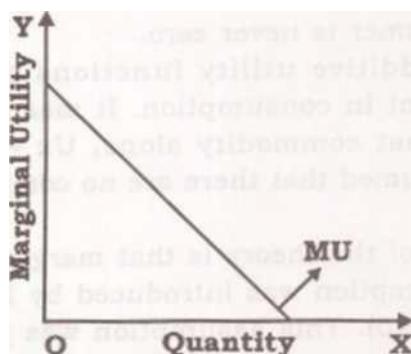


Fig. 3 (a)

Fig. 3 (b)

The law of diminishing marginal utility is based on a familiar and fundamental tendency of human nature. It has been arrived at by introspection⁴ and by observing every day behaviour of the people. The law is of great significance for the marginal utility theory of demand as the downward sloping demand curve is based on it. It explains the rationale underlying the law of demand - why idea of diminishing of a good rise as the price falls and vice-versa. The idea of diminishing marginal utility also plays a key role in explaining how a consumer should allocate his money income among various goods and services which are available to him to buy.

Prof. Marshall further assumed that law of diminishing marginal utility applies to all objects of desire including money. But there is one important difference. In case of other commodities saturation point can always be reached (which implies zero marginal utility of the commodity) but this is not so in case of money. Since money represents general purchasing power over all the other commodities, its marginal utility is never zero or negative. That is there is no saturation point for money.

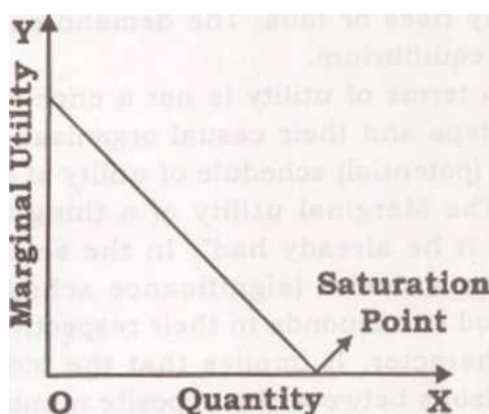


Fig. 4 (a)

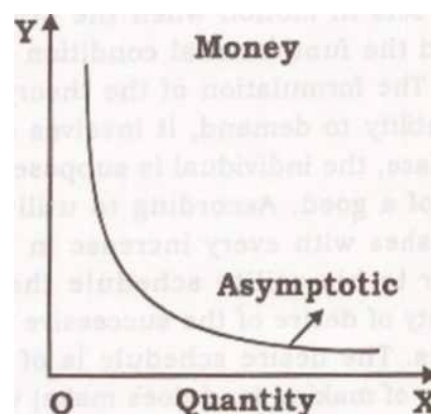


Fig. 4 (b)

4. "Introspection is the ability of observer to reconstruct events which go in the mind of another person with the help of self-observation. This form of comprehension may just guess work or intuition or the result of long-lasting experience." Email Kauder, *A History of Marginal Utility Theory*, p. 10.

The utility curves of a commodity and of money are illustrated in above diagrams. The utility curve of money tends to be asymptotic to quantity axis, but never intersects it, signifying that marginal utility of money to the consumer is never zero.

(3) Another assumption underlying the additive utility functions of different commodities is that the commodities are independent in consumption. It means that the utility of commodity depends on the quantity of that commodity alone, $U_x = f(Q_x)$. The relationship among commodities are ignored. It is assumed that there are no complements or substitutes.

(4) Another important or crucial assumption of the theory is that marginal utility of money to the consumer remains constant. This assumption was introduced by Bernoulli in 1730, and adopted by Marshall in his *Principles* (1890). This assumption was justified by Marshall on the ground that his (the individual consumer's) expenditure on anything "is only a small part of the whole expenditure". When price falls, real income of the consumer increases and consequently marginal utility of money to the consumer falls. Similarly, when price rises, real income of the consumer falls and as a result marginal utility of money to the consumer rises. But Marshall ignored these variations in income saying that consumer's expenditure on anything constitutes only a small part of his total expenditure. He thus, ignored income

effect of a price to measure marginal utility of goods in terms of money. Consequently, the marginal utility curve becomes demand curve of commodity as this assumption removes the difference between the two. Without it the marginal utility curve would have been below the demand curve for all in price and above the demand curve for a rise in price's

3.4 CONSUMER S EQUILIBRIUM AND THE DERIVATION OF THE LAW OF DEMAND

(a) Consumer Equilibrium

After acquiring knowledge of the assumptions of theory', we are now to see how a consumer achieves his equilibrium, once we know the process by which the consumer maximises his satisfaction, given his income and the marginal utility schedules of the commodities he desires to buy, it becomes possible for us to analyse the process of adjustment which sets in motion when the price of commodity rises or falls. The demand can then be derived the fundamental condition of consumer's equilibrium.

The formulation of the theory of demand in terms of utility is not a once-for-all leap from utility to demand, it involves a complex of steps and their casual organisation. In the first place, the individual is supposed to perceive a (potential) schedule of utility of successive units of a good. According to utility theorists, 'The Marginal utility of a thing to anyone diminishes with every increase in the amount of it he already had'. In the second place, similar to his utility schedule the individual has a desire (significance schedule). The intensity of desire of the successive units of the good corresponds to their respective margins utilities. The desire schedule is of a derivative character. It implies that the individual is capable of making (and does make) unit by comparisons between the opposite numbers in the two schedules. There is at least one more step at the psychological threshold; the individual must make up his mind as to what he is prepared to give in exchange for the good if it is to be acquired. Expressed in money, this gives us the individual's demand schedule in Terms of the price of good, which compound with the demand schedules of other individuals in the market, gives us the market demand schedule.

The equilibrium of the consumer can be explained with the help of the law of diminishing marginal utility and the law of equi-marginal utility. When the consumer reaches his equilibrium he maximises his utility or satisfaction. Maximisation means the most satisfaction the consumer can acquire under the circumstances. Equilibrium signifies a state of a balance of opposing forces. The consumer's force is his desire which is limited by his income. The opposing force is price, the sign and condition of the availability of a commodity. If price rises, the consumer buys less and if it falls, he buys more. The consumer's desire of different quantities of commodity is represented by diminishing marginal utility of commodity to him. On the other hand, consumer has limited income. The size of his money income determines the utility of a rupee. Its utility represents marginal utility of money to him. In case of a single commodity, the consumer reaches his equilibrium when he buys the quantity whose marginal utility is equal to the marginal utility of the rupee represented by the price. In the other words, consumer maximises his satisfaction when marginal utility obtained from a commodity equals its price ($MU_a/P_a = MU_m$). Again, at the point of equilibrium, marginal utility must be diminishing.

But the consumer does not spend his limited income on a single commodity alone. He has to satisfy his various needs with it. He may have to spend on food, clothing, recreation, dental care etc. How the consumer would allocate his limited money income among various goods? The consumer's equilibrium position is dictated by the law of Equi-Marginal Utility or the law of Maximum Satisfaction. Let there be two commodities A and B. Let P and P, stand

•i b

for the price, MU_a and MU_b for their marginal utilities, and let m be the marginal utility of money to the consumer. Then $P_a \times m = MU_a$ and $P_b \times m = MU_b$. This means that the price of A multiplied by the marginal utility of money equals the marginal utility of A. Similarly, for B. So, consumer reaches his equilibrium when:

$$\frac{P_a \times m}{P_b \times m} = \frac{MU_a}{MU_b}$$

as m's cancel out, so

$$\frac{P_a}{P_b} = \frac{MU_a}{MU_b}$$

$$\frac{MU_a}{P_a} = \frac{MU_b}{P_b}$$

This means that the ratio of the price of two commodities is equal to the ratio of their marginal utilities and the marginal utility of one commodity divided by its price equals the marginal utility of other commodity divided by its price. The same will be true in case of more than two commodities. The consumer would maximise his satisfaction with his given income.

When $\frac{MU_a}{P_a} = \frac{MU_b}{P_b} = \frac{MU_c}{P_c}$ and so on. How would he be in equilibrium.

The condition of consumer's equilibrium can thus be expressed in two ways:

- (1) The consumer will be equilibrium at a point where the marginal utility of each commodity is proportional to its price. It is known as *Proportionality Rule*.

The marginal unit of expenditure in each direction brings in the same increment of utility of satisfaction. It is known as the *Principle of Equi-Marginal Utility of Money*.

It does not mean that the consumer spends equal amount of money on different commodities. Not at all. He spends different amount of money on different commodities. It simply means that the last rupee spent on each commodity yields to the consumer same increment of satisfaction or same amount of extra utility.

He thus, maximises his satisfaction. He is in equilibrium when he buys all the commodities in such amount that $MU = P$. He has no inclination to change his expenditure pattern oil various purchases.

A detailed illustration can help in explaining the validity of the rule. Suppose there is a consumer who has limited weekly income of Rs. 10. He is to make purchase of two commodities A and B, with this given income so as to maximise his satisfaction. The marginal significance of one rupee is assumed to be equal to 8 units. Other necessary details arc given in the table below:

(1)	(2)		(3)	
Unit of a Commodity	Commodity A : Price ■ Re. 1		Commodity B : Price - Rs. 2	
	2 (a) Marginal Utility (Units) (MU/Price)	2(b) Marginal Utility per Rupee	3(a) Marginal Utility (Units) (MU/Price)	3(b)Margi nal Utility per Rupee
1	10	10	24	12
2	8	8	20	10
3	7	7	18	9
4	6	6	16	8
5	5	5	14	7
6	4	4	12	6
7	3	3	10	5
8	2	2	8	4
9	1	1	4	2

Column 2(a) and 3(a) provide marginal utility information with regard to commodities A and B. They represent diminishing marginal utility schedules. But these commodities any different prices. In order to make the amounts of extra utility obtained from differently priced goods comparable marginal

utility must be put on a per rupee spent basis. This is done in columns 2(b) and 3(b). This data given is simply obtained by dividing the marginal utility figures of columns 2(a) and (2b) by the assumed price of A and H, i.e. Re. 1 and Rs. 2 respectively.

The consumer reaches his equilibrium when he buys 2 units of A and B with his given income. The combination yields to the consumer, the maximum utility obtainable with this income. It also fulfils the condition i.e.

$$\text{MU of Commodity A} = \text{MU of Commodity B} = \text{MU of Money}$$

table and that of underlying assumption, we know that the rational consumer will buy 4 units of commodity A at price of Rs. 2. Now assume that the price of B falls to Re. 1. In that case the marginal utility per rupee data column 3(b) will become identical with that shown in 3(a). Consumer will maximize his satisfaction

(b) Derivation of Demand Curve from Marginal Utility when he buys 8 units of commodity B i.e. when

it is quite a simple step to derive an individual's down sloping demand curve from the

MU of Commodity B utility maximising rule. The law of demand simply states that given (a) consumer's tastes (b) his income = MU of money. This conforms to the down sloping nature of the demand curve

P of B.

money income and (c) price of other goods consumer would buy more of a commodity when its price falls and

vice-versa. We now make one further assumption that price of A representing **The Demand Schedule for**

Commodity B

"other goods" is given at Re. 1. Keeping in mind the information given in above

<i>Price per Unit of B</i>	<i>Quantity Demanded (Units)</i>
Rs. 2	4
Rs. 1	8

This happens because when price of commodity B falls MU of B will be greater than MU of A/P of A = Mum. (It is assumed that marginal utility of money, i.e. Mum, remains constant.)

In order to restore equilibrium, MU of B must be reduced. That can happen only when the consumer buys more of commodity B. Equilibrium is restored when MU of B becomes equal to the product of new price (Pb) and marginal utility of money (Mum) i.e. when $MU_B = P_B \cdot Mum$. It is thus clear from the proportionality rule that as the price of a commodity falls, its quantity demanded will increase, other things remaining unchanged. Consumer buys of diminishing marginal utility and law of Equi-marginal utility provide logical basis for the down sloping nature of the demand curve. The diagrammatic illustration given on the next page will make it further clear.

(c) Derivation of Demand Curve

A and B show equilibrium positions of the consumer

A denotes: $MU_A = P_A \cdot Mum$

B denotes: $MU_B = P_B \cdot Mum$

Thus quantity bought of commodity B rises from OQ_1 to OQ_2 with the fall in price of B from P_B to $P_{B'}$. The inverse price-demand relationship is deduced from the inverse relationship between marginal utility and the quantity in stock.

It is assumed here that consumer spends only very small portion of his total income on this commodity. A small variation in the quantity bought as a result of fall or rise in the price of the commodity will not effect much the size of the income, and therefore, also the total utility there from. Thus a change in price assumed to have a negligible effect on the real income of the consumer. In other words,

income effect of changes in price is ignored as marginal utility of money is assumed to remain constant during the act of purchase of the commodity. We are thus left only with substitution effect of a price change, which gives us only an inverse relationship between demand and price.

3.5 AGGREGATE (MARKET) DEMAND CURVE FOR A COMMODITY

Market Demand curve is a matter only of horizontal summation of individual demand curves. In some cases, the demand of an individual may be fairly representative of the general demand for the whole market. In other cases there may be large differences in individual demands. But, "in the large market where rich and poor, old and young, men and women, persons of all varieties, tastes, temperaments and occupations are mingled together, the peculiarities in the wants of individuals will compensate one another in a comparatively regular gradation of total demand".

Prof. Marshall formulated the general law of demand thus :

"The greater the amount to be sold, the smaller must be the price at which it is offered in order that it may find purchasers, or in other words, the amount demanded increases with a fall in price and diminishes with a rise in price (other things remaining unchanged)."

Thus demand curves for most of the commodities are negatively inclined. Output, who is the first to derive the demand curve from his marginal utility analysis, gave two reasons why the curve will be negatively sloped :

- (1) As price falls, the existing buyers extend it to more uses.
- (2) With every fall in price, the consumption, of the commodity spreads to more and more consumers.

3.6 EXCEPTIONS OF THE LAW OF DEMAND

The demand curve for most of commodities slopes downward from left to right. Prof. Marshall who gave the theory of demand noted three exceptions to the law of demand. In these cases the demand curve will be positively sloping:

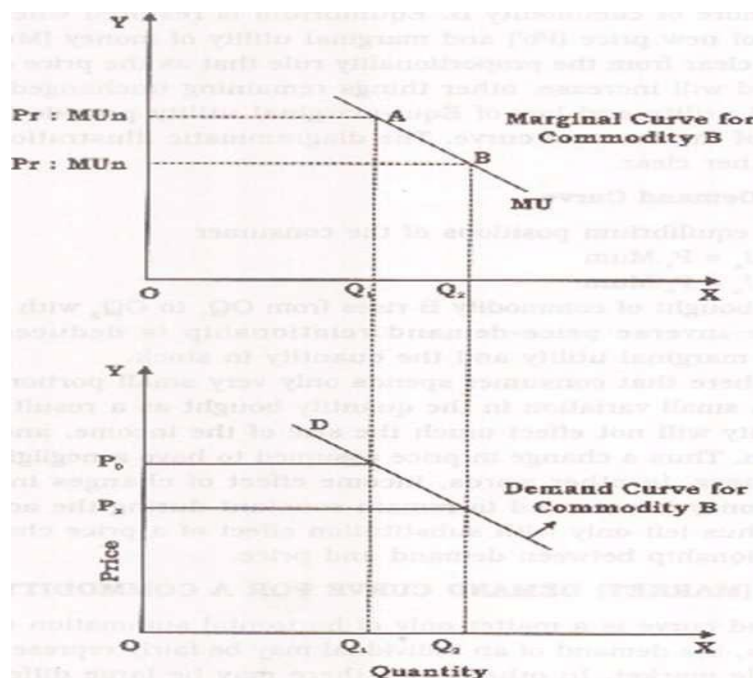


Fig. 5 • 6 demanded

G. Alfred Marsha!!.. ++Principles of Economy's; PP. yy

- (1) The law does not apply to speculative demand. In such cases, further anticipation of the rise of price may induce the speculators to demand more of the commodity. For example, in a period of rising

prices, sometimes the consumers buy more rather than less as they expect the prices to rise still further. This exception to the law of demand was included by Prof. Marshall in the first edition of the Principles.

(2) The law does not apply in case of inferior goods because of powerful Income effect (known as Giffen's paradox). The demand for such commodities may fall when their prices fall. This exception was introduced by Prof. Marshall in 3rd edition, of *Principles* (1899) after it was pointed out to him by one his contemporaries. Sir Robert Giffen.

(3) The law does not apply in case of conspicuous consumption. For example, diamonds are demanded only when they are very expensive. Their demand varies directly with price. The phrase 'conspicuous consumption' was popularized by Thorstein Veblen in *The Theory of the leisure Class* (1899).

(4) The law also does not apply in those cases where consumers are ignorant about the nature and price of the commodities and mistake them for other commodities because of deceptive labels as well as price.

As Prof. Samuelson says these exceptions may be taken as "rather unimportant exceptions to the universal law of downward-sloping demand."

3.7 Self Check Questions

3.7.1 How does the consumer equilibrium can be measured?

3.7.2 What is the slope of demand curve?

3.8 CRITICAL APPRAISAL OF THE THEORY

The marginal utility theory has been criticized and defended as perhaps to other theory has been. There are a number of criticisms of this theory of consumer behaviour. Five major points of criticism are noted here:

(1) The first charge that is levelled against the theory is that it is psychological and also gets involved with philosophical questions. As such, it cannot form part of a scientific discipline. It is alleged that the theory rests upon "individualistic and hedonistic" premises which is 'unsound psychology'. The two assumptions which have been criticized are (1) that the consumer is a rational entity and (2) the law of Diminishing Marginal Utility. It is true that the consumer tries to maximise his satisfaction, but still he cannot be treated as a calculating machine. The critics point out that 'men commonly seek' not utilities, not pleasures, but objects, and they are not commonly engaged in deliberative and careful comparisons and calculations of the units of pleasure which successive units of the same goods or units of different goods, or units at different stages of removal from the present, will yield to them. They ridicule the notion that man's desires are held in leash and spring into action only after completion of fine actuarial comparison of the hedonistic potentialities of different commodities.⁷ According to them, the consumer is not a calculating machine. It is quite likely that the consumer may be led by whims or by conventions even when he is purchasing small commodities. The charge against the theory is that it is 'hedonistic' in nature. Prof. Marshall and Wicksteed tried to free the theory from this charge and they were successful in their attempts to some extent, "Gradually the theory came to be treated more as a logic than a psychology of values."

With regard to the Law of Diminishing Marginal Utility, it is pointed out by the critics that the economists have borrowed this law from psychology. In this context they mention

7. Jacob Viner. 'The utility Concept in Value Theory and its Critics', *Journal of Political Economy*, August 1926. p.373

Weber-Fechner Law of Diminishing Marginal Pleasure which applies to sensations and not to feelings. Since, the critics observe, utility is a feeling and not a sensation, Weber-Fechner law cannot apply to utility. It may be mentioned here that the contention of critics is not valid as there is no evidence in the writing of the utility theorists to show that they have, borrowed the law of Diminishing Marginal Utility

from psychology. The Law of Diminishing Marginal Utility is based on the economist's own observations of consumer behaviour.

(2) The second main point of criticism is that the utility theory assumes cardinal measurability. A real number is associated with every utility feelings. Some utility theorists tried to measure it directly, and some took price which a consumer is 'willing to pay' as an approximation of marginal utility. But utility of a commodity is a subjective phenomenon, it is psychological feeling, a state of mind. Critics, therefore, pointed out that it is too much to expect from a consumer that he can measure utilities of different objects of consumption precisely. They rejected the idea that utility is a measurable quantity. On the other side two attempts to show that utility can be cardinally measured, have been made. one. by Prof. Fisher (1927) and the other by Prof. Frisch (1932). Both of them collected data about household expenditures and proved that utility can be statistically measured. However, both Irving Fisher and Ranger Frisch assume (a) similarities of consumer tastes (by independent utilities of different commodities which are untenable assumptions. This controversy still remains unresolved. However, alternative techniques to study consumer behaviour have been evolved which claim to steer clear of the assumption of numerical utilities.

(3) Third major criticism has been offered by Prof. Hicks in his Revision of Demand Theory (1956). Prof. Hicks argues that Marshall's model applies to single commodity case. It loses its validity in more than one. commodity case. Two assumptions on which Marshallian analysis of consumer behaviour is based are : Constancy of marginal utility of money and independence of utility of different commodities. These two assumptions restrict the theory to the analysis of demand of only one commodity, and the commodity has also to be one which claims only a little of the consumer's budget. Hick's point may now be discussed in more detail. Suppose consumer is in equilibrium. Then price of X falls and consequently his equilibrium is disturbed. MU_x is now greater than the product of new price and the marginal utility of money. To restore equilibrium MU_x must diminish so as to equate itself with the product of new price of X and the old marginal utility of money. Thus money expenditure on X must vary depending on the elasticity of marginal utility curve (except in the case of unit elasticity, where money expenditure of X will remain the same. If it is elastic, expenditure on X is going to increase. The assumption of the theory is that the consumer's purchases of all other commodities remain unchanged. In the new situation, if the consumer's total expenditure is to be restored to the amount he has available for spending, his expenditure on commodities is going to vary. But this is ruled out in Marshallian analysts. "In view of Marshall's *ceteris paribus*. this cannot happen, so that the adjustment must take place in unit of utility measurement (that is, the marginal utility of money). There is a gallant inconsistency between Marshall's assumption of constant marginal utility of money and *ceteris paribus* clause; They do not belong together. "

According to Prof. Hicks. "The theory of demand for a single commodity is only the beginning of demand theory. The general theory of demand is a theory of the relation between the set of prices at which purchases are made and the set of quantities which are purchased."*) Thus, Prof. Marshall's analysis need to be generalized and not restricted to a single commodity case.

(4) The fourth major point of criticism is that Marshall ignored the effect on demand of changes in income (income effect) and change in price of related goods (cross price effect). Further, while analysing the effect and substitution effect, which are important categories. It was because of this limitation that Marshallian analysis could not provide satisfactory explanation for Giffen's Paradox.

(5) Another important criticism relates to Marshall's assumption of independence of utilities. The assumption meant that the commodities are independent in consumption and are not related to each other in anyway. The utility functions of different goods are additive in nature. Prof. Marshall thus, ignored complementarily and substitution relationship among commodities. In view of the fact that most of the commodities are inter-related it is not reasonable to postulate that the utility of commodity depends on the quantity of commodity alone.

Criticism was also levelled on the basis that it is not easy to incorporate large indivisible products, such as house automobiles, scooters etc. in the analysis.

Thus Marshallian analysis of consumer behaviour suffered from a few grave limitations. The alternative techniques have been formulated to analyse and explain consumer's behaviour, they claim to be more comprehensive and better than Marshall's Indifference Preference and Revealed hypothesis from the subject matter of next, two lessons.

3.9 Answers to Self Check Questions

3.7.1 The equilibrium of the consumer can be explained with the help of the law of diminishing marginal utility and the law of equi-marginal utility.

3.7.2 The demand curve for most of commodities slopes downward from left to right.

3.10 SHORT QUESTIONS

- (1) State and explain the Law of Demand.
- (2) Explain Aggregate Demand curve for a commodity.

3.11 LONG QUESTIONS

- (1) Explain the concept of Consumer's Equilibrium.
- (2) Explain the exceptions of the Law of Demand.

3.12 References

- (1) Joel Dean, *Managerial Economics*.

MBA -Distance Education (First Year)

ME 103

Semester-1

MANAGERIAL ECONOMICS

Lesson No. 4

AUTHOR: DR. UPINDERJIT

KAUR **ELASTICITY OF DEMAND****STRUCTURE**

- 4.1. Introduction
- 4.2. Various Concepts of Elasticity of Demand
 - (a) Price Elasticity of Demand
 - (b) Income Elasticity of Demand
 - (c) Cross Elasticity of Demand
- 4.3. Measurement of Elasticity of Demand
 - (a) Total Expenditure Method
 - (b) Measurement of Elasticity at a point on the Demand Curve
 - (c) ARC Elasticity of Demand
- 4.4. Self Check Questions
- 4.5. Use of the Concept of Elasticity of Demand
- 4.6. Answers to Self Check Questions
- 4.7. Short Questions
- 4.8. Long Questions
- 4.9. References

4.1. INTRODUCTION

The law of demand states that a change in the price of a commodity leads to a change in quantity demanded of it in the opposite direction, except in case of a Giffen good. This relationship stated by the law of demand is qualitative one; it indicates simply the direction of change. The concept of elasticity of demand relates to the extent or degree of change in demand due to a change in price. It is quantitative phenomenon and is described as the responsiveness of demand to a change in price of the commodity. The concept of elasticity of demand has a very great importance in economic theory as well as in applied economics.

4.2. VARIOUS CONCEPTS OF ELASTICITY OF DEMAND

It is price-elasticity of demand which is usually referred to as elasticity of demand. But besides price elasticity of demand, there are various other concepts of elasticity of demand as income elasticity of demand and cross-elasticity of demand.

(a) Price-Elasticity of Demand

Price elasticity of demand relates to the responsiveness of quantity demanded of a good to the change in its price. In other words, price elasticity of demand is a measure of the relative change in quantity demanded in response to a relative change in its price. Price elasticity can be precisely defined as the proportionate change in quantity demanded in response to a small change in price divided by the proportionate change in price. Thus

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

$\frac{\text{change in quantity demanded}}{\text{Original Quantity}}$

=

$\frac{\text{change in price}}{\text{Original Price}}$

Price

In symbolic terms

$$E_p = \frac{\Delta q}{q} + \frac{\Delta P}{P} = \frac{\Delta q}{q} + \frac{\Delta P}{P}$$

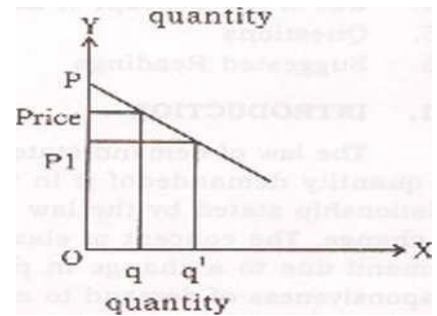
where ep stands for price elasticity q stands for quantity demanded p stands for price

Δq, ΔP stands for infinite small change in quantity price respectively. Δ stands for Infinite small change.

DEGREE OF PRICE ELASTICITY OF DEMAND

(1) Perfectly Elastic Demand

With a very small change in price like very small rise in price leads to zero demand and very small fall in price leads to infinite demand.

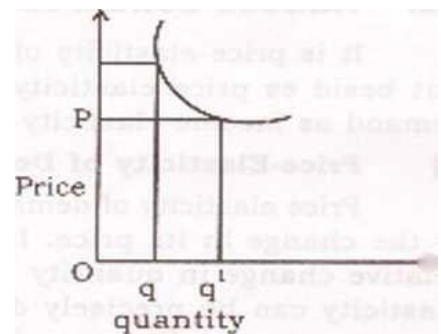


(2) Relative Elastic

With a small change in price a comparatively big change in demand. This happens in case of luxurious goods like colour television and air- conditioners etc.

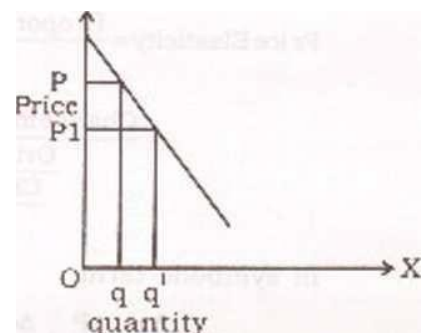
(3) Unit elasticity

Same proportionate change in price and quantity.



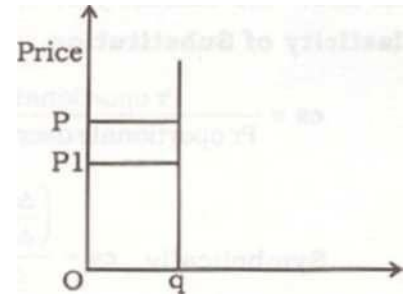
(4) Relative Elastic

A big change in price leads to small change in quantity. This happens in case of essential commodities like wheat, rice, sugar and soap etc.



(5) Perfecting inelastic

Change in price will leave demand unaffected.
For example, salt, demand



(b) Income Elasticity of Demand

Income elasticity of demand shows the degree of responsiveness of quantity demanded of a good to small change in the income of consumers. Thus, more precisely, the income elasticity of demand may be defined as the ratio of the proportionate change in purchase of a good to the proportionate change in income which induces the former:

$$\text{Income Elasticity} = \frac{\text{proportionate change in quantity demanded}}{\text{Proportionate change in Income}}$$

in symbolic terms,

$$e_y = \frac{\Delta q}{q} \times \frac{y}{\Delta y}$$

where

e_y stands for income elasticity of demand y

stands for initial income

Δy stands for small change in income q stands for

original quantity demanded Δq stands for small

change in quantity demanded

(c) Cross Elasticity of Demand

It refers to change in demand of commodity due to change in the availability of interrelated goods or change in their price. Often we find that commodities have close substitutes. Even if there is no change in the price of the commodity there may be a change in the price of the substitute. Consequently, there may be change in the demand of the commodity because of the change in the price of substitutes. For example, the increase in price of Tea may lead consumers to demand more coffee and vice-versa. It is described as cross elasticity of demand. Similarly, if two commodities are complementary, the demand for both will go together. Suppose A and B are complementary goods, and if the price of B falls, its demand increases and along with it the demand for A will also increase. For example, car and petrol are complementary goods. Thus, cross elasticity can be explained as under:

$$e_c = \frac{\text{Proportionate change in the demand for A}}{\text{Proportionate change in the price for B}}$$

More precisely when the substitution between two goods is easy, then a small change in the proportion of two goods possessed by the consumer, the change in the marginal rate of substitution between the two goods will not be much. It is thus clear that from a change in the proportion of two goods and the resultant change in the marginal rate of substitution, we

can know the elasticity of substitution which can be expressed as follows:

Elasticity of Substitution

$$Es = \frac{\text{Proportionate increase in the amount of X with respect to Y}}{\text{Proportionate decrease in the marginal rate of substitution of X for Y}}$$

Symbolically, in symbolic terms,

$$Es = \frac{\frac{\Delta qqqq}{qqqq} + \frac{\Delta qq}{ddqq}}{\frac{\Delta qq}{qqqq}}$$

Where

Es stands for elasticity of substitution

$\frac{qqqq}{qqyy}$ stands for original proportion quantities of goods X and Y

$\frac{\Delta qqqq}{\Delta qqyy}$ stands for small change in the proportion of goods X and Y

$\frac{\Delta yy}{\Delta qq}$ stands for original marginal rate of substitution for goods X for Y

$\frac{\Delta yy}{\Delta qq}$ stands for change in the marginal rate of substitution of goods X for Y

4.3 MEASUREMENT OF ELASTICITY OF DEMAND

(a) Total Expenditure Method

A qualitative measure of price elasticity of demand is given by total expenditure (total outlay) method. For example, with a fall in price of a good, more of it is purchased, the total expenditure on it may increase, decrease or remain constant. If a change in the price of the commodity changes the demanded for that commodity in such a way that total expenditure on it remain unchanged, elasticity of demand for that good is said to be unity. On the other hand, if a fall in price results in such changes in demand that brings about an increase in total expenditure incurred on it, elasticity is said to be more than unity or demand is highly elastic. Further, suppose a fall in price causes such a change in demand that total expenditure falls, then elasticity of demand is said to be less than unity or less elastic demand. We can illustrate the three cases with the following example:

Price per unit (in Rs.) (p)	Quantity demanded Q	Total expenditure (P*Q) (in Rs.)
10	10	100
9	12	108
8	14	112
7	16	112
6	18	108
5	20	100

The first two columns in the above example represents just a demand schedule, showing the inverse relationship between price and quantity demanded. It is the third column read with the first which tells us whether the elasticity of demand between two consecutive

prices are equal to one, greater than one or less than one. In accordance with expenditure method, the elasticity of demand is equal to one for a change in price between Rs. 7 and Rs. 8; it is greater than one for the change in price between Rs. 9 and Rs. 10; and it is less than one for the change in price between Rs. 5 and Rs. 6.

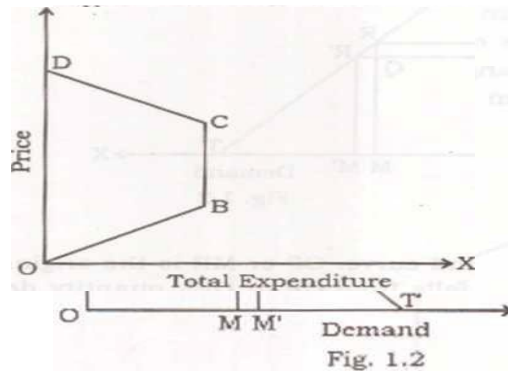


Fig. 1.1

In the figure 1.1, total expenditure is measured along X axis and price along Y axis. It is clearly explained that from point O to B, elasticity of demand is less than unity because total expenditure and price of the commodity are in the same direction. From B to C elasticity is equal to unity, because whatever, the change in price, total expenditure remains the same from C to D, elasticity is greater than unity, because a rise in price brings about a fall in total expenditure.

Thus, it is found that outlay method of measuring elasticity of demand can only tell us whether elasticity of demand in any particular case is greater than one, less than one or equal to one. It cannot give us a price measure of the elasticity except where it is equal to one. In case of elasticity of demand being greater than one, it can be anything greater than one up to infinity, and in the other case of elasticity being less than unity, it can be anything less than one including zero. So, the outlay method of measurement of elasticity of demand does not serve much useful purpose.

(b) Measurement of Elasticity at a point on the Demand Curve

Price elasticity of demand is define as:

$$\text{Price Elasticity} = \frac{\text{Proportionate change of quantity demanded}}{\text{Proportionate change in price}}$$

Using symbols

$$E_p = \frac{\frac{\Delta q}{q}}{\frac{\Delta P}{P}} = \frac{\Delta q}{q} \times \frac{P}{\Delta P}$$

In this fig. 1.2 given below, we take an example of straight line demand curve, Ox axis represents quantity demanded and OY represents the price.

TT is a straight line demand curve. OP or MR is the original price and OM is original quantity demanded. When price falls from OP to OP', quantity demanded rises from OM to OM'. This change in price by PP' causes change in quantity demanded by MM'. Substituting these in 1, we get

$$ep = \frac{MM^1 \cdot OOPP}{PP^1 \times OOMM}$$

Since MM¹ = QR¹ and PP = RQ and OP = MR

$$\text{Therefore, } ep = \frac{QQQ^1 \cdot MMQQ}{QQQQOOMM}$$

Take triangles RQR¹ and RMT in fig 1.2

$$\angle QRR = \angle MTR \text{ (Corresponding } \angle \text{)}$$

$$\angle RQR' = \angle RMT \text{ (right } \angle \text{)}$$

$\angle QRR'$ is common to both the triangles

Therefore, triangles RQR' and RMT are similar. A property of similar triangles is that their corresponding sides are proportional to each other from this it follows that,

$$\frac{QQQ^1 \cdot MMMM}{MMQQ} = \frac{MMMM}{MMQQ}$$

Writing $\frac{MMMM}{MMQQ}$ in place of $\frac{MMMM}{MMQQ}$ in equation (2), we get

$$ep = \frac{MMMMMMQQMMMM}{MMQQOOMMOOMM} = \frac{RT}{L}$$

Now, in the triangle OTT' MR is parallel to OT

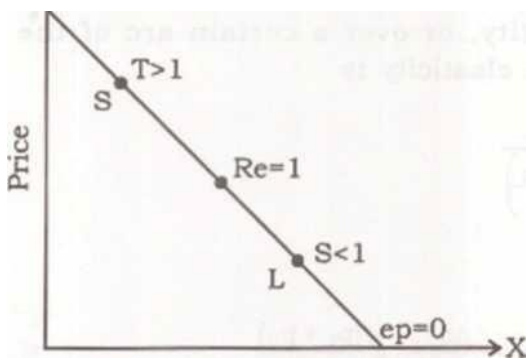
$$\frac{OO'MM}{MM} = \frac{QQMM^1}{MM}$$

$$\frac{MMMM \cdot QQMM^1}{OOMM \cdot QQMM} = \frac{RT}{L}$$

Hence from above, we find that price elasticity at point R on the straight line demand curve

TT¹ is

$$= \frac{RT}{L} = \frac{\text{lower segment}}{\text{upper segment}}$$



RT upper segment

Elasticity of demand on a straight line demand curve is equal to the distance from T to that particular point on the curve divided by the distance from the other end and T¹ of that point, i.e.

lower segment of the demand line divided by the upper segment. We can thus conclude that if,

$RT = RT$ then $ep = 1$ $ST^1 > ST$ then $ep > 1$

$LT^1 < LT$ then $ep < 1$

$RT^1 = O$ then $ep = 0$

$RT = O$ then $ep = \infty$

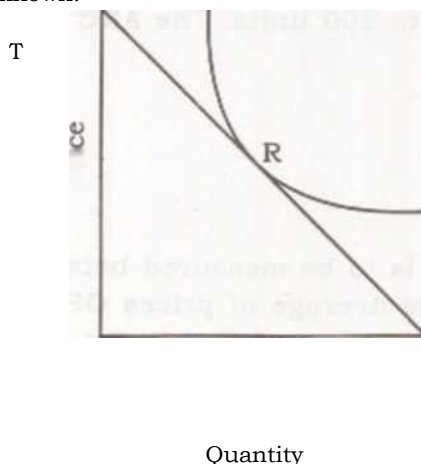
Quantity

Fig. 1.2

It is seen in the figure 1.2 that if R is middle point, elasticity of demand will be equal to unity because upper portion is equal to lower portion. At T it will be zero and at point T it will be infinity.

But if the demand curve is not a straight line like TT^1 but it is, as usual, a real curve, then how to measure elasticity at a given point on it. For instance, at point R on a demand curve

DD in Fig. 1.3 is to be known.



In order to measure elasticity in this case we have to draw a tangent TT' to the given point K on demand curve DD and then measure elasticity by finding out the value of RT / RT' .

(c) ARC Elasticity of Demand

Another method of measuring elasticity is known as arc method. The earlier method can be used to determine whether the coefficient of demand has a higher or lower value. In actual practice, we are interested in measuring elasticity between two point which are as close as possible. In other words, we want to know the change in demand when the change in price is possible. In other words, we want to know the change in demand when the change in price is infinitely small. The arc is a portion of demand curve between two points. Moreover, the important limitation of the point method is that it is used only when a demand curve is known. In real life, full and complete data regarding changes in price and quantity demanded is not always available. In such a situation, elasticity of demand cannot be measured at a point on the demand curve. Instead, it is measured over a certain range of value of price and quantity, or over a certain arc of the demand curve. The formula of the measurement of arc elasticity is

$$\begin{aligned}
 e_q &= \frac{\Delta q q}{(q_1 + q_2)} + \frac{\Delta p p}{(p_1 + p_2)} \\
 &= \frac{\Delta q}{\frac{(q_1 + q_2)}{2}} + \frac{\Delta p}{\frac{(p_1 + p_2)}{2}} = \Delta q q \times \frac{2}{(p_1 + p_2)(q_1 + q_2)} \\
 &= \frac{\Delta q}{\Delta p} \times \frac{(p_1 + p_2)^2}{(q_1 + q_2)^2} = \frac{\Delta q (p_1 + p_2)^2}{\Delta p (q_1 + q_2)^2}
 \end{aligned}$$

$$\frac{\Delta q}{q_1 + q_2} \Delta p$$

Consider the following example of changes in price and consequent changes in quantity demanded.

Price (Rs)	Quantity demanded (Units)
15 (p')	100 (Q)

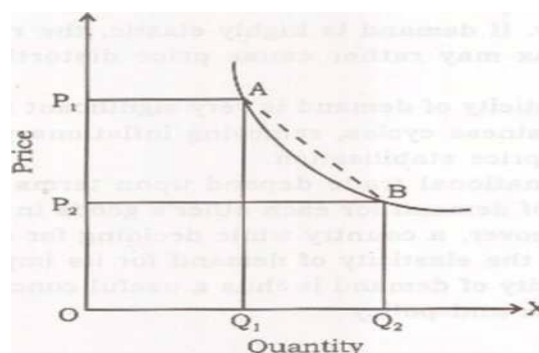
10 (p²) 200 (Q²)

In this example when price of a commodity falls from Rs. 15 to Rs. 10 per unit, quantity demanded increases from 100 to 200 units. The ARC elasticity is

$$ep = \frac{\Delta q \left(\frac{p_1 + p_2}{2} \right)}{\Delta p (q_1 + q_2)}$$

$$= \frac{100}{5} \times \frac{(15+10)}{(100+200)} = 1.66$$

In figure 1.4, if the arc elasticity is to be measured between point A and B on the demand curve DD, we will have to take average of prices OP₁ and OP₂ and average of quantities OQ₁ and OQ₂. It should be further noted that in figure below, the arc elasticity formula is taken as the approximation of the over the line AB. Therefore, the greater the



convexity of the demand curve between A and B, the greater the divergence between the dashed line AB and the true demand curve and therefore poor the approximation of arc elasticity measure (of the dashed line AB) for the true distance between A and B. Moreover, the larger the distance between A and B on the

demand curve, the greater will be divergence between dashed line and the true curve. Therefore, the arc elasticity formula should be used when the change in price is somewhat large but not very large. When the two points on the demand curve are very close together, arc (dashed straight line) becomes almost identical with the true curve and the ARC elasticity measurement becomes almost identical with point elasticity measurement on the demand curve.

4.4 Self Check Questions

4.4.1 what is price elasticity of demand.

4.4.2 Explain cross elasticity of demand.

4.5 USE OF THE CONCEPT OF ELASTICITY OF DEMAND

Although Samuelson condemned the concept of elasticity as an 'essentially arbitrary' and more or less useless concept, it has many important uses in both economic analysis and formulation of economic policies. Some important uses of elasticity concept are as following:

1. The concept of elasticity of demand plays a crucial role in business decisions regarding manoeuvring of prices with a view to making larger profit. For instance, when cost of production is increasing, the firm would like to pass the incremental cost on to the consumer by raising the price. Firms may decide to change the price even without change in cost of production. But whether this action of price raising will prove beneficial or not depends on (a) the price elasticity of demand for the products; (b) its crosselasticity, because when the price of a product increases, its substitutes become automatically cheaper even if their prices remain unchanged.

Thus, raising price will be beneficial only if : demand for a product is less elastic and the demand for its substitute is much less elastic. Although most businessmen intuitively are aware of the elasticity of demand of the goods they make, use of precise estimates of elasticity of demand will add precision to the business decisions.

2. The elasticity concept can be used in formulating government policies too, particularly in the taxation policy meant to raise revenue or to control prices: in granting subsidies to the industries; in determining prices for public utilities; in fixing the price of essential goods; and in determining export duties. To consider an example, suppose government wants to impose sales tax on a particular commodity with the sole objective of raising revenue. Whether adequate revenue can be raised or not, will depend on the price elasticity of that commodity. If demand is highly elastic, the revenue yield will be much less than expected. The tax may rather cause price distortion and effect production adversely.

The knowledge of elasticity of demand is very significant for the government in such matter as controlling of business cycles, removing inflationary and deflationary gaps in the economy and even the price stabilisation.

The gains from international trade depend upon terms of trade which ultimately depend upon the elasticity of demand for each other's goods in the two countries carrying on international trade. Moreover, a country while deciding for devaluation of its currency will take into consideration the elasticity of demand for its imports and exports.

The concept of elasticity of demand is thus a useful concept and has important role to play in economic analysis and policy.

4.6 Answers to Self Check Questions.

1. Price elasticity of demand relates to the responsiveness of quantity demanded of a good to the change in its price
2. It refers to change in demand of commodity due to change in the availability of interrelated goods or change in their price.

4.7 SHORT QUESTIONS

1. Explain the concept of elasticity of demand.

2. Critically examine the various methods employed in measuring the price elasticity of demand.
3. Distinguish between Price-elasticity of demand and income elasticity of demand.
4. Distinguish between Price elasticity of demand and cross elasticity of demand.
5. How is price elasticity of demand measured?

4.8 LONG QUESTIONS

1. Explain the concept of price elasticity of demand. Distinguish between point elasticity and arc elasticity.
2. What is meant by elasticity of demand? What is the usefulness of elasticity of demand?

4.9 SUGGESTED READINGS

1. Bishop, R.L. (Elasticities, Cross-Elasticities and Market Relationship. Am Eco. Rev., 1952.
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UTILITY ANALYSIS STRUCTURE

- 5.1. Introduction
- 5.2. Assumptions of the Theory
 - (a) General Assumptions
 - (b) Analytical Assumptions
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5.1 INTRODUCTION

The economic problems arise out of dis-equilibrium between human wants and means available to satisfy these wants. Economic concerns itself with the problem of allocation of scarce resources to alternative uses so as to achieve the greatest fulfillment of society's unlimited wants. The allocation of resources takes place at three levels: at the level of the household (consumer), at the level of the firm (producer) and the at the level of the economy. The Theory of Demand is the name given to that branch of economics which explains allocation of resources by households.

The theory sets up a functional relationship between the economic factors and individual's consumption pattern. As it is believed that economic factor operates only through income and prices economists concentrate on these two variables alone. The other noneconomic determinants of demand such as climate, culture, age, education, occupation etc. are grouped together which are assumed to be relatively stable during the period to which demand relates.

Demand refers to the quantity of a commodity which consumers are willing and able to purchase at a specific price during a given period of time. The basic preposition of the theory of demand is the law of demand. According to the law consumer will ordinarily buy more of a commodity at a low price and less of commodity at high price, given tastes, money income and inverse. If we draw a two dimensional diagram, measuring price on Y axis and quantity demanded on X axis, the demand curve will slope downward. The main aim of theory of demand is to explain the condition in which a consumer is in equilibrium in respect of purchase of consumer goods and from this to derive the law of demand. The theory seeks to explain how the consumer achieves his equilibrium with regard to his purchases and how he reacts to changes in the price of the commodity he purchases.

The theory of demand has been developed from three different hypotheses: marginal utility hypothesis, indifference preference hypothesis and revealed preference hypothesis.

These alternative formulations investigate the logical basis of demand and seek to derive the demand function of the consumer. They come into being one after another because of the shortcomings in the dissatisfaction when one consumer approaches. The development the theory of demand has been from psychological to behaviouristic explanation of the consumer behaviour in economic markets. The present lesson is confined to marginal utility analysis of demand; it will provide subjective explanation of the downward sloping nature of the demand curve.

The method of utility theorists is abstract. They make assumptions about the behaviour of the individual consumer and his economic environment. Then they set up proposition which are tussled logically. Thereafter, they become theories.

5.2 ASSUMPTIONS OF THE THEORY

There are three types of assumption underlying the marginal utility theory: general, analytical and those concerning the notion of utility.

(a) General Assumptions

There are three general assumptions:

1. The consumer is a composite consumption unit. It means that his choice represents the preference of all the members of the household.
2. The consumer is a rational being. The concept of rationality in marginal utility theory means four things:
 - (a) The consumer has a clear perception of utilities of various quantities of the object of desire. Prof. Jevons, one of the originators of theory (Theory of Political Economy, 1870) defined utilities as a relationship between a consumer's wants and the attribute of a consumer's object to satisfy that want.
 - (b) Utilities from commodities are capable of measurement in money terms.
 - (c) The consumer is capable of comparing marginal utilities of various commodities of exchange.
 - (d) The consumer will choose that alternative from the various alternatives available that gives him maximum utility. It is assumed that the consumer behaves rationally; he calculates, chooses consistently and maximises utility.
3. Ceteris Paribus (other things remaining the same). There are four possible determinants of demand for a commodity: Tastes, money income, price of related goods, (complement and substitutes) and price of the commodity under consideration. Prof. Marshall introduced the Ceteris Paribus assumption in his analysis and he argued that tastes, money income and prices of related goods change only in the long-run and these may be held constant for the purpose as utility theory is essentially a short period theory. He has made demand depend only on the price of the commodity. D, - HP.)

(b) Analytical Assumptions

There are three analytical assumptions:

1. The consumer has perfect knowledge.
2. All the quantities involved i.e. utilities of commodities, money income, prices are infinitely divisible.
3. The consumer is infinitely sensitive and reacts to the smallest discernible change in the market.

(a) Assumptions Concerning the Notion of Utility

(1) The most important assumption here is that the utility can be measured on an interval scale. It means that the utility is cardinal and can be expressed as a quantity.¹ It means that the utility derived by the consumer from the use of a certain commodity can be expressed in quantitative terms. It also implies that utility is quantitatively measurable and comparable.

The concepts of ordinal and cardinal (interval) scale of utility have been borrowed from the vocabulary of logic. The number 1, 2, 3 etc. are cardinal numbers. The number 2, for example is twice the size of number 1. As a contrast the number 1st, 2nd, 3rd etc., are ordinal numbers. Such numbers are ordered, or ranked and there is no way of knowing, just from ranking that is the size relation on the numbers. The second one might rank or order commodities according to our preferences in terms of more or less. In the interval scale we also measure preferences.

An example would help us to illustrate the point. Suppose there are two commodities, tea and coffee. It is said that the consumer preference is ordinal measurement. Ordinal measurement does not permit us to measure and compare quantities of satisfaction or utility, on the other hand we can say that a consumer prefers tea twice as much as coffee, we are then measuring his preference. This is cardinal measurement.

The cardinal utility theorists assume that utility is measurable. The units of measure in money terms. According to him, whatever the consumer pays for a certain thing rather than go without it represents the money measure of the utility obtained by the consumer.

(2) The second important assumption is the law of Diminishing Marginal utility. Utility is the want satisfying power a commodity or a service. Marginal utility is the addition made to total utility from the consumption of a commodity by the purchase of an additional unit of it. The law states the marginal utility derived by a consumer from the consumption of a commodity goes on diminishing as he consumes more and more of it, which implies that when a consumer increases his stock of commodity the total utility of a commodity will increase but at a diminishing rate. In Prof Marshall's words, 'There is an endless variety of wants but there is a limit to each separate want. This familiar and fundamental total utility of thing to any one (that is the total pleasure or other benefit it yields him) increase with every increase in the stock of it, but not as fast as his stock increases.¹ This tendency is derived from two facts: (1) although human wants are unlimited, yet any particular want is satiable, (2) Different commodities are imperfect substitutes for one another so far as satisfaction of a particular want by a particular commodity is concerned. If we are to graph this law, then marginal utility curve will slope downward to the right and total utility curve will be concave from below:

A quantity can be defined as anything that is estimable as greater or smaller than some other thing.

This property implies transitivity and asymmetry but not measurability. A quantity to be measurable must satisfy two additional requirements (a) it should be possible to define a unit and (b) it should be possible to define, increments operationally". H.K.M. Singh, Demand Theory and Economic Calculation in Mixed Economy, pp. 21-22.



The law of diminishing marginal utility is based on a familiar and fundamental tendency of human nature. It has been arrived at by introspection¹¹ and by observing everyday behaviour of the people. The law is of great significance for the marginal utility theory of demand as The downward sloping demand curve is based on it, which explain the rational underlying the law of demand why the quantity of a good rises as the price falls and vice versa. The idea of diminishing marginal utility also plays a key role in explaining how a consumer should allocate his money income among various goods and services which are available to him to buy.

Prof. Marshall further assumed that law of diminishing marginal utility applies to all objects of desire, including money. But there is one important difference. In case of other commodities, saturation point can always be reached (which implies zero marginal utility of the commodity) but this is not so in case of money. As money represents general purchasing power over all the other commodities, its marginal utility is never zero or negative. That is there is no saturation point for money.

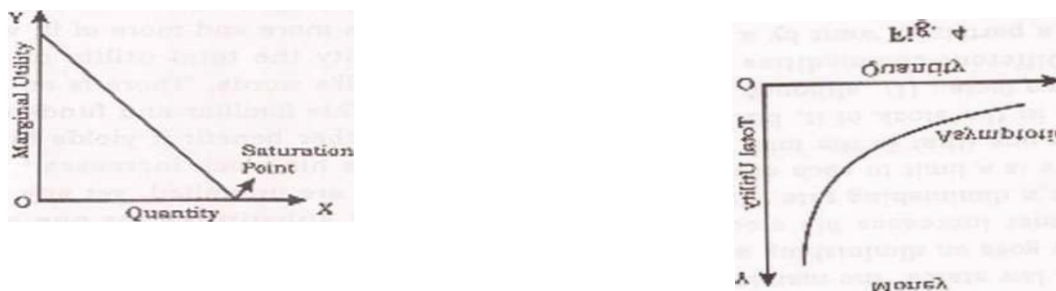


Fig. 3

The utility curve of a commodity and of money are illustrated in above diagrams. The utility curve of money tends to be asymptotic to quantity axis, but never intersects it, signifying that marginal utility of money to the consumer is never zero.

(3) Another assumption underlying the additive utility functions of different commodities is that the commodities are independent on consumption. It means that the utility of a commodity depends on the quantity of that commodity alone, $U_x = f(Q_x)$. The relationships among commodities are ignored. It is assumed that there are no complements or substitutes.

(3) Another important or crucial assumption, of the theory is that marginal utility of money to the consumer remains constant. This assumption was introduced by Bernoulli in 1730, and adopted by Marshall in his Principles (1890). This assumption was justified by Marshall on the ground that his (the individual consumer's) expenditure on anything "is only a small part of the whole expenditure." When price falls, real income of the consumer increases and consequently marginal utility of money to the consumer falls. Similarly, when price rises, real income of the consumer falls and as a result marginal utility of

money to the consumer rises. But Marshall ignored these variations in income saying that consumer's expenditure on anything constitutes only a small part of his total expenditure. He thus ignores the income effect of a price change by assuming constancy of marginal utility of money.

This enabled him to measure marginal utility of goods in terms of money. Consequently, the marginal utility curve becomes demand curve of the commodity as this assumption removes the difference between the two. "Without it the marginal utility curve would have been below the demand curve for a fall in price and above the demand curve for a rise in price."¹

This should be incorporated before the explanation of living diminishing marginal utility

<i>Units of Consumption</i>	<i>Total Utility</i>	<i>Marginal Utility</i>
1	10	-
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	-2
8	24	-4

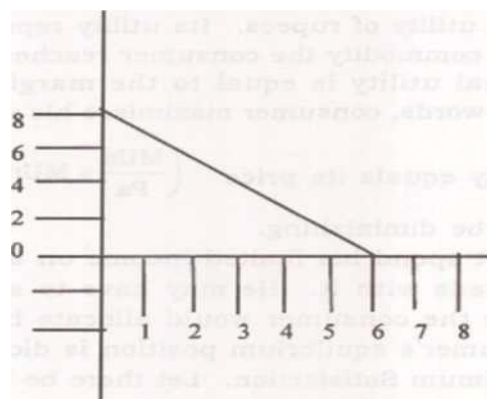
As a person goes on consuming more and more units of commodity, Marginal Utility decreases and sometimes it becomes zero and even negative.

5.3 CONSUMER'S DERIVATION OF THE LAW

(a) Consumer Equilibrium

After acquiring assumption of theory, we are consumer achieves his know the process by which the satisfaction, given his income schedules of the commodities become possible for us to adjustment which sets in

a commodity rises or falls. The law of demand can then be derived from the fundamental condition of consumer's equilibrium.



EQUILIBRIUM AND OF DEMAND

knowledge of the now to see how a equilibrium. Once we consumer maximises his and the marginal utility he desires to buy, it analyse the process of motion when the price of

The formulation of the theory of demand in terms of utility is not a once-for-all leap from utility to demand, it involves a complex number of steps and their causal organisation. In the first place the individual is supposed to perceive a (potential) schedule of utility of successive units of a good. According to utility Theorists, "The marginal utility of a thing to any one diminishes with every increase in the amount of it he already had." In the second place, similar to his utility schedule the individual has a desire (significance) schedule. The intensity of desire of the successive unit of the good corresponds to their respective marginal utilities. The desire schedule is of a derivative character. It implies that the individual is capable of making (and does make) unit by comparisons between the opposite numbers in the two schedules. There is at least one more step at the psychological threshold; the individual must make up his

mind as to what he is prepared to give in exchange for the good if it is to be acquired. Expressed in money this gives us the individual's demand schedule in terms of the price of good which compounded with the demand schedules of other individuals in the market, gives us the market demand schedule.'

The equilibrium of the consumer can be explained with the help of the law of diminishing marginal utility and the law of equi-marginal utility. When the consumer reaches his equilibrium he maximises his utility or satisfaction. Maximisation means the most satisfaction the consumer can acquire under the circumstances. Equilibrium signifies a state of a balance of opposing forces. The consumer's force is his desire which is limited by his income. The opposing force is price, the sign and condition in the availability of a commodity. If price rises, the consumer buys less and if it falls he buys more. The consumer's desire for different quantities of commodity is represented by the diminishing marginal utility of the commodity to him. On the other hand, the consumer has limited income. The size of his money income determines the utility of rupees. Its utility represents marginal utility of money to him. In case of a single commodity the consumer reaches his equilibrium when he buys the quantity whose marginal utility is equal to the marginal utility of the rupees represented by the price. In other words, consumer maximises

his satisfaction when marginal $\left(\frac{MU_a}{P_a} = MU_m\right)$ Again, at the point of

utility obtained from a commodity equals its price

equilibrium marginal utility must be diminishing.

But the consumer does not spend his limited income on a single commodity alone. He has to satisfy his various needs with it. He may have to spend on food, clothing, recreation, dental care etc. How the consumer would allocate his limited money income among various goods? The consumer's equilibrium position is dictated by the law of Equi- Marginal Utility or the law of Maximum Satisfaction. Let there be two commodities A and B.

1. A. Marshall, Principles of Economics, P. 93.
2. Introspection is the ability to observe to reconstruct events which go in the mind of another person with the help of self-observation. This form of comprehension may be just guess work or intuition or the result of long lasting experience. T.mil Kaurier”, A History of Marginal Utility Theory, P.10

Let Pa and Pb stand for their price, MUa and MUB for their marginal utilities, and let m be the marginal utility of money to the consumer. Then $P_a MU_a = P_b MU_b = MU_m$. This means that the price of a A multiplied by the consumer reaches his equilibrium when :

$$\frac{P_a MU_a}{P_b MU_b} = \frac{MU_a}{MU_b}$$

as m's cancel out, so, =

$$\frac{P_a}{P_b} = \frac{MU_a}{MU_b}$$

This means that the ratio of the price of two commodities is equal to the ratio of their marginal utilities of one commodity divided by its price equals the marginal utility of other community divided by its price. The same will be true in case of more than two commodities. The consumer would maximise his satisfaction with his given income.

When $\frac{MU_a}{P_a} = \frac{MU_b}{P_b} = \frac{MU_c}{P_c}$ and so on. He would be in equilibrium Pa Pb Pc.

The condition of consumer's equilibrium can thus be expressed in two ways.

- (1) The consumer will be in equilibrium at a point where the marginal utility of each commodity is proportional to its price it is known as *proportionality rule*.
- (2) The marginal unit of expenditure in each direction brings in the same increment of utility or satisfaction. It is known as the principle of *Equi-Marginal Utility of Money*. It does not mean that the consumer spends equal amounts of money of different commodities. Not at all. He spends different amounts of money on different commodity. It simply means that the last rupee spent on each commodity

yields to the consumer same increment of satisfaction or same amount of extra utility. He thus maximises his satisfaction. He is in equilibrium when he buys all commodities in such amount that MU/P. He has then no inclination to change his expenditure pattern on his various purchases.

Unit of a commodity	Commodity A : Price Re.1		Commodity Bx : Price Re.2	
	2 (a) Marginal Utility (Units)	2(b) Marginal Utility per Rupee (MU/Price)	3 (a) Marginal Utility (Units)	3(b) Marginal Utility per Rupee (MU/Price)
•1	10	10	24	12
2	8	8	20	10
3	7	7	18	9
4	6	6	16	8
5	5	5	14	7
6	4	4	12	6
7	3	3	10	5
8	2	2	8	4
9	1	1	4	2

A detailed illustration can help in explaining the validity of the rule. Suppose there is a consumer who has limited weekly income of Rs. 10. He is to make purchase, of two commodities A and B, with this given income so as to maximise his satisfaction. The marginal significance of one rupee is assumed to be equal to 8 units. Other necessary details are given in the table below

:

Columns 2a and 3a provide marginal utility information with regard to commodities A and B. They represent diminishing marginal utility schedules. But these commodities carry different prices. In order to make the amounts of extra utility obtained from different priced goods comparable, marginal utility must be put on a per rupee spent basis. This is done in columns 2b and 3b by the assumed prices of A and B, i.e. Rs. 1 and Rs.2 respectively. The consumer reaches his equilibrium when he buys 2 units of A and 4 units of B with his given income. This combination yields to the consumer the maximum utility obtainable with this income. It also fulfils the condition, i.e.

$$\frac{\text{MU of commodity A}}{\text{Price of A}} = \frac{\text{MU of commodity B}}{\text{Price of B}} = \text{MU of money}$$

$$\frac{8}{1} = \frac{16}{2} = 8 \text{ units}$$

(b) Derivation of the Demand Curve from the Marginal Utility

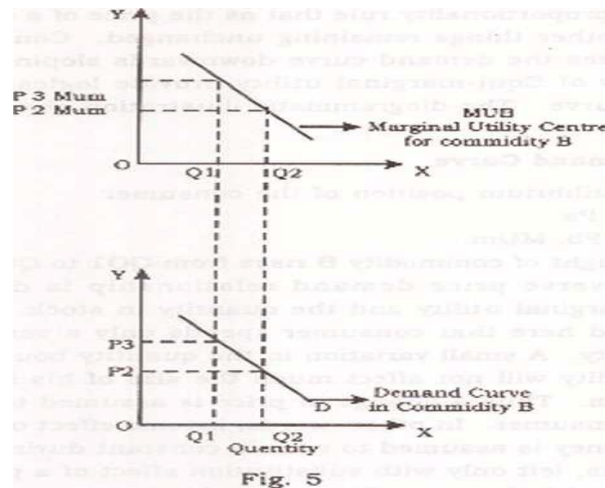
It is quite a simple step to derive an individual's downward sloping demand curve from the utility examining rule. The law of demand simply states that given (a) consumer's tastes (b) his money income and (c) prices of other goods, a consumer would buy more of a commodity when its price falls and vice-versa. We now make one further assumption that price of A representing 'other good' is given at Rs. 1. Keeping in mind the information given in above table and that of underlying assumptions, we know that the rational consumer will buy 4 units of commodity B at a price of Rs. 2. Now assume that the price of B falls to Rs. 1. In that case the marginal utility per rupee [data of column 3 (b)] will become identical with that shown in (3) a.

Consumer will maximise his satisfaction when he buys 8 units of commodity when.

MU of B

_____ = MU of m. This conforms to down sloping nature of the demand curve.

P of B



The Demand Schedule for Commodity B

Price per unit of B	Quantity Demanded (Units)
Rs. 2	4
Re 1	8

This happens because when price of commodity B falls $\frac{MU \text{ of B}}{P \text{ of B}}$ will be great than $\frac{MU \text{ of A}}{P \text{ of A}}$ (It is assumed that marginal utility of money i.e. MUm. remains constant) In order

to restore equilibrium, MU of B must be reduced. That can happen only when the consumer buys more of commodity B. Equilibrium is resorted when MU of B becomes equal to the product of new price (Pb) and marginal utility of money (MUm) i.e. when $MU \text{ of B} = P_b \cdot MUm$. It is thus clear from the proportionality rule that as the price of a commodity falls, its quantity demands will increase, other things remaining unchanged. Consumer buy more of B when its price falls. This makes the demand curve downwards sloping. Thus law of diminishing marginal utility and law of Equi-marginal utility provide logical basis for the down sloping nature of the demand curve. The diagrammatic illustration given on next page will make it further clear.

(c) Derivation of Demand Curve

A and B show equilibrium position of the consumer

A denote : $M_uA = P_a$

B denote : $M_uB = P_b \cdot MUm.$

Thus quantity bought of commodity B rises from QQ1 to QQ2 with the fall in price of B from Pb to Pbl the inverse price-demand relationship is deduced from the inverse relationship between marginal utility and the quantity in stock.

It is also assumed here that consumer spends only a very small portion of his total income on this commodity. A small variation in the quantity bought as a result of fall or rise in the price the commodity will not affect much the size of his income, and, therefore, also the total utility therefrom. Thus a change in price is assumed to have a negligible effect on the real income of the consumer. In other words, income effect of changes in price is ignored as marginal utility of money is assumed to remain constant during the act of purchase of the commodity. We are, thus, left only with substitution effect of a price change, which gives us only and inverse relationship between demand and price.

5.4AGGREGATE (MARKET) DEMAND CURVE FOR THE COMMODITY

Market Demand curve is a matter of only horizontal summation of individual demand curves. In some cases, the demand of an individual may be fairly representative of the general demand for the whole market. In other cases, there may be large differences in individual demands. But, “in the large markets

where rich and poor, old and young, men and women, persons of all varieties, test temperaments and occupations are mingled together, the peculiarities in the wants of individuals will compensate one in a comparatively regular gradation of total demand." (Marshall)

Prof. Marshall formulated the general law of demand thus:

"The greater the amount to be sold, the smaller must be the price, at which it is offered in order that it may find purchases; or in words, the amount demanded increases with a fall in price and diminishes with a rise in price' (other things remaining unchanged).¹

Thus demand curves for most of the commodities are negatively inclined. Dupuit who is the first to derive the demand curve from the marginal utility analysis, gave two reasons why the curve will be negatively sloped :

- (1) As price falls, the existing buyers extend it to more uses.
- (2) With every fall in price, the consumption of the commodity spreads to more and more consumers.

Alfred Marshall : Principles of Economics, pp. 98-99

Derivation of Demand Curve

5.5 EXCEPTIONS TO THE LAW OF DEMAND

The demand curve for most of the commodities slopes downwards from left to right. Prof. Marshall who gave the theory in grand architectural form noted three exceptions to the law of demand. In these cases, the demand curve will be positively sloping.

- (1) The law does not apply to speculative demand. In such cases, further anticipations of the rise or price may induce the speculators to demand more of the commodity. For example, in a period of raising prices, sometime the consumer buys more rather than less as they expect the prices to rise still further. This exception of the law of demand was included by Prof. Marshall in first edition of the *Principles*.
- (2) The law does not apply in case of inferior goods because of powerful income effect (known as Giffen's paradox). The demand for such commodities may fall when their prices fall. This exception was introduced by Prof. Marshall in 2nd edition of *Principles* (1895) after it was pointed out to him by one of his contemporaries, Sir Robert Giffen.
- (3) The law does not apply in case of conspicuous consumption. For example, diamonds are demanded only when they are very expensive. Their demand varies directly with price. The phrase conspicuous consumption was popularized by Thorstein Veblen in the *Theory of the leisure class* (1899).
- (4) This law also does not apply in those cases where consumers are ignorant about the nature and price of the commodities and mistake for other commodities because of deceptive labels as well as price.

As Prof. Samuelson says these exceptions may be taken as "rather unimportant exceptions to the universal of downward-sloping demand."

5.6 Self Check Questions

- 1 Explain Marginal utility.
- 2 Name two laws that explain consumer equilibrium.

5.7 CRITICAL APPRAISAL OF THE THEORY

The marginal utility theory has been criticised and defended as perhaps no other theory has been. There are a number of criticisms of this theory of consumer behaviour. Five major points of criticism are noted here:

(1) The first charge that is levelled against the theory is that it is psychological and also gets involved with philosophical questions. As such, it cannot form part of a scientific discipline. They allege that the theory rests upon "individualistic and hedonistic" premises which is 'unsound psychology'. The two assumptions which have been criticised are (1) that the consumer is a rational entity and (2) the law of Diminishing Marginal Utility. It is true that the consumer tries to maximise his satisfaction, but still he cannot be treated as a calculating machine. The critics point out that 'men commonly seek' not utility nor pleasures, but objects, and they do not commonly engage in deliberative and careful comparisons and calculation of the units of pleasure which successive units of the same goods or units of different goods or units at different stages of removal from the present, will yield to them. They ridicule the notion that man's desires are held in leash and spring into action only after completion of fine actuarial comparisons of the hedonic potentialities of different commodities. *1 According to them, the consumer is not a calculating machine. The charge against the theory is that it is 'hedonistic' in nature. Prof. Marshall and Wicksteed tried to free the theory from this charge and they were successful in their attempts to some extent. "Gradually the theory came to be treated more as a logic a psychology of values."

With regard to the law of Diminishing Marginal Utility, it is pointed out by the critics that the economists have borrowed this law from psychology. In this context, they mention Weber-Fechner Law of Diminishing Marginal pleasure which applies to sensation and not to feelings.

Since the critics observe, utility is feeling and not a sensation, Weber-Fechner law cannot apply to utility. It may be mentioned here that the contention of critics is not valid as there is no evidence in the writing of the utility from psychology. The law of Diminishing Marginal Utility is based on the economists' own observation of consumer experience.

(2) The second main point of criticism is that the utility theory assumes measurability. A real number is associated with every utility feeling. Some utility theorists tried to measure it directly and some took price which a consumer is willing to pay' as an approximation of marginal utility. But utility of a commodity is a subjective phenomenon, it is a psychological feeling, a state of mind. Critics, therefore, pointed out that it is too much to expect from a consumer that he can measure utilities of different objects of consumption precisely. They rejected the idea that utility is a measurable quantity. On the other side, two attempts to show that utility can be ordinally measured have been made, one Prof. Fisher (1927) and the other by Prof. Frisch (1932). Both of them collected data about household expenditures and proved that utility can be statistically measured. However, both Living Fisher and Ranger 'Frisch assume' (a) similarity of consumer tastes (b) independence of utilities of different commodities which are untenable assumptions. This controversy still remains unresolved. However, alternative techniques to study consumer behaviour have evolved which claim to steer clear of the assumption of numerical utilities.

(3) The third major criticism has been offered by Prof. Hicks in his Revision of Demand Theory (1956). Professor Hicks argues that Marshall's model applies to a single commodity case. It loses its validity in more than one commodity case. Two assumptions on which

1. Jacob Viner, "The Utility Concept in Value Theory and its Critics" Journal of Political Economy August 1925, P. 373

Marshallian analysis of consumer behaviour is based on: constancy of marginal utility of money and independence of utilities of different commodities. These two assumptions restrict the theory to the analysis of demand of only one commodity, and the commodity has also to be one which claims only a little of the consumer's budget. Hick's point may now be discussed in more detail. Suppose consumer is in equilibrium. Then price of X falls and consequently his equilibrium position is disturbed. MUX is now

greater than the product of the new price and the marginal utility of money. To restore equilibrium, MUX must diminish so as to equate itself with the product of new price of X and the old marginal utility of money. The money expenditure of X must vary depending on the elasticity of marginal utility curve (expect in the case of unit elasticity, where money expenditure on X will remain the same). If it is an elastic curve, expenditure on X is going to increase. The assumption of the theory is that the consumer's purchases of all other commodities remain unchanged. In the new situation, if the consumer's total expenditure is to be resorted to the amount he has available for spending his expenditure on commodities other than X must vary. Consequently, demand for other commodities is going to vary. But this is ruled out in Marshallian analysis. "In view of Marshall's *ceteris paribus* this cannot happen, so that the adjustment must take place in unit of utility measurement (that is, the marginal utility of money). There is a gallant inconsistency between Marshall's assumption of constant marginal utility of money and *ceteris paribus* clause: They do not belong together."¹

According to Prof. Hicks, "The theory of demand for a single commodity is only the beginning of demand theory. The general theory of demand is a theory of the relation between the set of prices at which purchases are made, and the set of quantities which are purchased."³ Thus Prof. Marshall's analysis is needed to be generalised and not restricted to a single commodity case.

(4) The fourth major point of criticism that Marshall ignored the effect on demand of changes in income (income effect) and changes in prices of related goods (cross price effect). Further, while analysing the effect of change in the price of a commodity on its demand he did not split it into income effect and 'substitution effect, which are important categories. It was because of this limitation that Marshallian analysis could not provide satisfactory explanation for Giffen's Paradox.

(5) Another important criticism relates to Marshall's assumption of independence of utilities. The assumption meant that the commodities are independent in consumption and are not related to each other in any way. The utility functions of different goods are additive in nature. Prof. Marshall, thus, ignored complementary and substitution relationship among commodities. In view of the fact that most of the commodities are inter-related it is not reasonable to postulate that the utility of commodity depends on the quantity of that commodity alone.

Criticism was also levelled on the basis that it is not easy to incorporate large, indivisible products, such as houses, automobiles, scooters, etc. in the analysis.

Thus, Marshallian analysis of consumer behaviour suffered from a few grave limitations. Alternative techniques have been formulated to analyse and explain consumer behaviour. They claim to be more comprehensive and broad-based than Marshall's Indifference Preference and Revealed Preference hypothesis from the subject matter of next two lessons.

5.8 Answers to Self Check Questions

5.6.1 The marginal utility of a thing to any one diminishes with every increase in the amount of it he already had.

5.6.2 The equilibrium of the consumer can be explained with the help of the law of diminishing marginal utility and the law of equi-marginal utility.

5.9 SHORT QUESTIONS

1. Explain the equilibrium of the consumer with the help of cardinal utility approach.
2. Explain the law of Diminishing Marginal utility.

5.10 LONG QUESTIONS

1. Discuss the importance and limitations of Diminishing Marginal utility.
2. What is meant by cardinal utility analysis? Give its main criticisms.

5.11 References

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1.H.K.M. Singh op. cit., P. 34.

INDIFFERENCE CURVE ANALYSIS**STRUCTURE**

- 6.1. Introduction
- 6.2. Main Features of Indifference Curve Analysis
- 6.3. Assumptions
- 6.4. Meaning and Characteristics of Indifference Curves
- 6.5. Self Check Questions
- 6.6. Properties of Indifference Curve
- 6.7. The Budget Line
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 - (a) Income Effect
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- 6.10. Derivation of Individual Demand Curve from Price Consumption Curve
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6.1 INTRODUCTION

Indifference preference analysis is an alternative way to study consumer behavior. The shortcomings of Marshallian Theory of consumer behavior have been discussed in the previous lesson. The main objections to the Marshallian approach were related to cardinal measurement of utility and additive nature of the utility function. It was contended that utility is measurable only ordinally, but empirically its magnitude cannot be assigned real numbers. Edgeworth accepted the view that utilities of separate commodities could be combined in an additive total utility function. He adopted the generalized utility function (in his *Mathematical Physics*, 1881) and made that the utility of a commodity to the consumer is a function of all the commodities that enter the consumer's budget. He designed technique of indifference curves to show how exchange is settled under bilateral monopoly. Later on Fisher (1892) and Pareto (1909) worked on this idea and started the gradual transformation of the utility theory. Other who have made significant contributions to the development of new theory are W.E. Johnson (1913) and Eugen Slutsky (1915). Johnson reformulated indifference curve technique and gave it the form in which it is used in modern exposition of the theory. This was earlier done by Fisher whose work remained unnoticed for a long time. Slutsky more or less anticipated the entire development of theory as it is associated with the names of Hicks and Allen who did not know of Slutsky's work when they presented the theory in 1934. However, the development of the theory (based on the concept of ordinal utility) reached its culmination and found its first complete statement in the writings of Hicks and Allen. The theory was further subjected to a comprehensive revision by Hicks in 1956.

It has been contended by the authors of the theory that indifference curve analysis provides a more general and in some sense a more sophisticated and comprehensive explanation of consumer choice and the law of demand than does utility analysis. They also assert that their analysis is less restricted in

nature as it is based on fewer and more tenable assumptions. Prof. Hicks further contends that indifference, preference hypothesis is more suitable for econometrics operations and thus, it is operationally more significant. (The third merit of the new theory has been proclaimed by Prof. Hicks in his Revision of Demand Theory, 1956. It was not advanced then, when the theory was stated for the first time in 1934).

6.2 MAIN FEATURES OF INDIFFERENCE-PREFERENCE ANALYSIS

Indifference curve analysis of demand has dispensed with the cardinal measurement of utility and additive utility function. It has adopted the concept of ordinal utility. Ordinal utility involves ranking of goods in terms of desirability. Economists who advocated the indifference curve approach argue that consumer satisfaction is subjective and, therefore, it cannot be measured in cardinal terms. Utility being a psychological feeling is not quantifiable. These economists believe that consumer satisfaction can be expressed in ordinal terms, in other words, consumers can say only that they obtained a 'greater' or 'lesser' amount of satisfaction when they increased or decreased the amount of a commodity. The consumer can not tell the quantitative difference between various level of satisfaction, he can simply compare them qualitatively and indicate whether one level of satisfaction is higher than lower than or equal to another. Thus consumer is required simply to rank his preferences and rank them consistently. The authors of the new theory have built the theory of consumer's behavior on the basis of ordinal utility.

Marshallian analysis is based on the assumption that a consumer selects one good at a time, the marginal utility of which is independent of all other goods. The ordinal utility analysis takes goods in a composite form and compares the rank ordering of different combinations. It is also assumed that goods are related in consumption.

The indifference curve analysis takes into consideration both direct and indirect effects of the price variation. Thus substitutive and complementarity relationship among different commodities are analyzed and taken care of. Furthermore, "income effect" and 'cross price effect' are also properly analyzed and made into an integral part of the theory. This theory generalizes the law of demand.

6.3 ASSUMPTIONS

The indifference preference analysis of demand retains some of the assumptions of the cardinal utility theory, modifies or drops other and also formulates some of its own. The main assumptions are the following.

1. The consumer possesses complete information about the main features of his economic environment, i.e. commodities prices, market etc.
2. The consumer acts 'rationally' so as to maximize his satisfaction. With given prices and total income, the consumer selects that combination of a good which is highest on his preference scale.
3. The 'continuity' assumption is also retained. It is assumed that consumer is capable of ordering all conceivable sets of commodities that are presented to him (This gives us continuous indifference curves). Hicks, however, relaxed this assumption in his Revision of Demand Theory. Now the consumer is expected to arrange or order only those combinations in his scale of preference which might actually be under his consideration (This gives us discontinuous curves).
4. The main element in this analysis is the indifference preference hypothesis. It means that if the consumer is offered a (finite) number of combinations of commodities, he can arrange them in a scale of preference. Thus, if these various

combinations are marked A, B, C, D, E, F the consumer can tell whether he prefers A to B or B to A or is indifferent between them. This scale of preference has two implicit assumptions:

- (i) It admits of the relation of preference as well as that of difference, i.e.
 - it assumes 'weak ordering' as against 'strong ordering'. (In 'Strong ordering' only the relations of the preference are admitted).
- (ii) The relation between various alternatives are 'transitive' it implies that if

the consumer prefers A to B, B to C, then he also prefers A to C. Similarly, if the consumer is indifferent between A and B, B and C then he is also indifferent between A and C, the assumption of transitivity of consumer's preferences ensures that consumer's preferences are consistent.

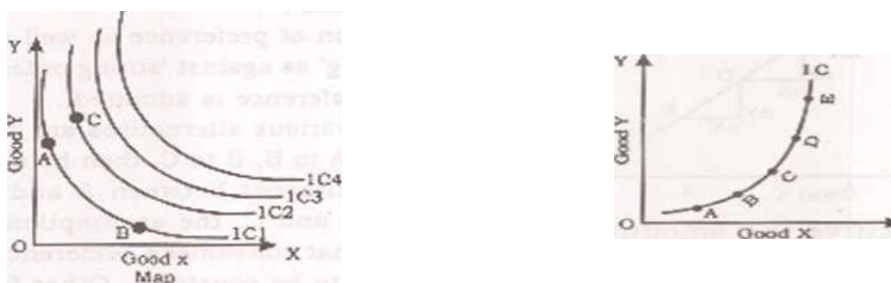
5. Only tastes are assumed to be constant. Other factors of Marshallian, "Ceteris Paribus" Clause i.e. consumers' income and prices of related goods are assumed to be variable.
6. Cardinal measurement of utility has been replaced by ordinal utility and the law of diminishing marginal utility has been replaced by the law of diminishing marginal rate of substitution.
7. Two Marshallian assumption; utility of a commodity depends upon the quantity of that commodity alone and constancy of the marginal utility of money have been dropped.

After gaining knowledge about the main features and assumptions of the theory, we can now concentrate on the exposition of the technique itself. The ordinal utility analysis of demand is usually called the indifference curve analysis because indifference curves are its main analytical tools.

6.4 MEANING AND CHARACTERISTICS OF INDIFFERENCE CURVES

A consumer builds up "a scale of preferences" (independent of prices) on which all objects of desire or pursuit (positive or negative) find their place and which registers the terms on which would be accepted as equivalents or preferred one to the other.¹ An indifference curve of a consumer can be defined as the geometrical representation of different combinations of two commodities, say X and Y as between which he is indifferent. In other words, all points on an indifference curve represent the same level of utility or satisfaction. An indifference curve, is therefore, also called an "is-utility curve". Each indifference curve represents a level of satisfaction. The higher the indifference curve the greater the level of satisfaction it represents, a set of indifference curves representing various levels of satisfaction is called an indifference map. The main feature of the indifference curve system is that the consumer is called upon to state only qualitatively the difference between the various states and he is not required to specify by how much he prefers one state to another and so on. As the indifference curves rise, the successive positions are simply denoted by ascending series such as 1,2,3,4, 5. The difference between curves has no meaning except that the higher indifference curve denotes a higher level of satisfaction.

An indifference curve is based on an indifference schedule. An indifference schedule is a list of combinations of two commodities say Y and X which yield the same level of total utility or satisfaction to a given consumer. Different indifference curves are based on different indifference schedules. An indifference map consists of a partial set of indifference curves. In an indifference map, different combinations of X and Y are depicted along the two axes, as is shown in the diagram given below:



The curves labelled IC_1 , IC_2 , IC_3 , IC_4 represent different levels of satisfaction. IC_4 represents a higher level of satisfaction than that indicated by IC_1 . Higher the curve, higher would be the level of satisfaction it represents. But each indifference curve in Fig represents all possible combinations of X and Y yielding the given level of utility.

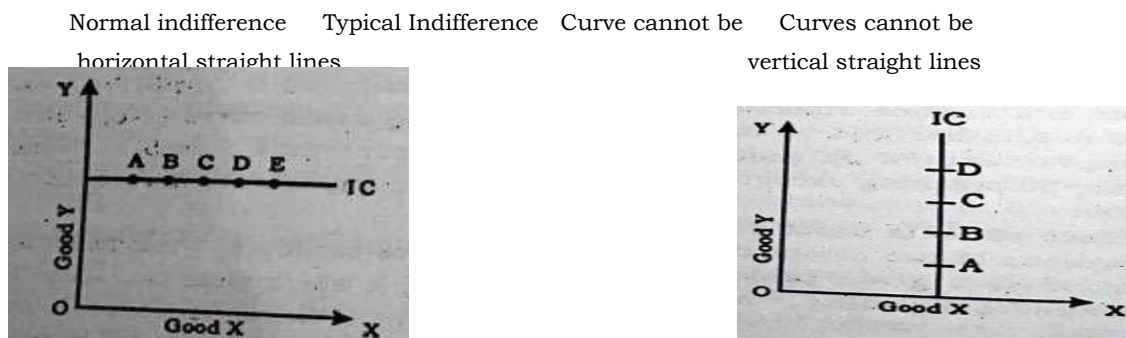
6.5 Self Check Questions

- 6.5.1 What is indifference curve.
- 6.5.2 Write main feature of Indifference curve analysis.
- 6.5.3 What is Indifference Curve

6.6 PROPERTIES OF INDIFFERENCE CURVE

Property 1. Indifference curves slope downward to the right.

This property implies that an indifference curve has a negative slope. This properly follows from assumption of no satiety, that is, the consumer prefers more of a good to less of it. Indifference curve being downward sloping means that when the amount of one good in the combination is increased, the amount of the other good is reduced. This must be so if the level of satisfaction is to remain on the same indifference curve. If, for instance, the amount of good X is increased in the combination while the amount of good Y remains unchanged, the new combination will be preferable to the original one and the two combinations will not therefore be on the same indifference curve. A little reflection will make it clear that one indifference curve on which lie various combinations of two goods that yield the same satisfaction to the consumer cannot assume a shape other than downward sloping to the right. If the indifference curve had the shape of horizontal straight line (Parallel to the X-axis), as in following diagram, that would mean as the amount of the good X increases while the amount of good Y remaining the same, the consumer would remain indifferent as between various combinations. But this cannot be so if our assumption of non-satiety to hold good.



According to assumption of non-satiety, the consumer always prefers a large amount of good to the smaller amount of the good other things being given. In the above diagram, in various combinations such as A, B, C and D indifference curve IC, while the amount of good X is successively larger, the amount of good Y to a same amount, how can he be indifferent between combination A, B, C and D etc. It is thus concluded that indifference curve cannot be horizontal straight line.

Likewise, indifference curve cannot be vertical straight line, for a straight vertical line, for a vertical straight line would mean that while the amount of good Y in the combination increases, the amount of good X remains the same. Thus in the above diagram, vertical line IC is drawn on which are shown combination A, B, C, and D and E while all these combinations contain the same amount of X, the amount of Y successively large. Thus combination A, B, C, D etc. would not yield the same amount of satisfaction to the consumer and, therefore, cannot be the point of an indifference curve. We therefore, concluded that indifference curve cannot be a vertical straight line too.

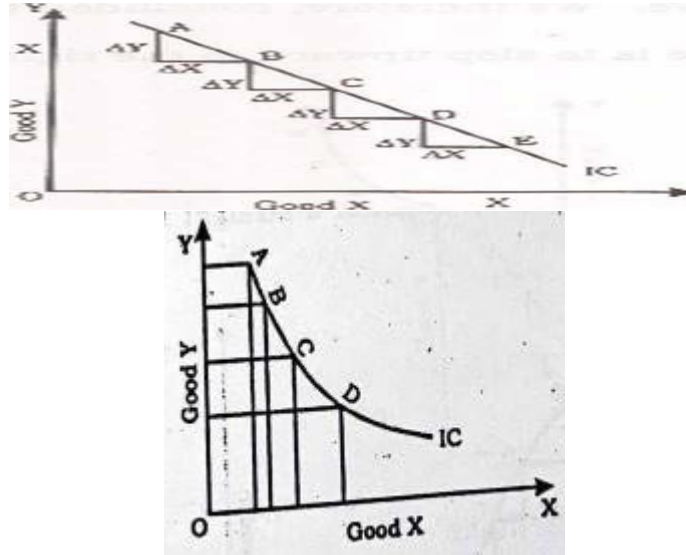
A third possibility for a curve is to slope upward to the right, as in the following diagram.

Indifference Curves cannot slope upward

But indifference curve cannot be of this shape too. Upward-sloping curve means that the amount of both the goods increase as one moves to the right, along the curve. If the indifference curve were upward sloping to the right, it would mean that combination which contains more of both the goods could give the same satisfaction to the consumer as the combination which had smaller amount of both the goods.

This is clearly invalid in view of our non-satiety assumption. It follows, therefore, that indifference curve cannot slope upward to the right.

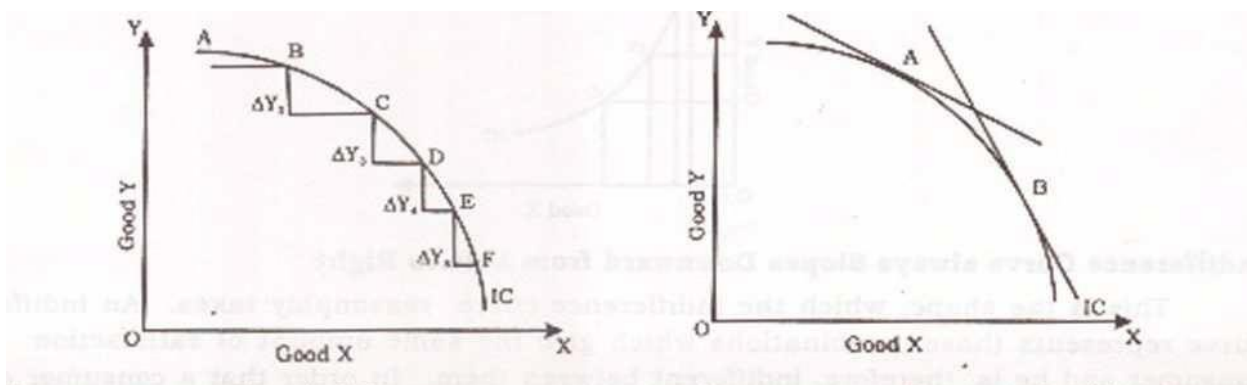
The last possibility for indifference curve is to slope downward to the right. In the following diagram we can clear it:



Indifference Curve Always Slopes Downward from Left to Right

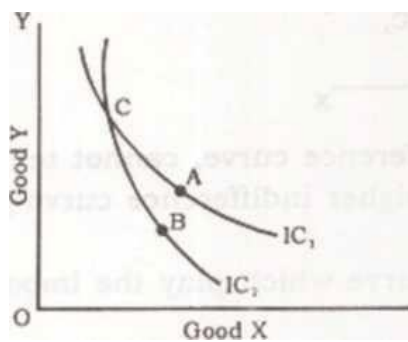
This is the shape, which the indifference curve reasonably takes. An indifference curve represents those combinations which give the same amount of satisfaction to the consumer and he is, therefore, indifferent between them. In order that a consumer should

get the same satisfaction from the various combinations of a curve and thus to maintain his indifference between them, then as the amount of good X is increased, the amount of good Y must be reduced. And this is what a downward sloping curve indicates. A downward sloping curve means that with every increase in the amount of X there is corresponding decrease in amount of Y and so on. The slope of the indifference curve at its various points will depend upon



So we can say that indifference curve can not be concave. Because in this case we

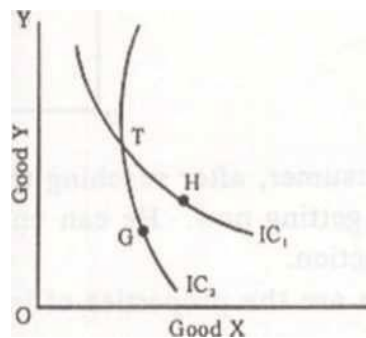
On a straight line indifference curve the amount of Y which the consumers are willing to give up



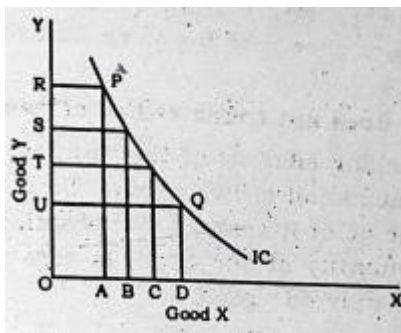
for each unit of X remain the same as more & more units of X are acquired in place of Y so that MRS_{xy} remains constant. Since MRS_{xy} is equal to the slope of indifference curve at a point on it, and because a straight line has the same slope throughout, therefore, the straight line indifference curve will mean the same MRS_{xy} throughout. But MRS_{xy} cannot remain constant except when goods happen to be perfect substitutes. Normal consumer's behaviour reveals that when goods are less than perfect substitutes MRS_{xy} usually falls as more of good X is substituted for Y. So in the end, we can conclude that indifference curve can not normally be a straight line.

Quantity of X. Thus we can say that the indifference curve is normally convex to the origin.

It can neither be concave to the origin or a straight line. We can prove it. It with the help of following diagram:



mean that the marginal rate of substitution of X for Y increases as the consumer obtains a greater quantity of X in place of Y. But this clearly violates our fundamental assumption about the consumer's behavior which states that MRS_{xy} declines as consumer substitutes more quantity of X for Y. If the principle of diminishing marginal rate of substitution is valid, then the indifference curve cannot be concave to the origin.



Another important property of indifference curves is that they are usually convex to the origin i.e. the curve is relatively flatter in its right hand portion and relatively steeper in its left hand portion. This is so because when a consumer increases the consumption of the one commodity by decreasing the consumption of the other then initially he becomes ready to give more of the commodity as he has to get the other commodity. But as the quantity of the commodity with him diminishes he wants to forego less of it in order to get the other commodity i.e. when we go on substituting one commodity for another, the rate of substitution goes on decreasing.

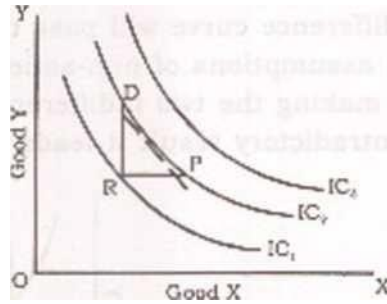
This constitutes the base for the indifference curve to be convex to the origin.

Property III Indifference Curve cannot intersect each other.

The third important property of indifference curves is that these cannot intersect each other.

This property can be made clear with the help of the following diagram:

In other words, only one difference curve will pass through a point in the indifference map. This property follows from assumptions of non-satiety and transitivity. This property can be easily proved by the first making the two indifference curve cut each other and then showing the absurdity on self-contradictory result it leads to:



No two indifference curve
Indifference curves cannot
Can cut each other
even meet each other

In the above diagram, there are two indifference curves IC_1 and IC_2 . IC_2 Curve will give more satisfaction than IC_1 curve. But in the diagram. Both the curves cut each other at point C. In this case level of satisfaction will be same. But it is not possible because two indifference curve shows two different levels of satisfaction.

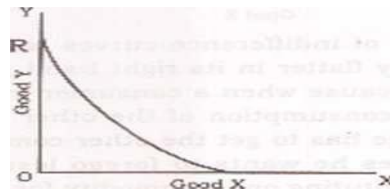
In other diagram that indifference curves cannot even meet each other, But it is some case as intersection of each other so it is not possible.

Property IV. Indifference Curve need not be parallel to each other

Parallel indifference curves imply that in all the indifference schedules the substitution rate between two goods should be the same, but that it is also not compulsory for indifference curves to be parallel.

Normally an indifference curves does not touch either of two axes.

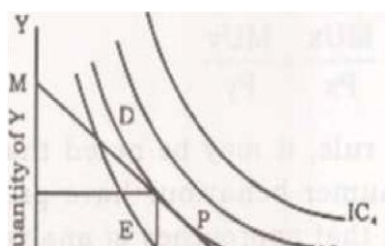
As it is assumed while making analysis of the indifference curves that the consumer wants to purchases only the combination of two goods. So if the indifference curve touches the Y axis then it implies that the point R shows a combination of OR quantity of Y and zero quantity of X therefore, if the quantity of one good, is zero then instead of considering a combination, we should consider only one good.



But the indifference curve is made up of different points showing difference combinations of two goods. Thus the indifference curves can't touch each other.

Higher the Indifference Curves Greater the Satisfaction

As we move from any point in ail indifference curve towards left or right upward. We reach a



higher indifference curve as is clear from the diagram:

But the consumer, after reaching the higher difference curve, cannot tell, how much more utility he is getting now. He can only tell that higher indifference curve provides him the greater satisfaction.

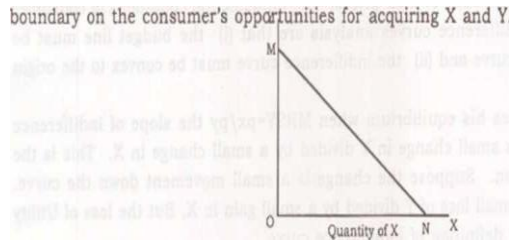
Thus, these are the properties of indifference curve which play the important role in difference curve.

6.7 THE BUDGET LINE

It is important to understand the concept of the budget line if the theory of consumer's equilibrium is to be understood, indifference curves indicate different level of satisfaction and consumer in his pursuit of maximisation of satisfaction will try to reach the highest possible indifference curve. But he has to work under two constraints : (i) he has limited money income with which to buy two commodities and (ii) he has to pay a price for the commodities. How far will he go, depends upon the prices of the commodities and the money income with him. This necessary information is provided by the budget line or price line. The budget line is used to indicate the various combinations of the two commodities that the consumer can buy with his given money income at the given prices. With this information, the consumer equilibrium can be known as indifference map indicates the consumer's scale of preferences and the price line shows his power to fulfill them. Assuming that the 'consumer's money income is fixed and price of X and Y in the market are given then within these constraints, the consumer can buy certain quantities of X and Y. The line MN indicates all such possibilities. If he spends all his income on X, given its price he can buy ON amount of X. Similarly, if he spends all his income on Y then he can buy OM of Y, Alternatively, he can buy any combination of X and Y falling on the line MN. This line is known as the budget line or price opportunity line. It is locus of points representing combinations of two commodities which the consumer can have with this given income and given price of commodities. The budget line can be considered as the limiting The slope of the budget, line shows the ratio of the prices of the two commodities. The positions of the budget line depend on the size of budget or income. If the income were larger (or smaller) the line would be farther to the right (or left). Changes in prices and in the budget are shown by changing the slope and position of the budget line. Money income is also represented sometimes along Y axis. And money stands for all other commodities. Thus, one commodity X is then compared with all other commodities which are represented by money income.

6.7 EQUILIBRIUM OF THE CONSUMER

A consumer is said to be in equilibrium when he maximizes his satisfaction with his given resources in a given set of circumstances. He is in equilibrium when he is buying such a combination of two commodities as leaves him with no tendency to rearrange his purchase of commodities.



We are now in a position to discuss consumer's equilibrium as we are equipped with necessary information of indifference map and budget line.

In above Fig MN line is the Budget line. Its slope shows the ratio of price and position the size of the consumer's budget. Indifference curves represent consumer's scale of preference between various possible combinations of two commodities. OMN is consumer's choice triangle given price income situation.

The consumer is in equilibrium at point A which is on the budget line and also on indifference curve₂ which is tangent to the budget line. The combination of OX, and OY. at A is thus preferred to all other attainable combinations. If the consumer chooses the combinations indicated by B and C, he would be on lower indifference curve. C, consumer of course would like to move on the a still higher indifference curves such as IC₃, or IC₄ but he cannot do so because with the given money income and given prices he cannot purchase the combinations represented by these two indifference curves.

When the consumer is in equilibrium, his highest attainable curve is tangent to the budget line. The slope of the curve IC₂ and the slope of the budget line are same or equal. It means that when the consumer is in equilibrium the marginal rate of substitution between two commodities is equal to the ratio of their prices. The fundamental conditions of consumer equilibrium in terms of indifference curves analysis are that (i) the budget line must be tangent to the indifference curve and (ii) the indifference curve must be convex to the origin at the point of tangency.

The consumer reaches his equilibrium when $MRS_{Y-X} = P_X/P_Y$ the slope of indifference curve is y/x which means a small change in Y divided by a small change in X. This is the marginal rate of substitution. Suppose the change is a small movement down the curve. Then y/x or MRS means a small loss of Y divided by a small gain in X. But the loss of Utility is equal to that the gain by definition of indifference curve.

Therefore,

$$\frac{Y \times MU_y}{(\text{lose of } Y)} = \frac{X \times MU_x}{(\text{gain of } X)}$$

By transposing

$$\frac{\Delta y}{\Delta x} = \frac{MU_x}{MU_y}$$

It implies that the slope of indifference curve or MRS_{Y-X} is equal to the ratio of marginal utilities. The slope of the budget line is P_X/P_Y , because

$$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{MU_x}{MU_y} = \frac{P_X}{P_Y}$$

It therefore, follows that consumer reaches his equilibrium when

$$MRS = \frac{\Delta y}{\Delta x} = \frac{MU_x}{MU_y} \quad \text{or} \quad \frac{P_X}{P_Y} = \frac{MU_x}{MU_y}$$

This is the utility maximizing rule, it may be noted that both marginal curve and indifference curve approaches to consumer behavior have produced identical result. This identical result is because of the fact that approaches of analysis or consumer behavior are *complementary in nature*.

But Hicks and Allen have demonstrated through their analysis that they could as well

a utility theorist with lesser and simpler assumption.¹ They also commend that the analysis can explain not only what utility analysis does but goes beyond that.

We now start discussing improvements and additions made by these economists in the theory of demand. Prof Marshall placed several restrictions on his demand theory by holding many variables and constants. But indifference curve analysis demands for a commodity is function of consumer's income, price of the commodity, and prices of related goods. Only those are assumed to be constant. We are now to analyse and find out how the consumer's behavior would undergo a change when changes in these variables are considered.

6.8 PRICE EFFECT: SUM OF INCOME EFFECT AND SUBSTITUTION EFFECT

When the price of any commodity decreases then the effect of it on the consumption of the commodity is known as the price effect. In this two effects are included one is income effect and the other is substitution effect, i.e. it is said that price effect is the joint result of the income effect and the substitution effect.

Quantity demanded increases due to two reasons:

- (i) When the price of the commodity falls, the real income of consumer goes up which forces the consumer to buy more, it is called income effect.
- (ii) When the price of a commodity falls so that commodity becomes relatively cheaper or cheapest than its substitutes it forces the consumer to buy more of that commodity, it is called Substitution Effect.

Thus, it is clear that the price effect is combination of income effect and substitution effect.

This means

$$PE = IE + SE$$

Where PE = Price Effect

IE = Income Effect and SE = Substituting Effect

The splitting up of price effect and substitution effect is useful in knowing the correct response of the consumer to change in the price of a commodity. It is a known fact that substitution effect is always positive. That means if price of a commodity falls, more of it will be bought and substituted for other good whose prices have not fallen. It makes clear that substitution effect is always positive. But we are not definite so far as the income effect is concerned. The income effect can be positive as well as negative. Income effect is positive in the case of normal or superior goods and income effect is negative in case of giffen goods or inferior goods. Here we are concerned with positive income effect and substitution effect.

(a) Income Effect

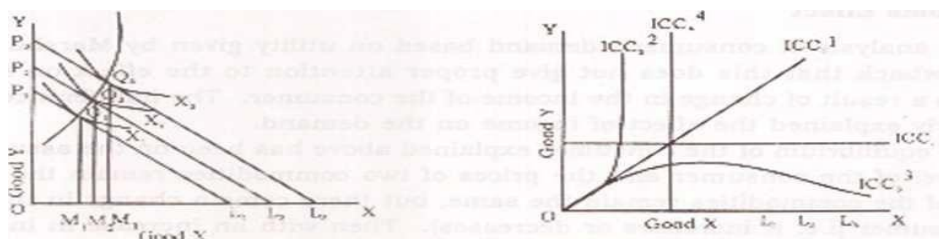
The analysis of consumer's demand based on utility given by Marshall etc. has one major drawback that this does not give proper attention to the effect on the consumer's demand as a result of change in the income of the consumer. The indifference curve analysis has properly explained the effect of income on the demand.

The equilibrium of the consumer explained above has been on the assumption that the income level of the consumer and the prices of two commodities remain the same. Though the price of the commodities remains the same, but there comes a change in the income of the consumer (i.e. it increases or decreases). Then with an increase in income consumer can demand more of the commodities than before and his satisfaction level will also be higher. Similarly, if the income of the consumer decreases then he can purchase less commodities

than before and in this situation his level of satisfaction will also decrease. In this way, the change in the level of satisfaction of consumer as a result of a change in the income of the consumer is known as income effect.

With the prices and a given money income as indicated by the budget line P, L, the consumer is initially in equilibrium at Q, on the indifference curve IC, and is having OM, of X and ON, of Y. Now suppose that income of the consumer increases. With his increased income he would be able to purchase larger quantities of both the goods. As a result, budget line will shift upward and will be parallel to the original budget line P, L, let us assume that the consumer's money income increases by such an amount that the new budget line is P₂L₃. With the budget line P, L, the consumer is in equilibrium at Q, on indifference curves IC₂ and is buying OM₂ of X and ON₂ of Y. Thus, as a result of the increase in his income, the consumer buys more quantity of both the goods. Since he is on the higher indifference curve IC₂, he will be better off than before i.e. his satisfaction will increase if his income increases further so that the budget line shifts to P₃L₄, line consumer is in equilibrium at Q₃ consequently his satisfaction further increases. In this diagram, the consumer is in equilibrium at still further higher level of income and it will be seen that the consumer is in equilibrium at Q₄ at indifference curves IC₄ when the budget line shifts to P⁴L. As the consumer's income increases, he switches to higher indifference curves and as a consequence enjoys higher level of satisfaction. The shape of the income consumption curve depends upon the nature of the goods. normally this line moves from left to right and from below to above i.e. normally the income effect is positive. This means that due to an increase in income the quantity demanded for a commodity also increases. But this happens only when the goods which he consumed are of same importance i.e. they should be of same nature.

Income consumption curve in case of Good X being inferior goods. In case of inferior goods indifference map would be such to yield income consumption curve which either slopes backward. In this diagram income consumption curve slopes backward i.e. bends towards the Y-axis. This shows that good X to be an inferior good. Since beyond point Q₂ income effect is negative for good X and as a result of a quantity demanded falls and income increases. But normal goods can be either necessities or luxuries depending upon whether the quantities purchased of the goods by the consumer increase less than or more than proportionately to increase in his income. If the quantity purchased of a commodity rises less than in proportion to increase in the income, the commodity is known as a necessity. On the other hand, if the quantity purchased of a commodity increases more than proportionately to increase in his income it is called a luxury.



In diagram five ICC curves are shown. Here ICC₁ represents a case when both the goods

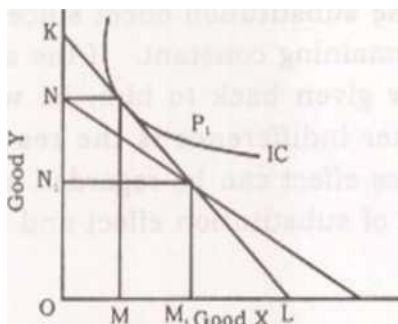
are normal. This shows positive effect of the change in income, i.e. with an increased income, increased quantity of both the goods is being purchased. ICC₂ which is bent towards Y axis shows positive income effect on the commodity Y and negative for the commodity X with an increased i.e. income less quantity of

X and more quantity of Y is being purchased. ICC_3 shows positive income effect for the commodity X. ICC_4 is parallel to Y-axis which means that with an increase in income increased quantity of Y with the same quantity of X is purchased

i.e. income is positive on Y and zero on X. ICC curve is parallel to X-axis which shows positive income effect on X and zero income effect on Y i.e. with an increased income more quantity of X with the same quantity of Y is purchased.

(b) **Substitution Effect**

When the price of a commodity changes in the market i.e. the price of our commodity between the two decreases or increases and when the same change comes in the income level of the consumer also in such a way that his economic condition remains as before i.e. when the consumer from the point of view of satisfaction feels neither good or bad than before than the effect of such changes on the consumer's equilibrium is known as substitution effect. The substitution effect can be made clear with the help of diagram.



In the diagram along X-axis X commodity and along Y-axis Y commodity is taken. KL is the price line based upon the income of the consumer and the prices of two goods. As the indifference curve IC touches the price line KL at the point P so point P is the equilibrium point of the consumer corresponding to this equilibrium position the consumer buys OM quantity of X and ON quantity of Y. Now we assume that the price of X decreases and in the same proportion the price of Y increases. Now changed circumstances the new price line is K, L. and the indifference curve IC touches this new price line at the point P, this means that consumer has no benefit of the decreased price of X because the price of Y has also increased and the loss has become equal to the gain. Thus, now P_t is the equilibrium point and hence the consumer buys OM quantity of X and ON , quantity of Y. The quantity OM of commodity X is greater than the quantity OM and the quantity ON , of commodity Y is less than the quantity ON of the same quantity. Thus the movement from the point P to P_t is called the substitution effect.

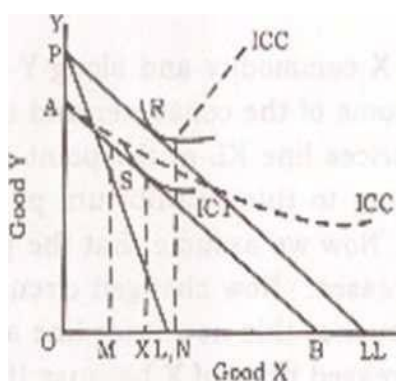
Price Effect is the sum of income effect and substitution effect

When the price of a good X falls, other things remaining the same, consumer would move to an equilibrium at an indifference curve IC_2 when the price of good X falls and the budget line twists from PL, to PL^A . This movement from Q to R represents the price effect. It is now highly important to understand that this price effect is the net result of the distinct prices substitution effect and income effect. In other words, price effect can be split into two different parts, one being the substitution effect and

oilier income effect.

When the price of good X falls and as a result budget line shifts to PL_a the real income of the consumers rises i.e. he can buy more of both the goods with his given money income. That is price reduction enlarges consumer's opportunity set of the two goods. With new budget line PL_a he is in equilibrium at point P. On higher indifference curve IC_2 and thus gain in satisfaction as a result of fall in price of good X. Now, if his money incomes are reduced by the compensating variation in income so that he is forced to come back to the indifference curve IC. as before, he would buy more of X since X has now

become relatively cheaper than before. In this diagram as a result of the fall in price of X price line switches to PL_1 . Now with the reduction in income by compensating variation budget line shifts to AB which has been drawn parallel to PL_2 so that it just touches the indifference curve IC, where he was before the fall in price of X. Since the price line AB has got the same slope as PL_2 it represents the changed relative prices with X relatively cheaper than before. Now X being relatively cheaper than before, the consumer in order to maximize his satisfaction in the new price income situation substitutes X for Y. Thus when the consumer money income is reduced by the compensating variation in income, the consumer moves along the same indifference curve IC_3 and substitutes X for Y with price line AB, he is in equilibrium at soon indifference IC_1 represents the substitution effect since it occurs due to the change in relative price alone real income remaining constant. If the amount of money income which was taken away from him is now given back to him, he would move from S on a lower indifference curve to R on a higher indifference curve. Thus the movement from Q to R due to price effect can be regarded as having been taken place into steps first from Q to S as a result of substitution effect and second from S to R as result of income effect. In this diagram:



Price effect = MN Substitution effect = MK Income effect = KN
 $MN = MK + KN$

or price effect = substitution effect + income effect From the above analysis it is clear that price effect is the sum of income and substitution effect because:

Price effect = Substitution effect + Income effect

6.10 DERIVATION OF INDIVIDUAL DEMAND CURVE FROM PRICE CONSUMPTION CURVE

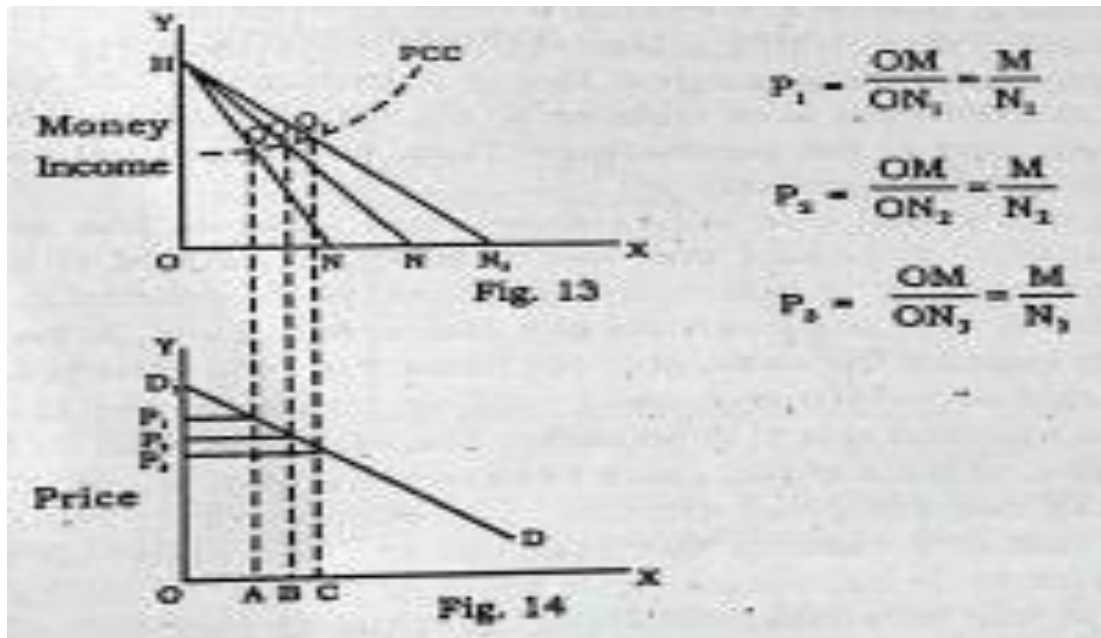
(a) *Individual Demand Curve*

We are now to construct an individual demand curve from price consumption curve. Demand curve shows the relationship between changes in the price of a commodity and the corresponding changes in the quantity demanded of a commodity by a consumer. But PCC does not relate price directly with quantity demanded as is the case with conventional price- quantity demand curve. The demand curve is drawn with quantity demanded on one axis and price on the other axis. But PCC is drawn with two commodities represented on the two axes or with one commodity shown on one axis and money income or the other axis. Again, in case of PCC price of commodity is not directly mentioned. It is the price or budget line which indicates the ratio of prices of two commodities. The PCC also brings out clearly the income and substitution effects of a change in price of a commodity. But in case of demand curve, this element is missing.

However, demand curve can be constructed on this basis of information provided by the price consumption curve.

In the upper part of figure 13-14, X is a commodity and Y money income. The PCC shows how the purchase of X varies as its price varies.

The lower part of figure depicts the derivation of demand curve from price consumption curve. Here vertical axis represents price, and horizontal axis quantity demanded X. The prices are found from the upper part by dividing money income by the maximum amount of X that can be brought. This gives us three prices, P_1 , P_2 and P_3 in the lower figure. These prices and the three quantities OA, OB, OC give three points on the demand curve DD. We, thus, obtain a downward sloping demand curve indicating inverse relationship between price and quantity demanded.



(Indifference curve Analysis is old wine in new bottle comment)

As is evident, a consumer's demand curve for a normal commodity slopes downward the right as both income and substitution effect are positive. Again, so long as positive substitution effect is stronger than negative income effect, the demand curve will continue to slope downward to the right. It is only when negative income effect outweighs the positive substitution effect that demand curve will bend towards the left along some part of its path, (in case of inferior goods).

(b) Market Demand Curve

Market demand curve is obtained by adding together the demand curve of all the individuals in the market. Like the individual demand curve, the market demand curves slope downwards to the right. Market demand curve generally slopes downwards to the right even if the commodity in question happens to be inferior for some individuals. There will be other consumers in the market who demand it in large quantity when its price falls. Thus, this commodity may not be inferior to everyone in the market. Again, new buyers enter the market as its price falls. There may be, thus, enough people buying sufficiently more of the commodity as its price falls to offset the peculiarities of those who buy less. The market demand curve, thus, slopes downward to the right in the usual manner. The Hicksian analysis has thus provided a more satisfactory explanation for this phenomenon as it makes greater insight into the effect of price change on the demand for a commodity by distinguishing between income and substitution effect.

6.11 ACHIEVEMENTS AND CRITICISM OF INDIFFERENT CURVES ANALYSIS

Superiority of indifference curve theory' has been denied by many economists foremost among them are Prof. D.H. Robertson, G.H. Knight, W.E. Armstrong. Prof. Knight remarks, "indifference curve analysis of demand is not a slope backward".

Prof. D.H. Robertson has stated that indifference curve analysis is the 'old wine in a new bottle'. Instead of 'utility' the word 'preference' is used in indifference curve analysis. Similarly, instead of cardinal numbers, indifference curve analysis uses ordinal number. The concept of marginal utility, 'diminishing marginal utility' have been replaced by 'marginal rate of substitution' and 'diminishing marginal rate of substitution.' Last but not least, the proportionate rule of Marshall has been replaced by the equality between the marginal rate of substitution and price ratio of the commodities. Thus, it is clear that indifference curve replaces some equation and concepts Only.

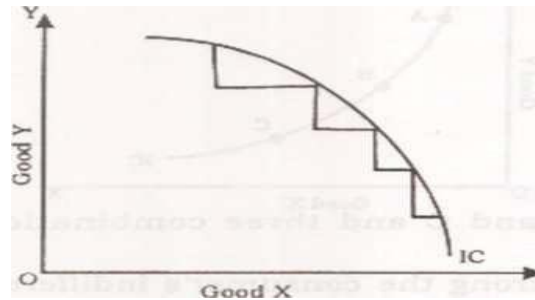
Prof. Robertson has stated that indifference curve analysis has re-introduced the concept of marginal utility. It is said that use of marginal rate of substitution in the indifference curve is unrealistic. It means, as the stock of X commodity increases, the consumer is willing to forego less and less units of Y commodity. Thus, Armstrong states that the concept of the utility remains the same, only the name has been changed. Thus the law of 'diminishing marginal rate of substitution is as valid or invalid as the law of diminishing marginal Utility. Now the marginal rate of substitution has been described by Hicks and others as the ratio of the marginal utilities of two goods ($MRS_{xy} = MU \text{ of } x / MU \text{ of } y$) But ratio cannot be measured Unless the two marginal utilities in question are at least measurable in principle. One cannot talk of a ratio by one assumes the two marginal utilities has the numerator or denominator to be non-quantifiable entities. It has, therefore, been held that the concept of marginal rate of substitution and the idea of indifference based upon. it essentially involves an admission that utility is quantifiable in principle. Against this, Hicks contends that we need not assume measurability of marginal utilities in principle in order to know the marginal rate of substitution. The MRS can be obtained without actually measuring marginal utilities. If a consumer is prepared to accept 4 units of good Y for the loss of the one marginal unit of X, MRS of Y for X is 4 ; i. We can. thus, directly derive the ratio indicating MRS by offering him how much compensation in terms of good Y the consumer would accept for the loss of a marginal unit of X.

Prof. Majumdar has expressed his view on this point when he said that the marginal

rate of substitution can be defined in such a way that its meaning can be made independent of the meaning of marginal utility. And if marginal utilities are taken to be quantifiable, then their ratio certainly give the marginal rate of substitution and if the marginal utilities are not taken to be quantifiable the marginal rate of substitution can still be derived as a meaningful concept from the logic of the compensation principle. The intention that the concept of marginal rate of substitution is a mere reintroduction of the marginal utility (a cardinal concept) in disguise is, therefore, not valid. It can further be said that if we do not assume that marginal utilities are measurable even in principles we can still have the marginal rate of substitution which is another distinct advantage of the ordinal formulation.

In both the analysis that is indifference curve and marginal utility, some type of diminishing intensity is assumed. In utility analysis, the law of diminishing marginal utility falls as more and more units of a commodity are brought. On the other hand, in indifference curve analysis the marginal rate of substitution of goods X for Y falls if more and more of X- commodity are substituted for Y. The critics say that the marginal rate of substitution MRS_{xy} diminishes and the indifference curve becomes convex to the origin, because as the consumer's stock OX increases they hold that Hicks and Allen have not been able to derive that basic principles of diminishing marginal rate of substitution independently of the law of diminishing marginal utility. They contend that by a stroke of terminological manipulation, the concept of marginal utility has been relegated to the background, but it is there all the same. They, therefore assert that "the principle of diminishing marginal rate of substitution is as much determinate or indeterminate

as the poor law of diminishing marginal utility. Convex indifference curve means a diminishing marginal rate of substitution X for Y.



The statement that indifference curve is "old wine in new bottle" can be further explained with the help of the criticism of the indifference curve, which is as follows: -

1. **Based on 'Unrealistic Assumption'**

It is stated that indifference curve analysis jumps from the frying pan of the difficulty of measuring utility into the fire of the unrealistic assumption of scale of preferences or to be more specific, the assumption of given indifference map is unrealistic as the measurement of utility.

2. **Absurd Combinations**

The indifference curve includes even those combinations which may be far from reality. For instance, it would be absurd to compose combination of 3 shirts with 8 shoes with a combination of 1 shirt with 5 neckties. Such combinations are generally found in indifference curve analysis. But these are senseless combinations.

3. **Only Two Good Model**

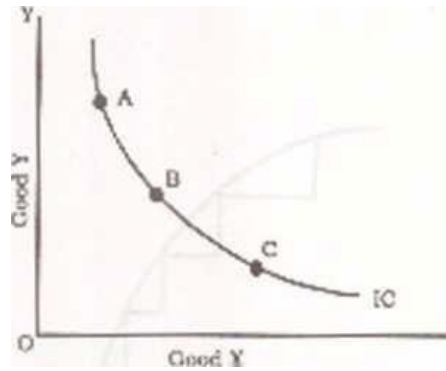
The indifference curve analysis is effective only in case of two commodities. If we want to study three goods, we need dimensional diagrams. These are really complicated. In case we have to study commodities more than three, then geometry cannot help, rather we have to take the help of complicated mathematics, which conceal the economic importance. Prof. J.R. Hicks has admitted this drawback of indifference curve analysis.

4. **Discontinuity**

Another drawback of indifference curve analysis is on account of its being geometrical in nature which involves the assumption of continuity. That means the indifference curves are smooth and continuous. This property is found in geometrical field but not in the economic world. In the real world, we find discontinuity. Its non-recognition means unrealistic analysis. It is on account of this fact Hicks has abandoned the assumption of continuity in "A Revision of Demand Theory."

5. **Transitivity Objected**

Prof. Armstrong has criticized the concept of transitivity in the indifference curves analysis. He states that in most cases the consumer's indifference is due to his inability to know the difference between alternative combination of goods. That shows the consumer will show his indifference between the combination which differ very slightly from each other not because they give same satisfaction but because of difference between them. If we admit this concept then the relation of indifference become non-transitive, the whole analysis breaks down. The new point of Prof. Armstrong is illustrated in below figure:



Here we consider A, D and C and three combinations which lie continuously on indifference curve IC.

According to Prof. Armstrong the consumer's indifference between the total utilities is so small as to be imperceptible to the consumer but, if we compare A with C, the difference between the total utilities become large enough to become perceptible. The consumer will prefer either A to C or C to A.

If the consumer can compare one change in situation with another change in situation, he can buy then he rates the change B more highly than the change BC. If such is the case, it is then always possible to find the point D so that he rates the change AD just as high as the change DC and that seems to be equivalent to saying that the interval AC is twice the interval CD, we are back in the world of cardinal measurement.

6. Limited Empirical Nature

Indifference curve analysis is neither based upon purely imaginary and subjective utility function, nor it is based upon purely empirically derived indifference function.

Because of this, Prof. Schumpeter has dubbed indifference curve analysis as 'a midway house'.

7. Predominantly Introspective

Prof. Samuelson has developed a behaviorist method of deriving the theory of demand. He seeks to enunciate the theorem from observed consumer's behavior. He regards the behavioristic approach as being 'scientific'. His theory is based upon the strong-ordering 'hypothesis, namely choice reveals preference.

8. Re-Introduction of the Concept of Marginal Utility

Prof. Dennis Robertson has stated that the indifference curve analysis has reintroduced the concept of marginal utility. It is said that use of marginal rate of substitution in the indifference curve analysis makes the indifference curve unrealistic. It means as the stock of X commodity increases, the consumer is willing to forego less and less units of

Y commodity. Thus Armstrong states that the concept of the utility remains the same, only the name has been changed. Thus, the law of diminishing marginal rate of substitution is as invalid as the law of diminishing marginal utility.

9. Weak Ordering Hypothesis

According to this hypothesis, the consumer can be indifferent between certain combinations. Though the possibility of relation of indifference is not denied, it is pointed out that indifference curve analysis has exaggerated the role of indifference in demand theory. The innumerable positions of indifference, assumed by Hicks Allen theory, is quite unrealistic. Prof. Hicks himself later-realized this shortcoming of indifference curve analysis.

It follows from what has been said above the indifference curve analysis of demand is an improvement upon the Marshallian utility analysis and the objections that the former too involves cardinal elements are groundless. It is off-course true that the indifference curve analysis suffers from some drawbacks and has been criticized on various grounds, as explained above, but as far as the question of indifference curve technique versus Marshallian utility analysis is concerned the former is decidedly better.

6.12 Self Check Questions.

- 6.12.1 Name two properties of Indifference curve.
6.12.2 what is budget line.

6.13 Answers to Self Check Questions

6.5.1 Indifference preference analysis is an alternative way to study consumer behavior.

6.5.2 Indifference curve analysis of demand has dispensed with the cardinal measurement of utility and additive utility function.

6.5.3 An indifference schedule is a list of combinations of two commodities say Y and X which yield the same level of total utility or satisfaction to a given consumer.

6.12.1 1) *Indifference curves slope downward to the right*

2) *Indifference Curves are convex to the origin*

6.12.2 The budget line is used to indicate the various combinations of the two commodities that the consumer can buy with his given money income at the given prices.

6.14 SHORT QUESTIONS

1. Explain the indifference curves and their assumptions. How far is it correct to say that there is no need of measurement of utility in this technique?
2. Explain the equilibrium of the consumer with the help of indifference curves

6.15 LONG QUESTIONS

1. What are price effect, income effect and substitution effect? Show that price effect is a combination of income and substitution effects?
2. Explain the law of demand with the help of Indifference curves.

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MBA -Distance Education (First Year)

ME 103

Semester-1

MANAGERIAL ECONOMICS

Lesson No. 7

AUTHOR: GURCHARAN SINGH

REVEALED PREFERENCE THEORY OF DEMAND**STRUCTURE**

- 7.1 Introduction
- 7.2 Preference Hypothesis and Strong Ordering
- 7.3 Choice Reveals Preference
- 7.4 Demand Theorem and Revealed Preference Hypothesis
- 7.5 Assumptions
- 7.6 The Revealed Preference Axiom
- 7.7 Self Check Questions
- 7.8 Critical Appraisal of Revealed Preference Theory
- 7.9 Answers to Self Check Questions
- 7.10 Short Questions
- 7.11 Long Questions
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7.1. INTRODUCTION

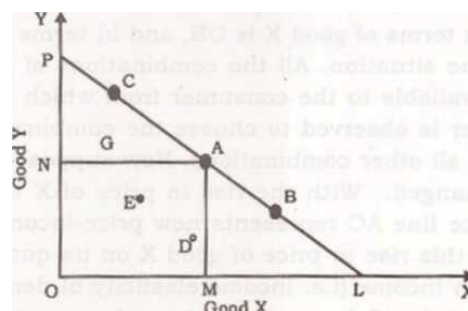
After the Marshallian theory of utility analysis for demand and Hicks Allen Indifference theory of demand, the Revealed Preference theory of demand was put forward by Prof. Samuelson. The theory seeks to explain consumer's demand for his actual behavior in the market in various price-income situations. Revealed preference theory is behavioristic- explanation of consumer's demand. The Revealed preference theory is regarded as scientific (behavioristic) explanation of consumer's behavior as against the psychological explanation provided by Marshallian, Hicks and Allen theories of demand. This shift from psychological to behavioristic explanation of consumer's behavior is a landmark in the development of the theory of demand.

7.2. PREFERENCE HYPOTHESIS AND STRONG ORDERING

Prof. Samuelson's revealed preference theory has preference hypothesis as a basis of his theory of demand. According to this hypothesis, when a consumer chooses a combination A, it means he considers all other alternative combination which he could have purchased to be inferior to A. Therefore, choice of a combination A reveals his definite preference over all other rejected combinations.

Let us graphically explain the preference hypothesis. Given the prices of two commodities X and

Y and the income of the consumer, price line PL is drawn in the figure.



7.3 CHOICE REVEALS PREFERENCE

The price line PL represents the given price-income situation. Here a consumer can buy any combination lying within or on the triangle OPL in other words, all combinations lying on the line PL such as A, B, C and lying below the line PL such as D, E, F, and G are alternative combinations open to him, from which he has to choose any combination. If our consumer

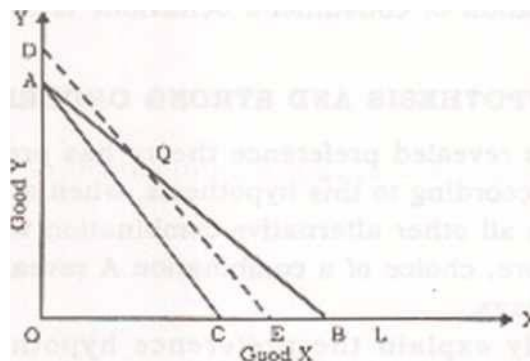
chooses combination an out of all those open to him in the given price-income situation it means

he reveals his preference for an overall other combination such as B, C, D, E and G which are rejected by him. As shown in the figure that at combination The consumer is buying OM quantity of commodity X and ON quantity of commodity Y.

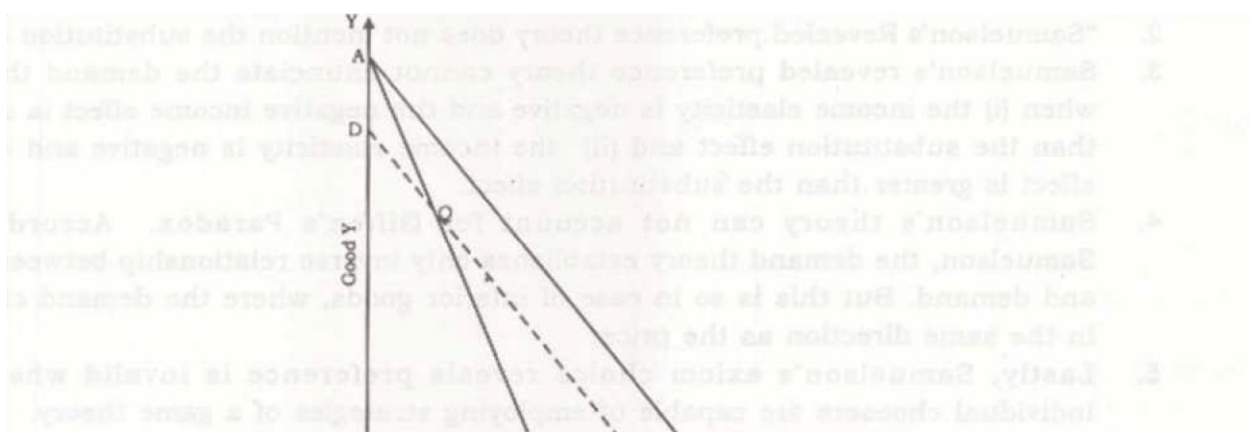
Thus, in revealed preference theory, strong-ordering preference hypothesis has been applied. The strong ordering implies that there is definite ordering of various combinations in consumer scale of preferences. Under strong ordering relations of indifference between various alternative combinations is ruled out. Under strong ordering the chosen position is shown to be preferred to all other positions in and on the triangle while under weak ordering it is preferred to all positions within the triangle, but may be indifferent to other positions on the same boundary as itself.

7.4 DEMAND THEOREM AND REVEALED PREFERENCE HYPOTHESIS

According to Marshall's law of demand there is inverse relations between price and amount demanded of a good. Samuelson established relationship between price and demand by assuming that income elasticity of demand is positive. The Fundamental theorem of consumption developed by Samuelson states that "Any good that is known always to increase in demand when money income alone rises must definitely shrink in demand when its price alone rises. * The geometrical proof of the Fundamental Theorem is illustrated in the following figure.



Let us suppose that the consumer spends his entire income on two goods. Further, suppose that his income in terms of good X is OB, and in terms of Y is OA. The price line AB represents the price income situation. All the combinations of good X and Y lying within or on the triangle OAB are available to the consumer from which he can buy any combination. Suppose that the consumer is observed to choose the combination Q. This means that Q is revealed to be preferred to all other combinations. Now suppose the price of good X rises, the price of Y remaining unchanged. With the rise in price of X the price line will shift to the new position AC. The price line AC represents new price-income situation. We now want to know



what is the effect of this rise in price of good X on its quantity demanded, assuming that demand varies directly with income (i.e. income elasticity of demand is positive). It is evident from the figure that combination Q is not available to the consumer in Price-income situation

AC. Let us compensate same combination Q even at the higher price of X. Draw a line DE parallel to AC so that it passes through Q.

The original combination Q is available in price income situation DE. It is evident that we will not choose any combination lying below Q on the line DE because if he chooses any combination below Q on line DE, his choice would be inconsistent. All combinations below Q on DE i.e. all combinations on QE could have been rejected by him in price income situation AB in favor of Q. It follows, therefore, that in the income situation DE the consumer will either choose the original combination Q or any other combination on & Q portion of DE. Thus, assuming a positive income-elasticity of demand, the inverse price demand relationship is established so far as rise in price is concerned.

The inverse price-demand relationship holds good in case of fall in price also. It can be illustrated by the following figure:

for Q over all other combinations in or on the triangle OAB. Now suppose the price of good X falls, so that the price line shifts to the right of AB i.e. the position AC. Let us now take away some amount of money from the consumer so that he is left with just sufficient amount of money which enables him to purchase the original combination. A line DE is drawn parallel to AC so that it passes through Q. The consumer will, therefore, choose either Q or any other combination of QE.

7.5 ASSUMPTIONS

(a) *Rationality*: The consumer is allowed to behave rationally i.e. he prefers bundles of goods that include more quantities of the commodities.

(b) *Consistency*: The consumer behaves consistently, i.e. if he chooses bundle A in a situation in which bundle B was also available to him he will not choose B in any other situation in which A is also available, symbolically.

If $A > B$, Then $B < A$.

(c) *Transitivity*: If in any one situation the consumer prefers combination A to combination B and combination B to combination C then he must prefer combination A to combination C

7.6 THE REVEALED PREFERENCE AXIOM

The consumer by choosing a combination of good in one budget situation reveals his preference for that particular combination; The chosen combination is revealed to be preferred for a particular collection of goods implies (axiomatically) the maximization of the

utility of the consumer.

7.7 Self Check Questions

1. Name three assumptions of Revealed Preference Theory.
2. Explain Rationality

7.8 CRITICAL APPRAISAL OF REVEALED PREFERENCE THEORY

Although Samuelson's revealed preference theory has made some important improvement upon the earlier theories of demand but it is not free from all flaws. Various criticisms levelled against it are:

1. Firstly, Samuelson does not admit the possibility of indifference in consumer's behavior. According to Samuelson's strong ordering hypothesis when a consumer chooses a combination A, he considers all other alternative which could have been purchased to be inferior to A. But it has been pointed out that if preference is to be judged from a large number of observations, then the possibility of indifference also emerges.

2. 'Samuelson's Revealed preference theory does not mention the substitution effect*.
3. Samuelson's revealed preference theory cannot enunciate the demand theorem when (i) the income elasticity is negative and the negative income effect is smaller than the substitution effect and (ii) the income elasticity is negative and income effect is greater than the substitution effect.
4. Samuelson's theory cannot account for Geffen's Paradox. According to Samuelson, the demand theory establishes only inverse relationship between price and demand. But this is so in case of inferior goods, where the demand changes in the same direction as the price.
5. Lastly, Samuelson's axiom choice reveals preference is invalid where the individual choosers are capable of employing strategies of a game theory.

In the end, we may conclude that Samuelson's Revealed preference theory is important due to the behavioristic method to the demand and his strong ordering hypothesis.

7.9 Answers to Self Check Questions

7.7.1 Rationality, Consistency and Transitivity.

7.7.2 The consumer is allowed to behave rationally i.e. he prefers bundles of goods that include more quantities of the commodities.

7.10 SHORT QUESTIONS

1.Explain the Revealed preference axiom.

7.11 LONG QUESTIONS

- 1 Explain the shift of the theory of demand from psychological to a behavioristic approach.
- 3 Critically examine the Revealed Preference Theory of demand.

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DEMAND FORECASTING TECHNIQUES**STRUCTURE**

- 8.1. Introduction
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 - (a) Short-term Purposes
 - (b) Long-term Purposes
- 8.3. Steps in Forecasting
- 8.4. Determinants of Demands Forecasting
- 8.5. Techniques of Forecasting Demand
- 8.6. Criteria for a Good Demand Forecasting Method
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- 8.16 References

8.1 INTRODUCTION

Demand Forecasting estimates sales in monetary as physical units for a future period under given set of economic and other environmental forces. Forecasting demand with higher level of accuracy is essential for a firm to enable it to produce The required quantities of its product at the given period of time. Demand forecasting is an effective tool to get finished goods at right time with minimum cost.

8.2 PURPOSE OF FORECASTING DEMAND

Forecasting is done both for short-term and long term purposes:

- (a) **Short-term Purposes:** - Demand forecasts assist in framing a suitable production policy so that demand equals supply of the product. It ensures regular supply of material, maximum utilization of machines, regular availability of labor. On the basis of demand forecast a firm can procure adequate finance at minimum cost.
- (b) **Long Term Purposes** If the period of forecast is more than a year it is called a longterm forecast. It helps to decide about the future production capacity of the plant. Reliable and accurate demand forecasts help the management to evaluate its labor requirements in order to remove the bottlenecks in the production process. Demand forecasts also help the enterprise to arrange for long term finances.

Thus the success of a firm depends on the accuracy of demand forecasting.

8.3 STEPS IN FORECASTING

The following steps are necessary for an efficient demand forecast:

1. Determination of the objective of forecast.
2. Selection of the period over which the forecast is to be made.
3. Determination of the nature of goods to be considered.
4. Collection of information to be used for forecasting.
5. Selection of a suitable method to be used for forecasting.
6. Making the forecast.

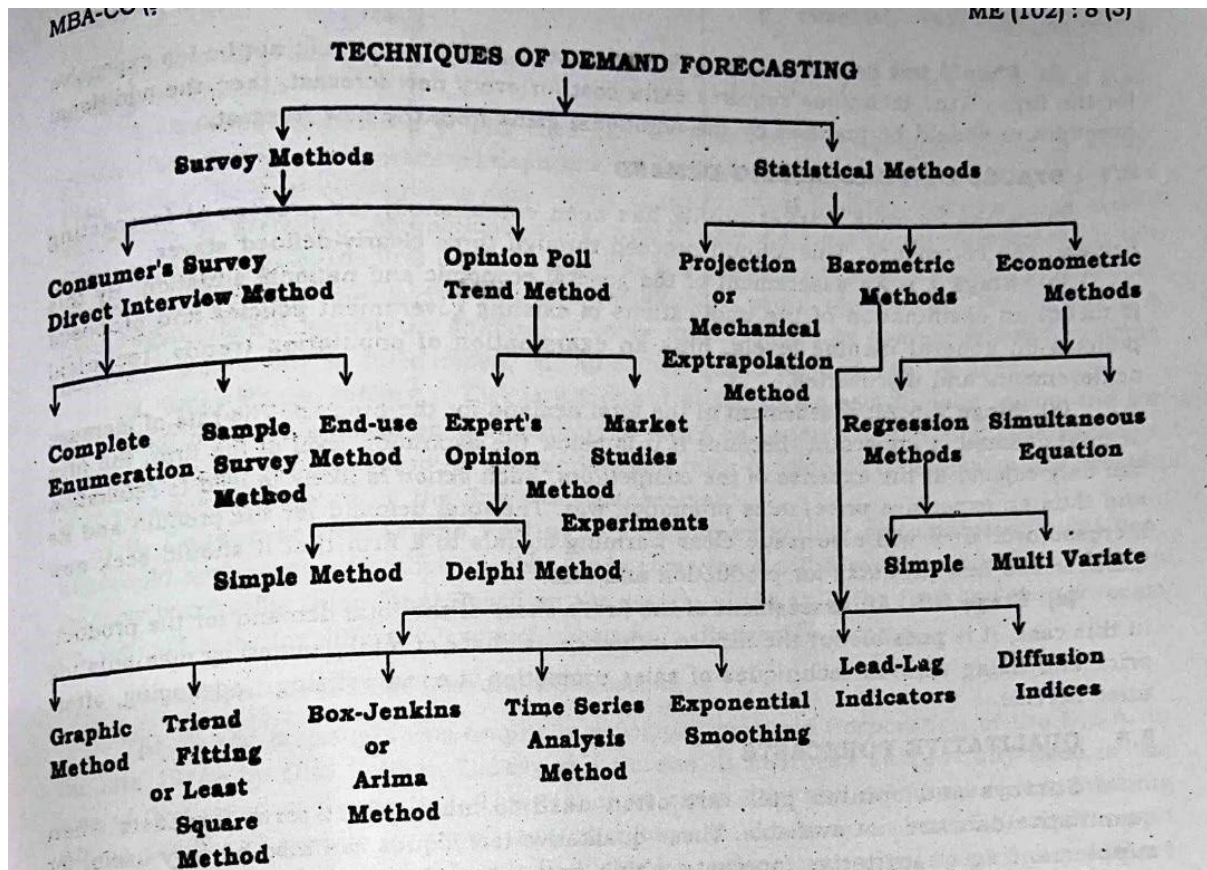
8.4 DETERMINANTS OF DEMAND FORECASTING

A trained forecaster knows the principles of demand and thus makes a competent forecast. For better forecasting we must know the nature of demand and its determinants. In order to identify the determinants of demand goods may be classified as follows:

- (a) *Non-Durable Consumer Goods* These goods are used only once e.g. food, beverages etc. Demand for these goods is influenced by three factors: purchasing power (or disposable income, Y), price of the commodity (P) and the characteristics of population (demography) (D). Demand can be forecast by the following formula: $d = f(Y, P, D)$
- (b) *Durable Consumer Goods* The demand for these goods is influenced by time-use characteristics, use facilities characteristics and demographic characteristics. Since these are not used at one point of time, the consumers can postpone their replacement. Demographic factors like age distribution, size of family etc., influence the demand for consumer durables like refrigerators, Cars, TVs etc.
- (c) *Capital (or Producer's) Goods* The demand for these goods is a derived demand, because these goods are required for the production of other goods. Demand for capital goods depends upon the profitability of the enterprises using these goods, their relative prices and the ratio of output to capacity in the user industries. The forecaster of demand for such goods concentrates on the growth potential of the user industries, the norms of usage of these goods per unit of installed capacity and their prices relative to other costs.

8.5 **TECHNIQUES OF FORECASTING DEMAND**

Various techniques to estimate demand for either the economy as a whole, or an industry or an individual firm have been developed which are better than mere guesses. Though these techniques differ widely yet they are not mutually exclusive. Forecasts may be made by means of sophisticated analysis (or Mathematical and statistical techniques) or they may be the result of intuition (opinion or sound judgement) These techniques of demand forecasting have been shown in the following chart.



8.6 CRITERIA FOR A GOOD DEMAND FORECASTING METHOD

The criteria for a good forecasting method are the following:

1. **Accuracy** Accuracy of a good forecast is checked by comparing the former forecasts with the actual results. The accuracy of the forecast is judged not only from the percentage of the deviation from the forecast by the actual but also the changes in direction the actual performance of demand has taken over a period of time.
2. **Plausibility** The forecasting technique must also be within the comprehension of the management so that they can appreciate the basis of the forecast.
3. **Stability** The forecast should hold good over the required period of time, may be short-term or long-term. For this purpose, the relationship of the demand variables included in the forecast should be reasonably stable.
4. **Flexibility** The forecasting technique adopted by the specialists should have flexibility. That is the technique must have the scope to include or exclude some variables in the light of changing conditions around the demand for the firm's product. The technique must give due weightage to the recent performance figures.
5. **Timely Availability** The forecasting technique should not be too much time-consuming. The management should not be made to wait for the forecast simply because the specialists want to arrive at a very accurate forecast. A less accurate forecast submitted in time is more welcome than the one which is late.

6. *Should not be too costly* The forecasting technique should not be too expensive for the firm. If the technique requires extra cost for every new forecast, then the additional expenditure should be justified by the additional gains from the new forecast.

8-7 STAGES OF FORECASTING DEMAND

Once the current market profile has been established, the process of forecasting demand can commence. This should proceed through three clearly-defined stages:

(a) *Stage 1* An assessment of the general economic and national situation. By this is meant an examination of the implications of existing government policies and proposed policies on general income levels, plus an examination of population trends, technical achievements and discoveries.

(b) *Stage 2* An assessment of the total demand for the product. The rate of increase in total demand is important, because if it is below the aspiration level of the firm, the firm can only expand at the expense of the competitors. Such action is likely to lead to retaliation and thus an expensive price/sales promotion war. The total demand for the product and its increase over time will also issue dear warning signals to a firm that it should seek new markets and new products for production and sale.

(c) *Stage 3* An assessment of the firm's share of the total demand for the product. In this case, it is possible for the firm to influence its share of total demand by manipulating price and using various techniques of sales promotion, i.e. advertising, packaging, aftersales service.

8.8 QUALITATIVE FORECASTS

Surveys and opinion polls are often used to make short-term forecasts when quantitative data are not available. These qualitative techniques can also be very useful for supplementing quantitative forecasts which anticipate changes in consumer tastes or business expectations about future economic conditions. They can also be invaluable in forecasting the demand for a new product which the firm intends to introduce. In this section, we briefly examine forecasting based on surveys and opinion polling.

(a) Survey Techniques

The rationale for forecasting based on surveys of economic intentions is that many decisions are made well in advance of actual expenditures. For example, business usually plan to add to plant and equipment long before expenditures are actually incurred. Consumer's decisions to purchase houses, automobiles, TV sets, washing machines, furniture, vacations, education and other major consumption items are made months or years in advance of actual purchases. Similarly, government agencies prepare budgets and anticipate expenditures a year or more in advance. Surveys of economic intentions, thus, can reveal and can be used to forecast future purchases of capital equipment, inventory changes and major consumer expenditures. Some big firms conduct regularly surveys of consumer choice about their products and products of their rivals. These surveys are becoming harder to conduct because consumers are not willing to spare time for the questionnaires or the sales peoples' inquiries.

(b) Opinion Polls

A firm's sales are strongly dependent upon the general level of economic activity and sales the industry as a whole, but they also depend on the policies adopted by the firm. The

firm can for its sales by polling experts within and outside the firm. There are several such polling techniques.

1. *Executive Polling* The firm can poll its top management from its sales, production, finance and personnel departments on their views on the sales outlook for the firm during the next quarter or a year. While these personal insights are to a large extent subjective, by averaging the opinions of the experts who are most knowledgeable about the firm and its products, the firm hopes to arrive at a better forecast than

would be provided by these experts individually. Outside market experts could also be polled. To avoid a bandwagon effect (whereby the opinions of some experts might be overshadowed by some dominant personality in their midst), the so-called Delphi method can be used.

2. *Sales Force Polling* This is a forecast of the firm's sale in each region and for each-prod line that is based on the opinions of firm's sales force in the field. The rationale is that these are people closest to the market and their opinion of future sales can provide very valuable information to the firm's top management.

3. *Consumer Intentions Polling* Companies selling automobiles, furniture, household appliances and other durable goods sometimes poll a sample of potential buyers on their purchasing intentions. Based on the results of the poll, the firm can then forecast its national sales for different levels of consumer's disposable income.

(c) The Delphi Method of Demand Forecasting

The Delphi technique was originally developed by Rand Corporation of the U.S.A. in the late 1940s by Olef Helmer, Dalkey and Gordon. It has been successfully used in the area of technological forecasting. This technique saves time and resources in approaching a large number of experts for their views on a forecast. In one case about 620 experts with different backgrounds in technology, administration, science, economics and policy makers were involved through the Delphi method.

The value of the Delphi technique is that it aids individual panel members in assessing their forecasts. Implicitly, they are forced to consider why their judgement differs from that of other experts. Ideally, this evaluation process should generate more precise forecasts with each iteration.

One problem with the Delphi method can be its expense. The usefulness of the expert opinion depends on the skill and insight of the experts, employed to make predictions. Frequently, the most knowledgeable people in an industry are in a position to command large fees for their work as consultants. Or they may be employed by the firm, but have other important responsibilities, which means that there can be a significant opportunity cost in involving them in the planning process. Another potential problem is that those who consider themselves experts may be unwilling to be influenced by the predictions of others on the panel. As a result, there may be few changes in the subsequent rounds of forecasts.

8.9 STATISTICAL METHODS OF DEMAND FORECASTING

There are two main methods used for forecasting the demand for a product, and they can be employed together so that a cross-check can be made on the results of each.

- (a) Taking past information as a starting point and using various statistical and mathematical techniques to establish relationships that will enable extrapolation and forecasting to take place.
- (b) Obtaining information as to the current intentions of consumers through interviews and surveys, test marketing and opinions of those with knowledge of the trade.

(a) Regression Analysis

The main technique employed for forecasting demand is regression analysis. Regression and correlation analysis, using past information as a guide, explores the relationship between a dependent variable (sales) and selected independent variables (price, advertising expenditure, income, etc.) and, given a strong relationship, uses the data to forecast the future. There are three stages in the process:

- (a) Collection of statistics concerning past values of relevant variables. In most cases insufficient data is available and that which is accessible is suspect. It must also be ensured that all relevant variables are included in the analysis, otherwise there will be serious distortion of results.
- (b) We assume causation between the independent and the dependent variables and use correlation analysis to determine the strength of the relationship. This relationship will always be subject to some degree of error, i.e., qualified by a significance test.
- (c) To produce our forecast, we now make adjustments to our independent variables used on an assessment of how we think they will vary over the time period considered. Will the general level of income

rise and by how much? How much advertising will be employed by our rivals in response to our own advertising budget? What adjustments would be made to their prices when forced with our own price policy?

The so-called Trend-projection method of fitting the trend to a time series is a regression analysis in which the independent variable is the time. The linear regression model takes the form of

$$S_t = S_0 + bt,$$

where S_t is the value of the time series to be forecasted for period t , S_0 is the estimated value of the time series (the constant of the regression) in the base period (i.e. at time period $t = 0$), b is the absolute amount of growth per period, and t is the time period for which the time series is to be forecasted.

(b) **Demand Forecast Through the Moving Average Method**

This is a simple method of forecasting demand. By this method we want to ensure that the predicted figure for the demand in a given period (month, quarter, year etc.) is more or less equal to the average value of the time series in a number of previous periods. For example, with a three year moving average, the forecasted value of the time series for the next period is equal to the average value of a time series in the last three periods. In the same manner, the average value of a time series with a four year moving average is given by the average value of the previous four periods, and so on. The larger the number of years under consideration, the greater is likely to be the smoothing effect in as much as less and less weights are attached to the recent observations. The greater is the random component in these time series, the more useful is this method of fitting the trend to the time-series data. *Example:*

The following table presents hypothetical data on the market share percent of a company in the 12-year period 1987-88. Forecast the company's market share for 1999.

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Market Share (percent)	20	22	23	24	18	23	19	17	22	23	18	23

We take the following steps in fitting the moving average trend.

1. We inspect the series to find that there is considerable random variation in the data but there hardly any secular or seasonal variation. We also find that the pattern of figures suggests a three-yearly moving average for the trend fitting.

Year	The Company's Actual Market Share (A)	Three-year Moving Average Forecast (F)	\hat{Y}_t
(1)	(2)	(3)	(4)
1987	20	-----	-----
1988	22	-----	-----

1989	23	-----	-----
1990	24	21.67	2.33
1991	18	23.00	-5.00
1992	23	21.67	1.33
1993	19	21.67	-2.67
1994	17	20.00	-3.00
1995	22	19.67	2.33
Demand Foreca1996	23	19.53	3.67
1997	18	20.67	-2.67
1998	23	21.00	2.00
1999	-----	21.33	-----

1. Calculate three-year moving average as shown in column (3). That is, find the average of the figures of the first three years, $(20 + 22 + 23) \div 3 = 21.67$. Write this figure in column (3) in the row the year 1990.

2. Drop the first-year figure in column (2) and take up the fourth year (1991) figure to the three-years total formed in the 2nd step above. The new average for the three years is $(22 + 23 + 24) \div 3 = 23$. We write this figure in the row of 1991.

3. We repeat the process of dropping one figure in the three-yearly total and adding the next more therein to find the next average figure. The average to be written in the row of 1992 is 21.67 and the same is the average for 1992 year.

4. Proceeding for each year in the same manner we go on writing the three-yearly moving average till we arrive at the year 1999. In this row we find the moving average to be 21.33. 5. By subtracting the figures in column (3) from those of column (2), we find the random fluctuations (A - F). The method of moving averages for fitting the trend to a time series is simple.

But it is a naive method, not considered scientific because it involves a good deal of subjectivity.

(C) Demand Forecast Through Exponential Smoothing

Trend projection can be considered to be just regression analysis where the only independent variable is time, a major assumption involved in this method is that each observation has the same weight. That is, the effect of the initial data item on the estimated coefficients is just as

much as the last data item. If there were little or no change in the pattern over the entire time series, this is not a problem. However, in some cases, more recent observations will contain more accurate information about the future than those at the beginning of the series. For instance, the sales figures of the last three months may be more relevant in forecasting future sales than data for sales ten years in the past.

Exponential smoothing is a technique of time series forecasting that gives greater weight to more recent observations. The first step in this technique is to choose a smoothing constant, α , where $0 < \alpha < 1$. If there are n observations in a time series, the forecast for the next period (i.e., $n + 1$) is calculated as a weighted average of the observed value of the series at period n and the forecasted value for that same period. That is,

$F_{n+1} = \alpha X_n + (1-\alpha)F_n$ where F_{n+1} is the forecast value for the next period, X_n is the observed value for the last observation, and F_n is a forecast of the value for the last period in the time series. The forecasted values for F_n and all the earlier periods are calculated in the same manner. Specifically,

$$F_t = \alpha X_{t-1} + (1-\alpha)F_{t-1}$$

starting with the second observation (i.e., $t = 2$) and going to the last (i.e. $t = n$). Note that equation (2) cannot be used to forecast F_t because there is no X_y or F_0 . This problem is usually solved by assuming

that the forecast for the first period is equal to the observed value for that period. That is, $F_j = X_j$. Using equation (2), it can be seen that this implies that the second - period forecast is just the observed value for the first period, or $F_j = X_x$.

The exponential smoothing constant chosen by us determines the weight given to different observations in the time series. As α approaches 1.0, then $(1-\alpha) \rightarrow 0$ and equations (1) and (2) indicate that the forecast is determined only by the actual observation for the last period. In contrast lower values of α give greater weight to observations from previous periods.

8.10 Self Check Questions

- 8.10.1 What is the purpose of demand forecasting?
- 8.10.2 Explain non-durable goods.
- 8.10.3 why demand for capital goods is derived demand.
- 8.10.4 who developed the Delphi method of demand forecasting?

8.11 FORECASTING DEMAND FOR A NEW PRODUCT

A discussion of the demand for established products given earlier does not apply to the forecasting of demand for a new product. This is because no such data relating to the sales of the product over time exists which could be used for fitting a trend line to the data. Another difficulty in the case of new products is that the consumer has no experience about the use of the new product. Therefore, Joel Dean has suggested a number of possible approaches.

- (a) *Evolutionary* Project the demand for the new product as an outgrowth and evolution of an existing product.
- (h) *Substitute* Analyze the new product as a substitute for some existing product or service.
- (c) *Growth Curve* Estimate the rate of growth and the ultimate level of demand for the new product on the basis of the pattern of growth of established products.
- (d) *Opinion Polling* Estimate demand by direct enquiry into the ultimate purchases, extending the sample to derive the total demand for the product by the population as a whole.
- (e) *Sales Experience*: - Offer the new product for sale in a sample market and from this try to estimate the total demand from all channels and a full-developed market.
- (f) *Vicarious* Survey consumer reaction to a new product indirectly through the eyes of special used dealers who are supposed by informed about consumer needs and alternative opportunities.

These methods are of course not mutually exclusive, and if possible, a combination of several methods should be used so that cross checks are available.

8.12 FORECASTING THE DEMAND FOR CONSUMER DURABLES

Forecasting the demand for individual products requires special techniques adopted to meet peculiarities of the special market involved. In forecasting the demand for consumer durable number of factors have been considered worth including in the forecasting techniques. (a) *Population Changes* Some demands for consumer durables are closely related to demographic changes such as the size, the growth rate and the regional distribution of population. The producers of baby toys and baby suits must utilize projections of birth rates in long-term demand forecasting. The publisher of textbooks studies the potential trends in college enrolment in the near future.

- (b) *Saturation Levels* Durable goods have a limit to their markets. Not everyone purchases a car. Color T.V. sets' demand is limited to some income groups. There must be a threshold level of income before a household can buy domestic appliances like microwave ovens, vacuum cleaners or dish washes. Take the use of demand for refrigerators. There is a point when close to 100 percent of the specific income households own home refrigerators. Then the potential market for refrigerators becomes limited to the demand for replacement.

(c) *Discretionary Income* in forecasting the demand for durable goods, forecasters make use of discretionary or super-numeracy income rather than the usual measures of GNP. There is strong evidence to support the view that the demand for consumer durables is closely correlated with discretionary income. This is a concept of income which includes temporary incomes into personal income after tax.

(d) *Discretionary Buying Power* Forecasters of durable consumer goods build up indexes of discretionary buying power which are built out of the following components: discretionary income + cash balances and liquid assets + new consumer credit. This index of buying power has a decisive effect on consumer durable demand.

(e) *Consumer Credit Outstanding's* Another important factor for consideration in forecasting will be consumer credit outstanding (debt) in the field of our consumer durable such as cars. Car financing is taking hold in the market. A high ratio of outstanding consumer debt to current income may suggest a slowing down of purchases based on new debt for two reasons - (1) lenders will be more cautious towards risks of financing and (2) the consumers will themselves refrain from incurring more debt.

(f) *The Number and Age Distribution of Existing Stocks* The number of automobiles and their age distribution must be known before a forecast can be made about the future market. Trucks and buses of a particular age and model must go off the road. To that extent new demand would be created.

(g) *Replacement Demand Versus New-owner Demand* The entire demand for a consumer variable is composed of replacement demand by existing owners and the demand from entirely new earners. If incomes are rising fast, the new owner demand may be more than the replacement demand. But in a period of business slow down, the new owner demand may fall to very low levels.

(h) *Consumer Attitudes and Plans:* - Forecaster of the demand for a durable like that car such as Marti cars must make use of the consumer plans and intentions about the demand for these. A potential buyer has to decide about the purchase of a used car or a new car, a well-known brand or a new brand etc. In making such decisions, consumers are much influenced by their associations, social associations and peer-group influence.

(1) *The Nature of Innovations on the Consumer Durable* Producers' durable goods often introduce some new features to their products so as to give an idea of distinctiveness to their brands. More seating capacity for same price', 'Reduced risk of injury on accident', 'Stronger controls' these are the enticing slogans for consumers. These slogans create new demand for the cars with the new features.

8.13 Answers to Self Check Questions

8.10.1 Forecasting is done both for short-term and long term purposes

8.10.2 *Non-Durable Consumer Goods* These goods are used only once.

8.10.3 The demand for these goods is a derived demand, because these goods are required for the production of other goods.

8.10.14 The Delphi technique was originally developed by Rand Corporation of the U.S.A. in the late 1940s by Olaf Helmer, Dalkey and Gordon.

8.14 Short Questions

1. How is the demand for a product estimated with the help of regression analysis?
2. What are the criteria for a good forecasting method? How do you rate Regression Analysis for this purpose?
3. Write steps of Demand Forecasting?

8.15 Long Questions

1. How can a business economist make qualitative forecasts?
2. How can we use regression technique to fit a time trend to the demand for product or service for forecasting purposes?

3. What is meant by exponential smoothing of a demand function? How is it more useful than linear curve fitting?

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MBA -Distance Education (First Year)

ME 103

Semester-1

MANAGERIAL ECONOMICS

Lesson No. 9

AUTHOR: DR. BALBIR SINGH

THEORY OF PRODUCTION**STRUCTURE**

- 9.1. Introduction
- 9.2. Production Function
 - (a) Fixed Proportion Production Process
 - (b) Variable Proportions Production Function
- 9.3. Laws of Production
 - (a) The Law of Variable Proportions
 - (b) Return to Scale
- 9.4. Application of the Law of Diminishing Returns
- 9.5. Self Check Questions
- 9.6. Importance
- 9.7. Cobb-Douglas Production Function
- 9.8. Self Check Questions
- 9.9. Elasticity of Substitution
- 9.10. Answers to Self Check Questions
- 9.11. Short Questions
- 9.12. Long Questions
- 9.13. References

13.1 INTRODUCTION

It seems that production is the most important activity taking place in an economy. Therefore, the decisions about what to produce and how to produce are vital to any economic system. The cost of production of a commodity is determined mainly by the way in which the resources are combined in a production process, the productivity of resources in various combinations and the prices of the resources involved in the production process. The method of production to be adopted may be determined by the quantity of the output to be produced. This method, in turn, influences the distribution of income and consequently affects the choice of goods to be produced. The process of production itself is capable of influencing consumer's preferences and market. Therefore, the theory of production is one of the most important topics to be studied in economics. In this lesson we shall discuss (A) the concept of production function (B) the laws of production, (C) Cobb-Douglas production function, and (D) the elasticity of substitution.

13.2 PRODUCTION FUNCTION

Production function shows the functional relationship between physical inputs and physical outputs. It defines the maximum quantity of physical output available from a given set of inputs or the minimum amount of inputs necessary to produce a given amount of output. According to Koutsoyiannis, "The production function is a purely technical relation which connects factor of inputs and output." As Stigler puts it, "The production function is the name given to the relationship between the rates of input of productive services and the rate of output of product." Whereas Koutsoyiannis defines production function

as a technical relationship between inputs and output. Brown says that the production function also specifies the relation between the inputs themselves. Ferguson views production as “a schedule... showing the maximum amount of output that can be produced from any specified set of inputs, given the existing technology of state of art.” Output is a dependent variable in a production function and is measured as a flow of goods over a specific period of time. Inputs are considered as independent variables. The general mathematical form of production function is:

$$Y = f(L, K, R, S, Re, E_f)$$

Where

Y = output

L = Labor input

K = Capital input

R = Raw Material S -

Land input

Re = return of scale

E_f = Efficiency Parameter

For a simplicity, only the inputs of labour and capital are considered as independent variables in a production function. Both labour and capital enter the production function explicitly. Normally, land does not explicitly enter the production function. It is because of the implicit assumption that land does not impose any restriction on production. A simple form of a production function is.

$$Y = f(K, L)$$

Where Y is the output per unit of time; K and L the quantities of the services of capital and labour per unit of time and it is the functional relation between inputs and the outputs.

Assumptions

There are implicit assumptions in the concept of production function. First, the inputs and the output are non-negative. Second, the key independent variables are assumed to be adequate to explain the changes in the output and so only these key variable is included in the production function. Third, implicit assumption underlying a production function is that the technology does not change. Fourth, the external effects are not considered. That is, the production of a firm is a relation between its output and the inputs it uses. So it is assumed that the output of the other firms or the inputs used by these firms do not matter.

TYPES

There are two types of production functions. The fixed proportion production function with either single or multiple processes, and the variable proportion production function:

(a) FIXED PROPORTION PRODUCTION PROCESS

(i) Single Process

A fixed proportion production function is one in which the technology requires a unique combination of inputs to produce each level of output. In this process, the possibility of substitution between inputs is ruled out. It means that to produce a given level of output efficiently, there exists only one way in which inputs may be combined to produce efficiently a given level of output.

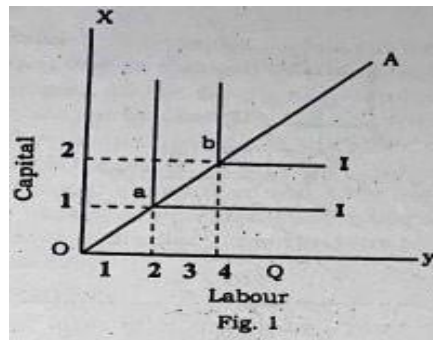
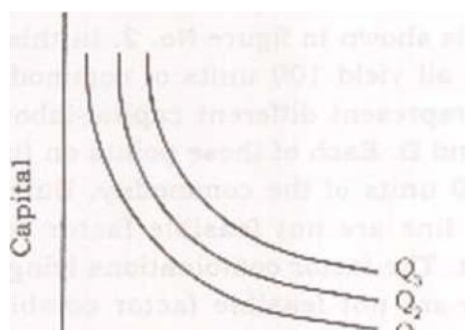


Figure 1 shows the fixed proportion production process. We assume that there are only two inputs, capital (L) and Labour (L) and the services of these two inputs are combined in the specific proportion 1: 2 respectively, to produce one unit of the output. Isoquants are L shaped. Let us assume that at a, the output is one unit. Output of one unit can be produced (at 'a') using 1 unit of capital and 2 units of labour. However, if we increase the amount of labour input and keep fixed the quantity of capital at 1, the output will not increase. Similarly, if we increase the amount of capital input and keep the labour input fixed at 2 units the output would not increase. So any increase in an input without the proportionate increase in the quantity of the accompanying input will not increase the output, we will have to double quantity of both the inputs subject to the condition that constant returns to scale is in operation. In the figure, if we want to double the quantity of the output (i.e. a to b) we have to increase both the inputs in a fixed proportion. This has been done by increasing the amount of capital to 2 units and that of labour to 4 units.

(11) Multiple Process

A variant of the above discussed function in a fixed proportion production function with multiple number of processes. Each process is defined by a line from the origin along which the ratio of inputs is fixed. Within one productive process no factor substitution is possible. But in different processes there are various factors in different quantities, since they involve different fixed factors ratios. Such a product of commodity for which four fixed proportions processes are available is shown in figure No. 2. In this figure, four fixed capital labour ratios have been drawn and all yield 100 units of commodity. OA, OB, OC and OD are the process rays whose slopes represent different capital-labour ratio. We get a linked line ABCD by joining point A, B, C and D. Each of these points on the line represents a factor combination which can produce 100 units of the commodity. But one thing to note is that all points on this linked isoquant line are not feasible factor combinations and cannot directly produce 100 units of output. The factor combinations lying between A and B, B and C and C and D on the linked line are not feasible factor combinations, for it has been assumed by us that only four factor combinations A, B, C and D corresponding to four available processes are feasible factor combinations capable of directly producing 100 units of output.



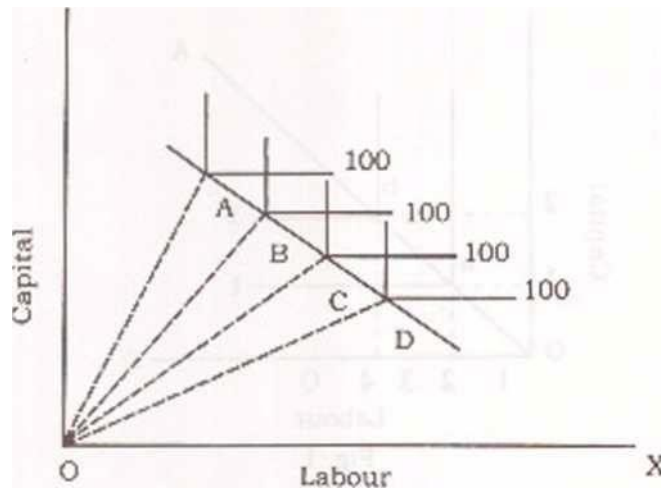


Fig. 2

(a) VARIABLE PROPORTIONS PRODUCTION FUNCTION

This is the standard neo-classical production function. The function is continuous because it is assumed that the production processes are infinite, which means inputs can be combined in any number of ways. In a two input model it is possible to substitute continuously one input for another, while keeping the level of output unchanged.

Figure No. 3 shows an isoquant map. An isoquant or equal product curve is obtained from an infinite number of combinations of the services of labour and capital. An isoquant map consists of infinite number isoquants. This is because the response of output to infinitesimal changes in inputs is assumed to be continuous. The isoquants do not intersect each other because of the assumption that the production is single valued, i.e. any given combination of inputs there is unique level of output.

A variable production function may be written as: $Q = f$

(K, L)

The isoquant, which is the locus of efficient points of inputs combinations to produce a given level of output, is continuous and smooth. An isoquant is assumed to be convex to the origin. The marginal product of labor and also of capital is positive. The marginal rate of technical substitution diminishes as one input is substituted for another.

13.3 LAWS OF PRODUCTION

The laws of production refer to the various technically possible ways of increasing the level of output. The level of output can be changed by changing the factor input combinations. We can increase output by changing all the factors of production and this is possible in the long run only. When we change output by changing the amount of all the factors, it is studied under the law known as law of returns to scale. On the other hand, we can increase output by using more of the variable factor(s) while other factors are kept constant. The increase in output with at least one factor constant is studied under the law known as the law of variable proportions. Thus, we have two laws of production i.e. the law of returns to scale and the law of variable proportions. We propose to discuss these two laws in detail one by one and we take up first the law of variable proportions.

(a) *The law of Variable Proportions*

In the short period, one or more than one factor input remain fixed, while one or more than one factor input can be varied with respect to the fixed factor(s). The law of proportions explains the behavior of output as the quantity of one factor is increased, keeping the quantity of other fixed. This law states

that as equal increments of input are added, the inputs of other productive services being held constant, beyond a certain point, the resulting increment of product will decrease. It means that the marginal and average output would eventually decline.

This law is based mainly on three assumptions. First, that the state of technology remains constant. Secondly, that of all the inputs used, the quantity of some (at least one) of the factor input must be kept constant. Thirdly, there is possibility of varying proportion in which the various factor inputs are combined in production.

The following table would be helpful to explain the law:

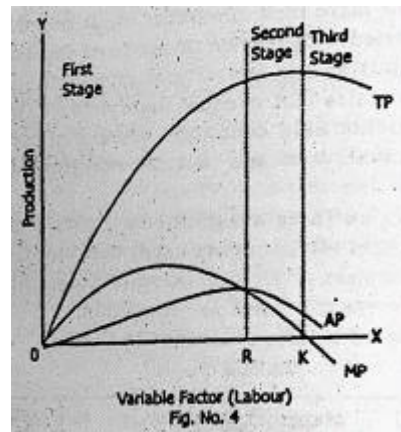
TABLE No. 1

<i>No. of workers</i>	<i>Total Marginal Product (in Quintals)</i>	<i>Marginal Product (in Quintals)</i>	<i>Average Product (in Quintals)</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
1.	5	5	5
2.	12	7	6
3.	24	12	8
4.	32	8	8
5.	37	5	7.40
6.	39	2	6.49
7.	39	0	5.57
8.	37	-2	4.62
9.	32	-5	3.54

Note: In this table only the labor input is allowed to vary, while all other factor inputs are assumed to be held constant

It is clear from the above table that as the number of workers is increased, the marginal product of labour is increasing up to the employment of the 3rd worker and when more workers are employed, the MP of labour starts declining and becomes zero as the 7th worker is employed. If we continue to employ more workers the marginal product of the successive workers would be negative as is shown in the table. The total product increases at increasing rate up to the point where marginal product is maximum and after this the total product would continue to increase, but at a decreasing rate till the marginal product becomes zero. When the marginal product is zero the total product would be maximum. In the above table, when 8th worker is employed the marginal product of the worker is negative and so the total product would also decrease. The law has three stages. The first stage is characterized by increasing average product and in the second stage both average product and the marginal product fall, but are positive. The third stage is reached when the marginal product becomes negative.

The diagrammatic representation of the law would make it more clear.



The diagram makes it clear that in the first stage the marginal product is higher than the average product. The first stage ends where the average product reaches its maximum (point R). But the marginal product reaches its maximum and starts declining even before the stage ends. The total product continues to increase up to the point where second stage ends (point K).

No producer would like to produce in the third stage because the marginal product of the variable factors is negative. A rational producer would not produce in the first stage the marginal product of the variable factor is more than average product, and moreover, average product continues to increase with the increase in the variable factor. Economically, the second stage is the most important region where the average product is greater than marginal product and both AP and MP are still positive. Moreover, the marginal product of the fixed factor in the first stage would be negative. If a producer decides to operate in the first stage, it would mean that he is not utilizing fully the opportunity of increasing production by increasing quantity of the variable factors whose average product continues to increase throughout the first stage. Thus, it would be profitable for the producer to operate in the second stage where the law of diminishing returns is in operation. In the second stage the relevance ratio of (the variable factor to the fixed factor, which a firm should use would depend upon the competitive cost of the variable factor and fixed factors.

Now we shall discuss the reasons responsible for the operation of the above mentioned three stages of production. The first, second and third stages are also known as the law of increasing returns, the law of diminishing returns and the law of negative returns, respectively.

The law of increasing returns occurs mainly due to two reasons. Firstly, when we add more units of the variable factors to the constant quantity of the fixed factor, then the fixed factor is more effectively utilized and it means the efficiency of the fixed factor increases. Generally, the fixed factor is indivisible and in the beginning, the variable factor is relatively smaller in quantity, some amount of the fixed factor may remain unutilized. When the quantity of the variable factor is increased, full utilization of the fixed factor becomes possible and it results in increasing returns.

Secondly, as the more units of the variable factor are added, the efficiency of the variable factor itself increases. It is because when the quantity of the variable factor becomes greater, the scope for specialization or division of labour increases.

The law of diminishing returns starts operating only after certain amount of the variable factor has been added to the fixed quantity of the other factor. The per unit output made by the variable factor after a point becomes less and less because the additional units of the variable factor have less and less of the fixed factor to work with. Now the fixed factor is overused and the variable factor is partially used. It happens mainly due to the indivisibility of the fixed factor. Thus law of diminishing returns comes into force when we continue to increase the quantity of the variable factor even after the optimum combination of the variable factor with the fixed factor has been achieved. Mrs. Joan Robinson says that the diminishing returns occur because the factors of production are imperfect substitutes for one another.

Because we cannot use one factor in place of the other to infinite level, the law of diminishing returns operates.

The third stage or the law of negative returns operates when the number of the variable factors becomes too excessive relative to the fixed factor that they start getting in each other's way and it results in the fall of the total output. Moreover, the excessive number of the variable factor also impairs the efficiency of the fixed factor. It is generally said that "Too many cooks spoil the broth." So all this leads to the negative marginal product of the variable in the third stage.

(b) Returns to Scale

We have explained above the law of variable proportions which presumes that one factor in the combination of factors is fixed and another is variable. Here we will explain another type of production known as the returns to scale. In case of returns to scale all inputs of factors are considered to be variable. In this type of production function, we try to find out the behavior of output when it is possible to change the size of all the factors. It means we attempt to explain the behavior of output in response to changes in these scales. Any change in the scale means that all inputs or factors are changed in the same proportion. The following table would be helpful to explain the returns to scale.

TABLE - 2

Units of all the factors used	Total Returns (quintals)	Average Returns (quintals)	Marginal Returns (quintals)	
One	10	10	10	Increasing
Two	22	11	12	
Three	35	11.66	13	
Four	60	15	25	Constant
Five	85	17	25	
Six	102	17	17	Decreasing
Seven	114	16.28	12	

From the above table it is clear that when the units of all the factors are increased in the same proportion, the total output increases at the different rates i.e. increasing, constant and decreasing. Now we will discuss in some details the increasing returns to scale, constant returns to scale and decreasing returns to scale.

(1) **Increasing Returns to Scale**

It means that the output increases at a higher rate than the increase in factors of production employed. We get the increasing returns, generally, in the initial stages of production. Chamberlin is of the view that increasing returns to scale are obtained due to specialization. As the size of the concern increases division of labour becomes possible and it leads to the increasing returns. The increasing returns to scale are also available to those industries where capacity varies roughly with the cube of the dimensions whereas the material required to construct the capital goods varies roughly with the square dimensions. A 2x2x2 box holds two times much raw materials as 1x1x1 box, but contains in four times much material (capacity).

(2) **Constant Returns of Scale**

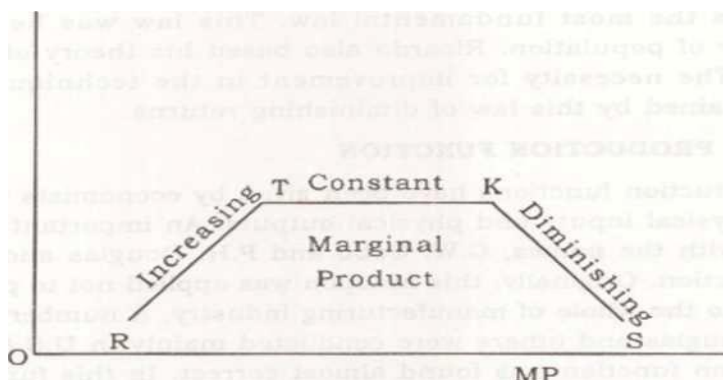
It means the total output increases at the same rate at which all the factors of production are increased. If the amount of all the factors is doubled, total output will also be doubled; and if the factors are tripled, the output will also be tripled. In our table given above the marginal returns are constant when 4th and 5th doses are applied. In mathematics this law of constant returns is known as linear and homogeneous production of the first degree. There are evidences which show that production function for the economy as a whole is not too far from being homogeneous of the first degree. The view that in the production function for an individual firm, there is a long phase of constant returns to scale, is also supported by empirical evidence.

(3) **Decreasing Returns to Scale**

Decreasing returns to scale means that proportionate increase in inputs of all factors used in production will give rise to a less than proportionate increase in output. It occurs mainly because of the increasing complexities of large scale management. When the size of a firm gets very large the administrative organization becomes extensive. The management also becomes unable to adopt itself rapidly to changing condition of demand and cost. With the expansion of the factors after a point diseconomies of scale take place and cause decreasing returns to scale. There is a difference between decreasing returns to scale and diminishing marginal returns, because the former arises from the increasing complexities of the

organization, while the latter is caused by the application of increasing units of a variable factor to fixed factors. The decreasing returns to scale, in our table starts operating only after the sixth dose of inputs has been applied.

The following figure (No. 5) shows the increasing, constant and decreasing returns to



Units of Factors of Production *Fig. No. 5*

The figure shows that when the units of factors of production are increased, the marginal product increases in the initial stage. As more and more units are put into production process the marginal product becomes constant. If we increase further the units of inputs the output will start declining. In this figure (No. 5) the product curve shows increasing returns from R to T, constant returns from T to K and diminishing returns from K to S.

13.4 APPLICATION OF THE LAW OF DIMINISHING RETURNS

The law of variable proportions states that the marginal physical product of the variable factors increases in beginning but starts declining after a certain amount of the variable factor relative to fixed

factor has been used. At the time of Marshall, it was generally thought that the law of diminishing returns applied to agriculture and manufacturing industries were subjected to increasing or constant returns. But now it is regarded that the law of diminishing returns applies both to agriculture and industry. Marshall is of the view that this law operates quickly where nature plays an important role as compared to man. He says that where nature plays relatively more important role, the law of increasing returns comes into force. The role played by nature is more in case of agriculture as compared to industry. That is why it is said that this law applies more quickly to agriculture than to industry. It may be due to the following reasons: - First, specialization and division of labour are relatively easy in industry than in agriculture. Secondly, technological innovations are slow in agriculture in comparison to industry. Thirdly, the role of nature is more in agriculture than in industry. Fourthly, human supervision is relatively difficult in agriculture as compared to industry because agriculture is spread over vast areas.

This law of diminishing returns is based on certain assumptions. First, the techniques of production are assumed to be constant. Secondly, this law starts operating only after a certain stage in production is achieved. Thirdly, the soil to be used for cultivation must not be new.

13.5 Self Check Questions

9.5.1 What is production function?

9.5.2 What are the two types of production function?

9.5.3 what is the law of production?

13.6 IMPORTANCE

The theory of production, as stated in the beginning, is very important in economics. The cost of production of a product is determined by the laws of production in operation. These costs through the supply of the product influence the price of the product. The laws of production are helpful in providing subsidy or imposing taxes on an industry. But the law of diminishing returns is the most fundamental law. This law was helpful to Malthus in formation of his theory of population. Ricardo also based his theory of rent on this law of diminishing returns. The necessity for improvement in the techniques of production to increase output is explained by this law of diminishing returns.

13.7 COBB-DOUGLAS PRODUCTION FUNCTION

A number of production functions have been given by economists to measure relations between changes in physical inputs and physical outputs. An important production function is the one associated with the names, C.W. Cobb and P.H. Douglas and is known as Cobb- Douglas production function. Originally, this function was applied not to production process of an individual firm but to the whole of manufacturing industry. A number of studies in 1920's and 1930's by Cobb-Douglas and others were conducted mainly in U.S.A. which showed the Cobb-Douglas production function was found almost correct. In this function, generally two inputs are taken (though in the recent past, it has been worked out by applying more than two inputs). This function is linear and homogeneous. This function can be written as:

$$Q = KL^a - C^b$$

Where

Q = Quantity of output

L = Labour input

C = Capital input K =

Positive Constant a =
exponent of labour

b = exponent of capital

Properties of the Function

1. Since the function is having log-linear form, it is simple to handle. In logarithmic form, the function is $\log Q = a \log L + b \log C$

2. The function is mostly used in form:

$$Q = KL^a - C^b \quad (a < 1)$$

In this special case, where $a + b = 1$, the function shows constant returns to scale. That is if the inputs of labour and capital are increased by constant g , then the quantity of output will be increased to:

$$K(gL)^a (gc)^{1-a} = Kg^a L^a C^{1-a}$$

But because $g^a g^{1-a} = g$, therefore $g K_a$

C^{1-a}

$$= g Q$$

Thus, the output has also increased by g because the inputs were increased by g . It is not necessary that $a + b = 1$ in Cobb-Douglas production function. If the function is homogeneous of degree 1 there are constant returns to scale. If in the above equation, g cannot be factored out (i.e. taken common) then the production function is not homogeneous, i.e. it is non-homogeneous. A homogeneous function is a function such that if each of the

inputs are multiplied by g , then g can be completely factored out. If it is of degree less than one, decreasing returns to scale is said to be existing. Similarly, if it is of degree greater than one, there is an increasing return to scale.

3. The function yields diminishing returns to each input. This can be easily shown, consider input L.

$$Q = KL^a C^b$$

$$\frac{\partial Q}{\partial L} = \alpha KL^{\alpha-1} C^b$$

Second order partial derivative is.

$$\frac{\partial^2 Q}{\partial L^2} = \alpha(\alpha-1) KL^{\alpha-2} C^b < 0$$

Since α is a positive fraction, $(\alpha-1)$ is negative. Thus the rate of change of marginal product of input L is negative, and MP_L declines. Similarly, it can be shown for input C.

4. α and β show the output elasticity coefficient for input L and C. The output elasticity of an input is defined as the ratio of the relative change in output over a relative change in the input. In symbols, the output elasticity of input L is written as:

$$\frac{\frac{\partial Q}{Q}}{\frac{\partial L}{L}}$$

$$= \frac{\frac{\partial Q}{\partial L} \cdot L}{Q}$$

$$= \frac{\alpha KL^{\alpha-1} C^b \cdot L}{KL^a C^b} = \alpha$$

Similarly, it can be shown that p is the output elasticity of input C

5 In Cobb -Douglas production factor intensity is measured by the ratio $\frac{\alpha}{\beta}$. The higher this ratio, the more labour intensive the technique is. On the other hand, the lower ratio, $\frac{\alpha}{\beta}$ that the technique is more capital intensive

6. an and b show the relative distributive shares of inputs L and C. The relative distributive share of input L is given by:

$$\frac{\partial Q}{\partial L} \cdot \frac{L}{Q}$$

Substituting the value of $\frac{\partial Q}{\partial L} \cdot \frac{L}{Q}$ and Q into this expression, we get

$$\frac{\partial Q}{\partial L} \cdot \frac{L}{Q}$$

It is clear that a is the relative distributive share of factor L.

5.The function can also show the relative efficiency of the firms. The coefficient K measures the efficiency in the organization of factors of production. If the two firms have the same L^U . L^{**} and still produce different quantities of output, the difference can be due to the superior organization and entrepreneurship of one of the firms which results in different efficiencies. If firm A has a larger K than that of firm B, then firm A is said to be more efficient than firm B.

Douglas and others made time-series and cross sectional studies for the manufacturing industry in many countries such as U.S.A., Canada etc. Douglas found almost similar results in these countries. The studies revealed that labour exponent was two-thirds and the capital exponent was one-third. In majority of the cases, the exponent seemed to be unity. It implies from Cobb-Douglas function that labour's share in national product tends to be constant under competitive market conditions.

The function has certain limitations. Firstly, the total output has been considered as a function of labour and capital only. The role of raw materials was not properly recognized in this function. But now, the economists have worked out this production function successfully by including raw materials along with labor and capital in this function. Secondly, all units of labour have been considered homogeneous in this function, actually, they arc not homogeneous in the real life. Thirdly, this function mainly perceives constant returns or at the most declining returns in industry, but increasing returns has equal probability of its application in industry. Fourthly, in the inter-industrial samples, we face the problem of non-constant technology while using this function, and this also happens in case of time-series samples. But it can be said that despite its limitations, the function is very beneficial in research work especially because it is relatively simple to handle.

13.8 Self Check Questions

9.8.1 Explain increasing returns to scale.

9.8.2 Explain decreasing returns to scale.

9.8.3 Explain law of diminishing returns.

13.9 ELASTICITY OF SUBSTITUTION

The elasticity of substitution between two goods, is a measure of the ease with which one can be substituted for the other. The elasticity depends on the substitution effect and so can be measured from the indifference curves. Stonier and Hague say that "elasticity of substitution, like the substitution effect upon which it depends, can be measured at any point on any indifference curve. It measures the extent to which goods can be substituted for one another, if the consumer is to remain on that given indifference curve."

This notion also applies in case of factors of production. J.R. Hicks observes that the elasticity of substitutions is measured in those cases where the variable factor can be substituted for other. Mrs. John Robinson says that the elasticity of substitution is "the proportionate change in the ratio of amounts of the factors divided by the proportionate change in the ratio of their marginal physical productivities." The elasticity of substitution between two factors would be 'infinite' if one can be substituted for another without any trouble at all. On the other hand, the elasticity of substitution would be, 'zero' if one factor

cannot be substituted for another at all. When it is difficult to substitute one factor for another, then a small change in proportion of the two factors will bring about a large change in the marginal rate of technical substitution between the two factors. But when the substitution between two factors is easy then a small change in the proportion of two factors of production would not bring much change in the marginal rate of technical substitution- between the goods. So from the change in proportion of two factors and the resultant change in the marginal rate of technical substitution, we can know the elasticity of substitution

$$Elasticity\ of\ Substitution = \frac{\text{Proportionate Change in the Amount of } x \text{ with Respect to } Y}{\text{Proportionate Change in the Marginal Rate of Technical Substitution on of } x \text{ for } y}$$

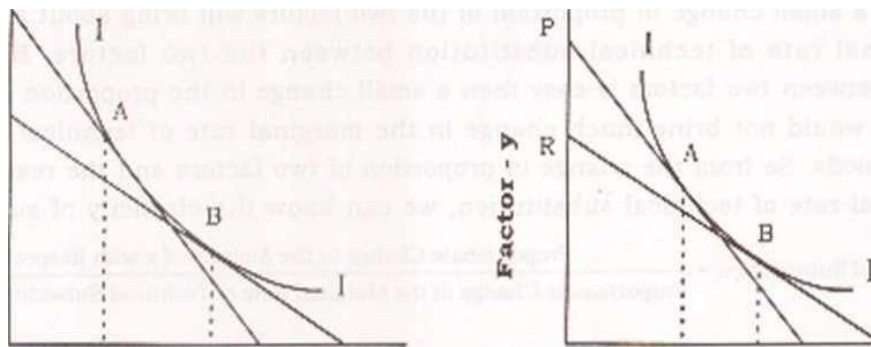
$$e_s = \frac{\frac{dx}{x}}{\frac{d(MRTS_{xy})}{MRTS_{xy}}} = \frac{dx}{x} \cdot \frac{MRTS_{xy}}{d(MRTS_{xy})}$$

Similarly, elasticity of demand can be known in case of demand for consumer goods. We have to replace of factors and MRS in place of commodities and MRTS, respectively in the above formula.

We shall use the following two diagrams to easily understand the concept of elasticity of substitution: In Figure 6.1, an isoquant curve between two close substitutes has been drawn. Due to the close substitution between factors and isoquant is near to be the straight line. In figure 6.2, an isoquant between two complementary factors has been drawn. The convexity isoquant between two factors is very large, because the substitution between two complementary factors is difficult.

We know that the marginal rate of technical substitution at a point on the isoquant curve can be known from the slope of the tangent drawn at the point. In the following two figures on points A and B of the two isoquant curves, two tangents PQ and RS have been drawn, their slope indicates marginal rate of technical substitution at them. In figure 6.1 and 6.2 the change in marginal rate of technical substitution between points A and B, respectively is equal because the corresponding tangents in the two figures are parallel to each other i.e. PQ in figure 6.1 is parallel to PQ of Figure 6.2 and RS of figure 6.1 is parallel to RS of figure 6.2. It means when we move from A to B the change in the marginal rate of technical substitution (MRTS) is the same in both the figures. Whereas in both the figure fall in MRTS_{xy} between A to B is the same, the increase in the quantity of x on isoquant curve of figure 6.2. It is clear from the two figures that the distance M₁, M₂ in figure 6.1 is much greater than the distance M.M_a in figure 6.2. Thus, in

figure 6.2 the same relative change in MRTS as that in figure 6.1 brings about a small increase in quantity demanded of factor x i.e. elasticity of substitution between two factors shown in figure 6.2, is very low. But in figure 6.1 with the same relative change in figure 6.2, the increase in quantity of factor x is very large, i.e. elasticity of substitution between two factors is very large



M. M. O S

Factor-x

Fig. No. 6.1

M. M, Q S

Factor-x

Fig. No. 6.2

The factors, which are perfectly complementary to each other are used in fixed proportions and no substitution between them is possible. So the marginal rate of technical substitution between perfect complementary factor's is zero. But in the real world, perfect complements rarely exist because some substitution is always possible between the factors. On the other hand, when the two factors are perfect substitutes of each other, then the proportion between them can be increased infinitely without any change in the MRTS between them. So the elasticity of substitution between such factors would be infinite. But in real life such factors rarely exist. So it can be said that we mostly come across such situations in the real world where elasticity of substitution between factors (or goods) ranges between zero and one.

13.10Answers to Self Check Questions

9.5.1 Production function shows the functional relationship between physical inputs and physical outputs

9.5.2 There are two types of production functions. The fixed proportion production function with either single or multiple processes, and the variable proportion production function

9.5.3 The laws of production refer to the various technically possible ways of increasing the level of output. The level of output can be changed by changing the factor input combinations.

9.8.1 It means that the output increases at a higher rate than the increase in factors of production employed.

9.8.2 It means the total output increases at the same rate at which all the factors of production are increased

9.8.3 Decreasing returns to scale means that proportionate increase in inputs of all factors used in production will give rise to a less than proportionate increase in output.

9.8.4 The law of variable proportions states that the marginal physical product of the variable factors increases in beginning but starts declining after a certain amount of the variable factor relative to fixed factor has been used.

13.11 SHORT QUESTIONS

- (1) What is meant by production? Define production function and describe the underlying assumptions.
- (2) State and illustrate the Cobb-Douglas Production function.

9.12 LONG QUESTIONS

- (1) Distinguish between laws of return to variable proportion and laws of return to scale. What are the reasons for the operation of the Law of Diminishing Return?
- (2) Explain the concept of elasticity of substitution.

9.13 REFERENCES

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ISO-QUANT CURVES AND PRODUCER'S EQUILIBRIUM

STRUCTURE

- 10.1. Definition of Iso-Quant
- 10.2. Iso-Quant Map
- 10.3. Assumptions
 - (a) Marginal Rate of Technical Substitution
- 10.4. Economic Region of Production
- 10.5. Characteristics of Iso-Quants
- 10.6. Iso-Cost Line
- 10.7. Producer's Equilibrium
- 10.8. Expansion Path
- 10.9. Self Check Questions
- 10.10. Difference between Indifference Curves and Iso-quants
- 10.11. Elasticity of Substitution
- 10.12. Answers to Self Check Questions
- 10.13. Short Questions
- 10.14. Long Questions
- 10.15. Reference

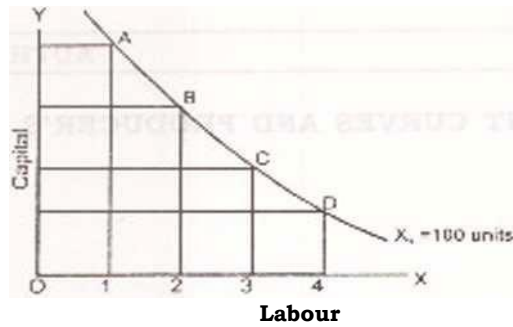
10.1. **DEFINITION OF ISO-QUANT**

An iso-quant represents a production function with two variable inputs. It shows different input combinations that may be used to produce a special level of output. Alternatively, an iso-quant is a curve in input space showing all possible combinations of inputs physically capable of producing a given level of output. In simple words, we may say that iso-quants show different combinations of two resources with which a firm can produce equal amounts of production. Different iso-quants indicate different levels of output that can be obtained from alternative combinations of inputs. Let us suppose that a firm desires to produce hundred units of a commodity. It can do so by employing one of the following alternative combinations of labour and capital:

Equal Product Schedule

Combinations	Units of Labour and capital	Units of Capital	MRS of Labour
A	1	11	--
B	2	8	3 : 1
C	3	6	2 : 1
D	4	5	1 : 1

A graphic representation of these combinations yield an iso-quant. If we indicate labour along X-axis and capital along Y-axis, the various combinations of labour and capital will yield common points. Connecting these points by a smooth curve, we get an iso-quant showing an output level of hundred units of the commodity.

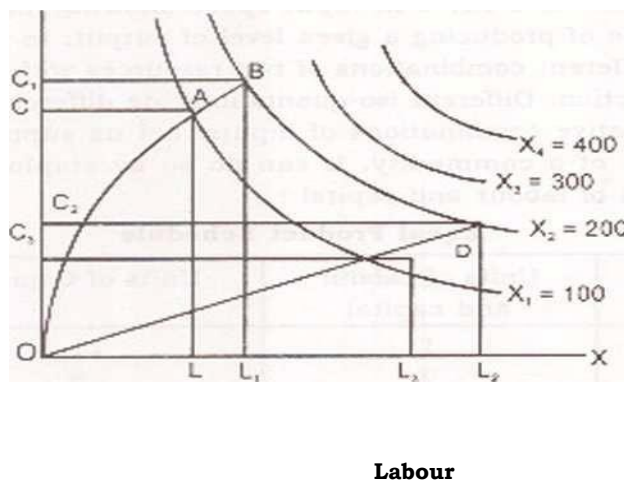


In this figure, X represent an iso-quant. It shows combinations of labour and capital with which a firm can produce hundred units of output. Point A, B, C and D on the iso-quant X, refer to alternative combinations of labour and capital capable of producing hundred units of output.

10.2. ISO-QUANT MAP

A group of iso-quant called an iso-quant map. Each iso-quant shows a different amount of output which can be produced with the help of alternative combination of the two inputs.

The following figures represents an iso-quant map. The two axes measure the quantities of labour and capital and the curves show different combinations of labour and capital that can be used to produce 100, 300 and 400 units of the output respectively. It is clear from the figure that farther the iso-quant, the greater is the output associated with it.



Consider first iso-quant X, indicating 100 units of output. Each point shows labour capital combination capable of producing 100 Units of output. For example, OC units of capital and OL, units of labour may be used to produce 100 units. Similarly, OC₂ unit of capital and OL₁ units of labour may be used to produce 200 units of the commodity. It is important to note that on the same iso-quant, the level of output remains the same, but capital labour ratio declines continuously as we move from the left to right.

10.3. ASSUMPTIONS

The concept of iso-quants is based upon a few assumptions which are as follows: -

1. **Production with two Inputs:**

The concept of iso-quant is based upon the assumption that output is being produced with the help of two variable inputs. It must have become apparent from the figures given above that the commodity is being produced with the help of labour and capital alone.

2. **Changing Proportion:**

The concept of iso-quant is also based upon the assumption that the given amount of output can be produced by effecting a change in the proportion in which two inputs are being used.

3. **No change in Technical Conditions:**

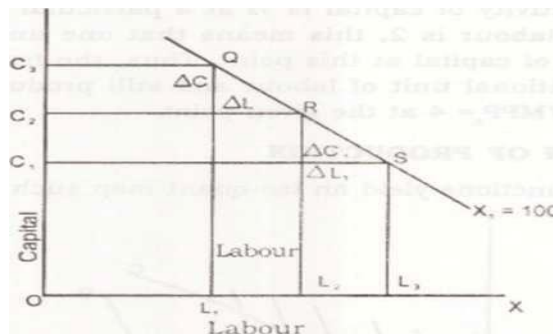
This assumption implies that technological conditions must remain unchanged i.e., there must not be any improvement or deterioration in the method of production.

4. **Homogeneous Units:**

The various units of the inputs must be alike in efficiency. It means that efficiency of all units of labour and that of capital must be equal to each other.

(a) Marginal Rate of Technical Substitution

Marginal rate of technical substitution of labour for capital is the amount of capital that must be given up in order to use an additional unit of labour under the assumption that level of output remains the same. To illustrate, let us take the help of the following diagrammatic representation.



In moving from point Q to point R on iso-quant $X = 100$, the firm gives up ΔC Units of capital for one unit of labour i.e. ΔL

Thus Marginal Rate of Technical Substitution of labour for capital (MRTS) equals

$$\frac{\Delta C}{\Delta L} \text{ Similarly from point R to S on the same iso-quant, the MRTS is equal to } \frac{\Delta C}{\Delta L}$$

The marginal rate of technical substitution of labour for capital diminishes as more and more labour is substituted for capital. This is so because the less of capital and the more of labour, the firm is using the more difficult it becomes for the firm to substitute labour for capital in production. The fact that marginal rate of technical substitution falls as more labour is substituted for capital means that iso-quant is convex to the origin as is evident from the figure given above.

By definition, as one moves along an iso-quant, output remains constant. This means that gain in output from the usage of little more labour is equal to the loss in output from a little less of capital. The gain in output equals marginal physical productivity of labour time, the little more amount of labour being used ($MPP_L \times \Delta L$)

The loss in production equals marginal physical productivity of capital units of capital given up ($MPP_C \times \Delta C$)

Accordingly,

$$\Delta C \cdot MPP_C = \Delta L \cdot MPP_L$$

By simplifying, we get

$$\frac{\Delta C}{\Delta L} = \frac{MPP_L}{MPP_C}$$

We know that

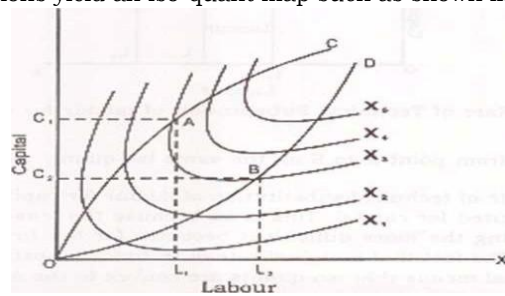
$$MRTS = \frac{\Delta C}{\Delta L}$$

$$MRTS = \frac{MPP_L}{MPP_C}$$

It follows from the above calculation that marginal rate of Lechnical substitution equals Che ratio of marginal physical productivity of labour to that to capital. For example, if the marginal physical productivity of capital is V_i ac a particular point on an iso-quant while marginal productivity of labour is 2, this means that one unit of labour is 4 times more productive than one unit of capital at this point. Thus, the firm can given up four units of capital by using one additional unit of labour and still produce the same level of output. Therefore, $MRTS_{fc} - MPP_L/MPP_C = 4$ at the given point.

10.4ECONOMIC REQION OF PRODUCTION

Many production functions yield an iso-quant map such as shown in the figure given below:



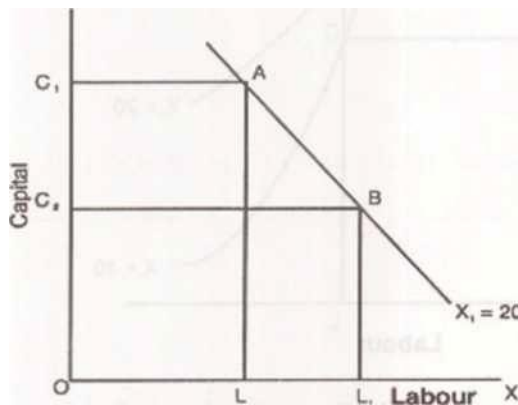
X_1, X_2, X_3, X_4 and X_5 are five iso-quants equal product curves, shown in this diagram. These isoquants bend back upon themselves or have positively-sloped segments. The parallel-dashed lines indicate the points at which iso-quant bend back upon themselves. The lines OC and OD join these points and form the boundary lines for the economic region of production. In technical terminology, OC and OD lines are known as ridge lines. These ridge lines help the firm in delineating the boundary lines for the economic region of production. Suppose quantity represented by iso-quant X, is to be produced. Production of this amount requires OL irreducible amount of labour along with OC, amount of capital i.e. with OC units of capital OL, amount of labour must be used to produce output represented by X^{\wedge} iso-quant. Beyond this level of input, additional units of capital along with $O L_1$ units of labour, would push the producer to a lower iso-quant indicating an uneconomic use of resources.

Similarly, production of amount of output also requires a certain minimum amount of capital. According to point B on iso-quant X^{\wedge} OC_2 is the irreducible amount of capital to be used alongwith OL_2 amount of labour to produce X, output. The X_3 level can not be attained without at least this much amount of capital. Additional usage of labour along with OC, amount of capital, would reduce rather off rational operation.

10.5CHARACTERISTICS OF ISO-QUANTS

Iso-quants have the same characteristics as indifference curves. A few important characteristics of iso-quants arc as given below :

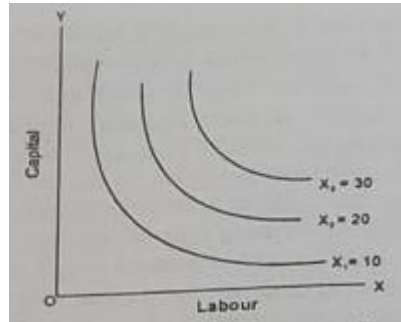
1. *Iso-quants are negatively sloped* : Like indifference curves, iso-quant slope downward from left to right. This means that if the firm wants to use less capital, it must use more labour to produce the same level of output.



According to the above given figure, iso quant X = 20 units of output slopes downward

from left to right. As producer moves from point A to point B on iso-quant X_1 , labour is substituted for capital in such a way that level of output remains the same. The negative slope implies that one output can be substituted for the other in the production of a given amount of output.

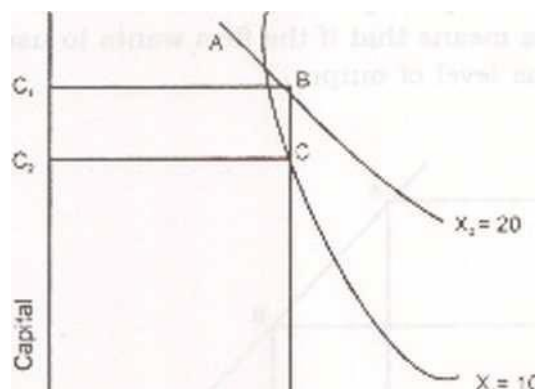
2. *Higher iso-quant shows higher level of output* : An iso-quant that lies above and to the right of another corresponds to a higher output level than the one that lies to the left and below. It means that iso-quant farther from the origin of the graph involves higher levels of output than those nearer to it.



This iso-quant map contains three iso-quant X_1 , X_2 and X_3 . Iso-quant X_1 indicates output of 10 units while iso-quant X_2 shows an output level of 20 units. It is evident from the figure that iso-quant lying to the right indicates larger output. Greater output should flow from the use of large quantities, resources and iso-quant to the right involve larger quantities of capital and labour than those to the left.

3. *Iso-quant never cut each other* : Like the indifference curves, iso-quant can never intersect, a logical contradiction would develop.

In this figure, consider two iso-quant X_1 and X_2 intersecting at point A. Point A lies on iso-quant X_2 , as does C. By definition, the output at C must be the same as at A.



Labour

But A is also a point on X_1 , and so is B. Again, by definition, the output must be the same as at A and B. It follows from this that both B and C would produce the same outputs as that at A. This is not logical because B and C, though contain the same amount of labour, but differ in respect of capital. Thus, two combinations of inputs denoted by points B and C never produce the same level of output. It follows from this that two iso-quant can never intersect each other.

$$\frac{T/P_c}{T/P_l} = \frac{T \times P_l}{P_c \times T} = \frac{P_l}{P_c}$$

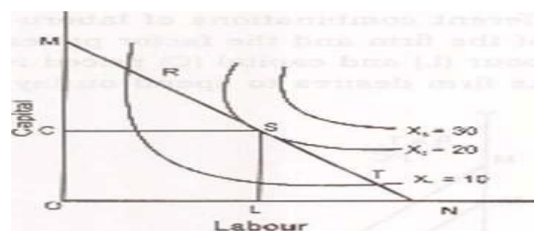
It follows from above that the slope of an iso-cost line equals the ratio of prices of two inputs. Suppose total outlay were to increase from T to T_1 . This increase would shift the isocost line MN to the right, parallel to the original iso-cost line since there has been no change in the price of either labour or capital. The new iso-cost line is shown by T_1/P_c , T_1/P_l . As against this, if total outlay decreases, iso-cost line would shift to the left, parallel to the original iso-cost line since there has been no change in the price of either labour or capital.

10.7. PRODUCER'S EQUILIBRIUM

A producer's equilibrium point is one at which he maximizes output for his given total outlay or at which he minimizes cost for his given output. Thus, the problem of determination of producer's equilibrium can be discussed under two sub-heads viz. (a) maximizing output for a given cost and (b) minimizing cost subject to a given output.

(a) Maximising output for a given cost

Like indifference curve analysis, iso-quants only tell us what a firm wishes to do, given the production function. It does not tell us what the firm can do. As against this, an iso-cost line shows different combinations of inputs that a firm can purchase given the prices of inputs and constant outlay. By combining the concepts of iso-quants and iso-cost line, the problem of maximizing output for a given cost can be solved.



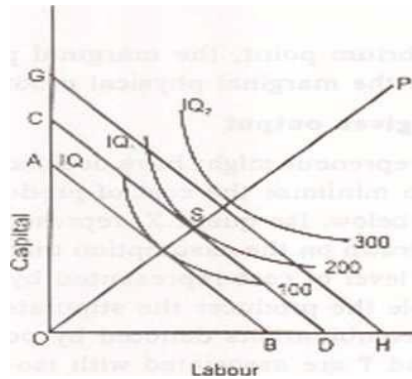
A rational producer wants to get the largest output for the given outlay. Input combinations denoted by points R, and T are available to the firm under the given constraints i.e. given prices of labour and capital and constant, outlay. The firm under consideration would purchase input combination denoted by point S for the reason that this input combination enables the firm to produce maximum amount of output i.e. 20 units' subject to the given cost.

A greater output is not obtained for the given level of expenditure and a lesser output is irrational because production can be expanded at no extra cost. Hence producer's point of equilibrium is one where iso-cost line is tangent to the iso-quant. At the point of tangency, the slope of an iso-quant equals the slope of an iso-cost. That is, at the equilibrium.

This means that at the equilibrium point, the marginal physical productivity of last rupee spent on labour is the same as the marginal physical productivity of capital.

(b) Minimising Cost subject to a given output

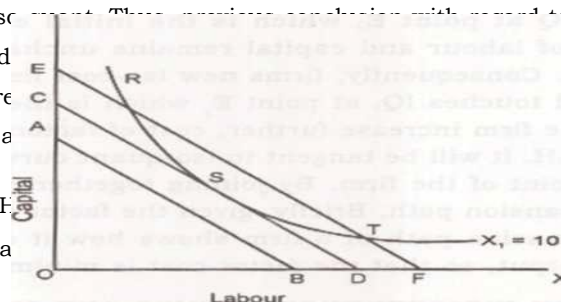
It is just possible that an entrepreneur might have decided to produce a given amount of output. His endeavor would be to minimize the cost of producing the given output. The problem can be solved graphically as below. Iso-quant X_1 represents 20 units of output while AB, CD and EF are the iso-cost lines drawn on the assumption that prices of labour and capital remain the same. First observe that level of cost represented by AB is not flexible because input combinations on it do not enable the producer the stipulated output. Next, 10 units of output can be produced with input combinations denoted by points R, S and T. But input combinations denoted by points R and T are associated with iso-cost line EF whereas input combination denoted by point S is associated with iso-cost line CD.



It is obvious that under the circumstances by employing input combination denoted by point S, the producer can produce ten units of output at the least possible cost. S is a point at which iso-cost line CD is tangent to the iso-quant $X_1 = 10$. This equilibrium combination with regard to the producer's equilibrium point stands valid viz., in order to produce a given output, the entrepreneur has to equate the marginal rate of technical substitution at point S.

10.8. EXPANSION PATH

With an increase



to increase its

output. Quantity of output can increase only if with an increase in the financial resources of the firm, there is no increase in the cost of the factors. The level of total output of a firm increases with increase in its financial resources. Which of the optimum combinations of factors will be used by the firm at different levels of output: is indicated by Expansion Path. Expansion path refers to the laws of all such points that shows least cost combination of factors corresponding to different levels of output. In other words, expansion path traces the movement of the firm from one optimum combination of the factors to the other optimum combination of factors when the scale of operation of the firm is expanded.

Expansion path can be explained with the help of above given figure. On Ox-axis units of labour and on OY axis units of capital are shown. The initial iso-cost line of the firm is AB. IC is tangent to IQ at point E, which is the initial equilibrium of the firm. Supposing the cost per unit of labour and capital remains unchanged and the financial resources of the firm increase. Consequently, firm's new iso-cost line CD will be parallel to the initial iso-cost line AB and touches IQ, at point E_1 which is the new equilibrium point. If the financial resources of the firm increase further, cost of factors remaining unchanged, the new iso-cost line will be G.H. It will be tangent to iso-quant curve IQ_2 at point E_2 , which will be the new equilibrium point of the firm. By joining together equilibrium points E, E_1 , and E_2 we get a line called expansion path. Briefly, given the factor prices and marginal rate of technical substitution, expansion path of a firm shows how it combines various factor inputs at different levels of output, so that the factor cost is minimizing.

10.9 Self Check Questions

1. Explain producer's equilibrium?
2. What is iso cost line?

10.9. DIFFERENCE BETWEEN INDIFFERENCE CURVES AND ISO-QUANTS

Although the theory of iso-quants is based upon the concept of indifference curves, yet important points of difference exist between them. These two concepts differ from each other in the following respects :

1. *Level versus Amount* : The indifference map provides an ordinal ranking of utility levels whereas an iso-quants map provides a cardinal ranking of output levels. Indifference curves are labeled as IC_1, IC_2, IC_3, \dots etc. indicating either a lower or a higher level of satisfaction whereas isoquants are labeled as X_1, X_2, X_3, \dots etc. indicating a specific amount of output. Each isoquant shows a specific amount of output.
2. *Objective* : To the consumer, the equilibrium point corresponds to utility maximization. It is a point at which a consumer attains his objective of maximum satisfaction. But to a producer, the point of tangency between an iso-cost line and an isoquant indicates an equilibrium position in the sense that the input combination of the point of tangency is the one appropriate to the level of outlay expenditure represented by the isocost line. It says nothing whatsoever about maximizing profit which is the objective of the producer.
3. *Shape* : Indifference curves consistently slope downward from left to right but this is not so in respect of iso-quants. Iso-quants bend back upon themselves or have positively sloped segments.
4. *Derivation of Demand Curve* : A consumer's demand curve can be derived with the help of indifference curves because the successive equilibria yield points at which the consumer attains his objective. But the demand curve for a factor of production cannot be derived from the various points of tangency between iso-cost lines and iso-quants because these points do not correspond to profit maximizing equilibria.

10.10. ELASTICITY OF SUBSTITUTION

If, starting from a position of producer equilibrium, price of one input falls, the equilibrium position of the producer will be disturbed. In the process of re-establishing equilibrium, the producer substitutes the cheaper input for the other. The extent to which one input can be substituted for the other depends on the type of relation that exists between the inputs. If the two inputs are perfect complements and thus have to be used in fixed proportions, there would be no possibility of substitution. As against this, if they are perfect

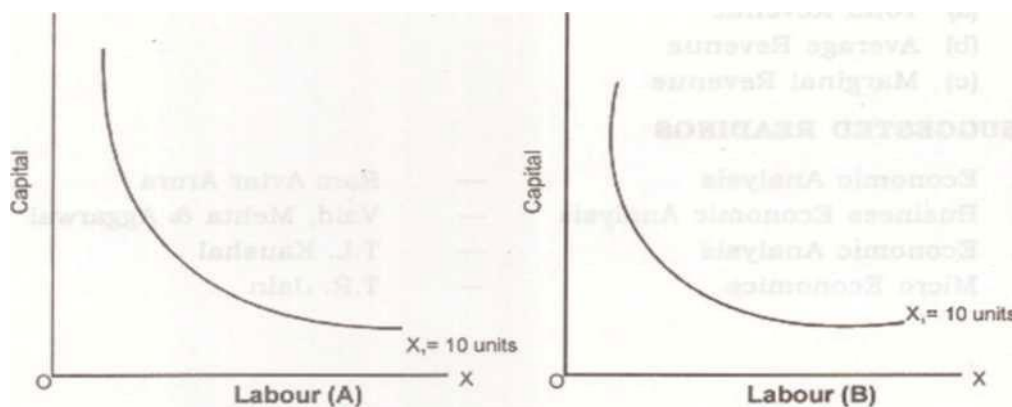
substitutes, then production could be carried on either by using one or the other input alone or by using some combination of the two.

The curvature of an iso-quant, reflects the degree of substitutability. The more convex an iso-quant, the greater the complementarity of the factors and less the substitutability. As against this, the less the curvature of an iso-quant, the greater would be the possibility of substitution between factors.

Figure A illustrates a less curved iso-quant. Here possibility of substitution is more. Figure B reflects a more curved iso-quant. Here elasticity of substitution is less.

A coefficient of elasticity of substitution has been developed to measure the degree of substitutability between the two factors of production. The elasticity of substitution measures the relative

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ratio to given proportional change in the marginal rate of technical substitution of labour for capital.

Thus, by formula, elasticity of substitution is

$$= \frac{KK/LL}{\Delta MMQQMMMM/MMQQMMMM}$$

If the elasticity of substitution is zero, inputs i.e. labour (L) and capital (K) will be used in fixed proportions. If, however, elasticity of substitution were infinite, then, we can maintain that factors are perfect substitutes. Thus, higher the value of (ES), the higher the degree of substitutability between the factors.

10.11 Answers to Self Check Questions

10.9.1 A producer's equilibrium point is one at which he maximizes output for his given total outlay or at which he minimizes cost for his given output

10.9.2 An iso-cost line shows different combinations of labour and capital that a firm can purchase, given the total outlay of the firm and the factor prices

10.12 Short Questions

1. What are Iso-quants? What are the characteristics of iso-quants?
2. Explain the Marginal Rate of Technical Substitution in detail.
3. Define Iso-quants. What is the difference between iso-quants and indifference Curves?
4. How will you explain producer's equilibrium with the help of iso-quants?

10.13 Long Questions

1. Explain the nature of AR & MR under perfect competition and Imperfect Competition.

2. Write short notes on:

- (a) Total Revenue
- (b) Average Revenue
- (c) Marginal Revenue

10.14 References

Economic Analysis	— Ram Avtar Arora
Business Economic Analysis	— Vaid, Mehta & Aggarwal
Economic Analysis	— T.L. Kaushal
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COST FUNCTIONS

STRUCTURE

- 11.1. Introduction
- 11.2. The Concepts of Costs
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 - (b) Opportunity or Alternative Costs
 - (c) Private and Social Costs
 - (d) Short Run Costs
 - (e) Fixed Costs and Variable Costs
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11.1 INTRODUCTION

Cost of production is the most important force governing the supply of a product. It should be pointed out here that for each level of output, the firm chooses least cost combination of factors. Various concepts of costs as are used in modern economic theory are explained below and then we turn to study the derivation of short-run and long-run cost curves.

11.2 THE CONCEPTS OF COSTS

(a) Accounting Costs and Economic Costs

When an entrepreneur undertakes an act of production, he has to pay prices for the factor which he employs for production. He, thus, pays wages to the laborer employed, prices for raw materials, fuel and power used, rent for building and the rate of interest on the money borrowed for doing business. All these are included in cost of production. An accountant will take into account only the payments and charges made by the entrepreneur to the suppliers of various productive factors, which are called accounting costs.

But an economists view of the cost is somewhat different from this. It generally happens that the entrepreneur invests a certain amount of money capital in his productive business. If this money capital

had been invested somewhere else, it would have earned a certain amount of interest or dividend: likewise, an entrepreneur contributes his entrepreneurial and managerial ability to it. Had he not set up his own business, he would have sold his services for some positive return. An accountant would not include these while calculating the cost of production but an economist would include these in the cost of production. Likewise, the money rewards for other factors owned by the entrepreneur himself and employed by him in his own business are also considered as the constituents of cost of production.

The accounting costs or the contractual cash payment which the firm makes to other factor owned for purchasing or hiring the various factors are also known as explicit costs. The money rewards for other factors the entrepreneur himself owns and employs in the firm are known as implicit cost. The economists take into consideration both the explicit and implicit cost. Economic cost = Accounting costs + Implicit costs

$$= \text{Explicit cost} + \text{Implicit costs}$$

(b) Opportunity or Alternative Costs

The concept of opportunity cost occupies a very important place in modern economic analysis. The opportunity cost of any commodity is the next best alternative that is sacrificed. Prof. Benham defines the opportunity cost as, "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."

The concept of opportunity cost bears two important points first, the opportunity cost of anything is only the next best alternative foregone. Thus, opportunity cost producing a good is not any other alternative good that could be produced with the same factors, it is only the most valuable other good, which the same factors could produce. Second point worth noting is all the factors used in the production of one thing may not be the same as are required for the production of next best alternative good.

Therefore, the opportunity cost of a good should be viewed as the next-best alternative good that could be produced with the 'same value' of the factors which are more or less the same.

(c) Private and Social Costs

There are certain cost which arise due to the function of the firm but do not normally figure in business decisions nor are such costs explicitly paid by the firms. Certain such costs are paid by the society. Thus, the total cost generated by the firm's decision may be divided into two categories.

- (a) Those paid out or provided by the firms and are known as 'private costs',
- (b) Those not paid by the firms including the use of resources freely available plus the disutility created in the process of production and are known as 'Social costs'

Private costs are those which are actually incurred or provided for by an individual or a firm on the purchase of goods and services from the market. For a firm, all the actual costs, both explicit and implicit, are private costs. Private costs are internalised in the sense that 'the firm must compensate the resources owned in order to acquire the right to use the resource.' It is only the internalised cost that is incorporated in firm's total cost to production.

Social cost, on the other hand, implies the cost which society bears on account of production of a commodity. Social cost includes both 'private cost' and 'external cost'. External cost includes (a) the cost of 'resources for which the firm is not compelled to pay a price', e.g., atmosphere, rivers, lakes and also for the use of public utility services like roadways, drainage system etc. and (b) the cost in the form of disutility created through air, water and noise pollution's etc. The cost of expenditure incurred to safeguard the individual and public against various kinds of health hazards created by the production system and thus, is used in the estimation of social costs. But private and public expenditure serve only as an indicator of trends in 'public disutility', it does not give the exact measure of the public disutility.

(d) Short Run Costs

There are some input or factors which can be readily adjusted with the changes in output level. These factors may be labor, raw material etc. On the other hand, there are some factors such as capital equipment, buildings etc. which can't be so readily varied. It requires a comparatively longer time to make

variations in them. The factors such as raw materials, labor etc., which can be readily varied with the change in the level are known as variable factors and the factor such as capital equipment's and buildings which cannot be so readily varied are called Fixed factors.

Corresponding to this distinction between variable factor and fixed factors, economists distinguish between short run and long run. The short run is a period of time in which output can be increased or decreased by changing only the number of variable factors such as labor, raw* material etc. In the short run, quantities of the fixed factors such as capital equipment, factory building etc. cannot be varied, i.e., the quantities of fixed factors remain unaltered.

On the other hand, the long run 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.

Having explained the difference between the fixed factors and the variable factors and also between the short run and the long run, we are in a position to distinguish between fixed costs and variable costs which when added together make up total cost. (e)Fixed Costs and Variable Costs

Fixed cost are those costs which are independent of output, that is 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 large or small. Even if the firm closes down for some time in the short run, these costs have to be borne by it. Fixed costs are also known 'as overhead costs' and include charges such as contractual rent, insurance fee, maintenance costs, interest on capital invested, property taxes minimum administrative expenses 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 productions and their amount can be altered in the short run when output rises or falls. If the firms shut down for some time in the short run, it will not use variable factors and will not, therefore, incur any variable costs. Variable costs are also called 'prime costs' or 'direct costs.'

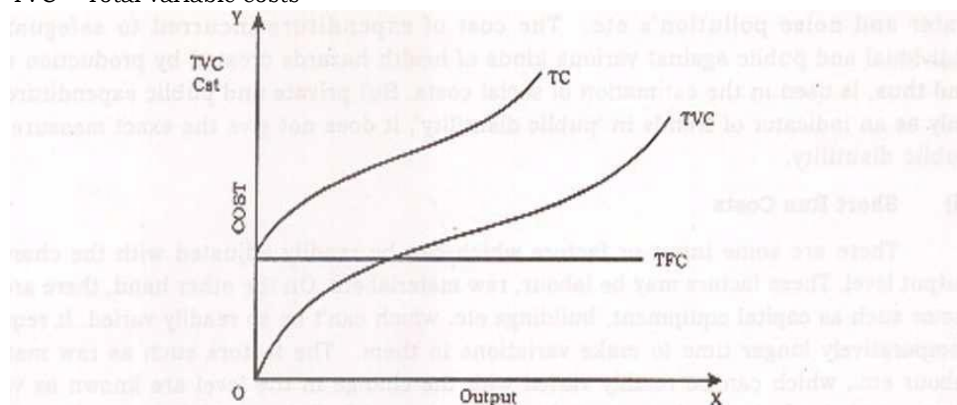
Total cost of business is the sum of its total variable costs and total fixed costs.

$$TC = TFC + TVC$$

Where TC = Total costs

TFC = Total fixed costs

TVC = Total variable costs



Since the total fixed cost remain constant whatever the level of output, the total fixed cost curve is parallel to the X-axis. It is seen in the fig. 1.1. that total fixed cost curve starts from a point on the Y-axis meaning thereby that total fixed cost will be incurred even if output is zero. On the other hand, the total variable cost curve (TVC) rises upward showing thereby that as the output is increased, the total variable costs also increase. The total variable cost curve TVC starts from the origin which shows that when output is zero, the variable costs are also nil. It is also noted that TC is a function of the total output.

$$TC = f(Q)$$

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

11.3 Self-Check Questions

11.3 (a) What is Social Cost?

11.3 (b) What do you understand by variable cost?

11.4 THE SHORT-RUN AVERAGE COST CURVES

The concept of average costs is more frequently and usefully used in economic theory.

(a) Average Fixed Cost (AFC)

Average fixed cost is the total fixed cost divided by the number of units of total output produced. Therefore,

$$AFC = TFC/TQ$$

Where TQ is total output produced. It is seen from the figure 1.2 that the average fixed cost continuously falls throughout.

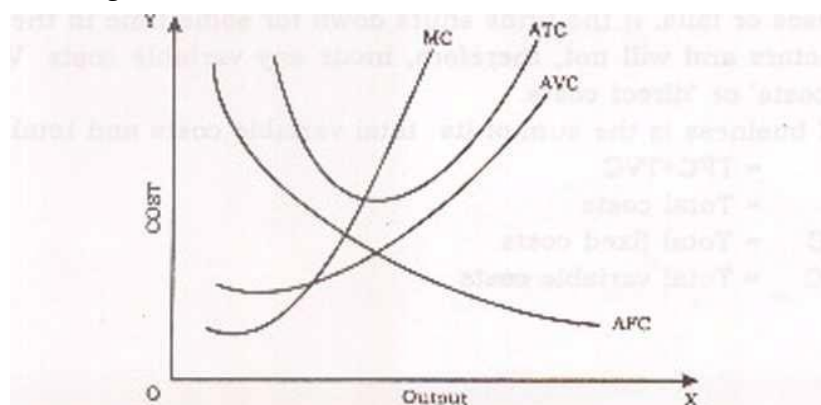


Fig. 1.2 : Short-Run Average and Marginal Cost Curves

The average fixed cost curve possesses another property; if we pick up any point on the (AFC) curve and multiply it with the corresponding quantity of output produced, the product will be same because total fixed cost remains constant throughout. (b) Average Variable Costs (AVC)

Average variable cost is the total variable cost divided by the number of units of output produced. Therefore,

$$AVC = TVC/TQ$$

Thus, average variable cost is variable cost per unit of output. The average variable cost will generally fall as the output increases from zero to the normal capacity output due to the occurrence of increasing returns. But beyond the normal capacity output the average variable cost will rise steeply because of the operation of diminishing returns.

(c) Average Total Cost ATC or AC

Average total cost of what is simply known as average cost is the total cost divided by the number of units of output produced.

$$\text{Average Cost} = \text{Total cost} / \text{Output}$$

$$AC = TC/TQ$$

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.

$$TC = TVC + TFC$$

$$AC = TVC + TFC / TQ$$

$$AC = TVC/TQ + TFC/ TQ$$

$$AC = AVC + AFC$$

The shape of average total cost will depend on average fixed cost and the average variable cost. We find in the Fig. 1.2 that in the beginning, both AVC and AFC curves fall, the ATC curve, therefore, falls sharply in the beginning. When AVC begins rising, but AFC curve is falling steeply, the ATC curve continues to fall. But as output increases further, there is a sharp rise in AVC which more than offsets the fall in AFC. Therefore, the ATC curve rises after a point. Therefore, the average cost curve (ACC) like the AVC curve first falls, reaches its minimum value and then rises. Average cost curve is therefore almost of a 'U' shape.

(d) Marginal Cost

The concept of marginal cost occupies an important place in economic theory. Marginal cost is 'addition' to the total cost caused by producing one more unit of output. In other words, marginal cost is the addition to total cost of producing n units instead of n-1 units where n is a given number.

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

Since marginal cost is a change in total cost as a result of change in output, it can be written as:

$$MC = \text{Change in TC} / \text{Change in TQ}$$

MC is independent of fixed cost. Since fixed costs do not change with output, there are no marginal fixed costs when output increases.

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

Marginal cost is independent of fixed cost and, thus, can be directly attributed to change in variable cost.

$$MC = \text{Change in TVC} / \text{Change in TQ}$$

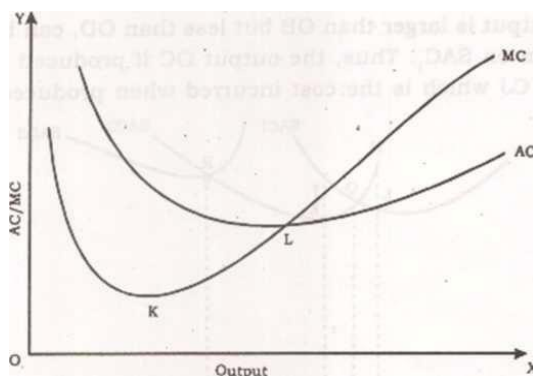
11.5 THE RELATION BETWEEN AVERAGE AND MARGINAL COST CURVES

The relationship between the marginal cost and average cost is same as that between any other marginal average quantities. It can be illustrated with the help of following example. Table 1.1

Units of Output	Fixed Cost (Rs.)	Variable Cost (Rs.)	Total Cost (Rs.)	Average Cost (Rs.)	Marginal Cost (Rs.)
1	42	60	102	102	
2	42	110	152	76	50
3	42	150	192	64	40
4	42	210	252	63	60
5	42	310	352	70.4	100
6	42	540	582	97	230

The relationship between average and marginal cost can be shown with the help of fig. 1.3

when marginal cost is above average cost, the average cost rises but when marginal cost is below the average cost, average cost falls. When marginal cost, stands equal to the average cost, the average cost remains constant. The minimum point of marginal cost curve comes prior to the minimum point of average cost curve. It is not necessary that when average cost curve is falling, marginal cost curve will also be falling what can be said definitely is that, when average cost curve is falling, marginal cost curve will be below the average cost curve.



Relationship between Marginal Cost and Average Cost Curves

11.5. WHY IS AVERAGE COST (AC) CURVE U-SHAPED?

Basically (AC) average cost curve gets its shape because of the operation of the law of variable proportions. In the beginning, the proportion of fixed factors is relatively large as these are under-utilized in the beginning. Therefore, AC will fall with increase in the amount of variable factors. When the proportion between fixed and variable factors is most desirable, AC touches its minimum. Later on, proportion of variable factors becomes relatively larger and, therefore, AC swings upward. It can be expressed in another manner too. We know that AC is the addition of AFC and AVC. In the beginning both AFC and AVC fall with increase in output, therefore, AC should decline as more is produced. AC does not necessarily go up as AVC begins to rise because during this period fall in AFC may be greater than rise in AVC only when increase in AVC is more than a decrease in AFC, that AC will move up. Thus, AC has a minimum point at a large output while AVC records a minimum at a lower output. The availability of internal economies and diseconomies also offer an explanation to the U-shape of average cost curve.

11.6 Self-Check Questions

11.6 (a) Write down the Formula of Average Cost.

11.6 (b) How do you Calculate Average Fixed Cost.

11.6 (c) Average Cost will fall with _____ in the amount of variable factors.

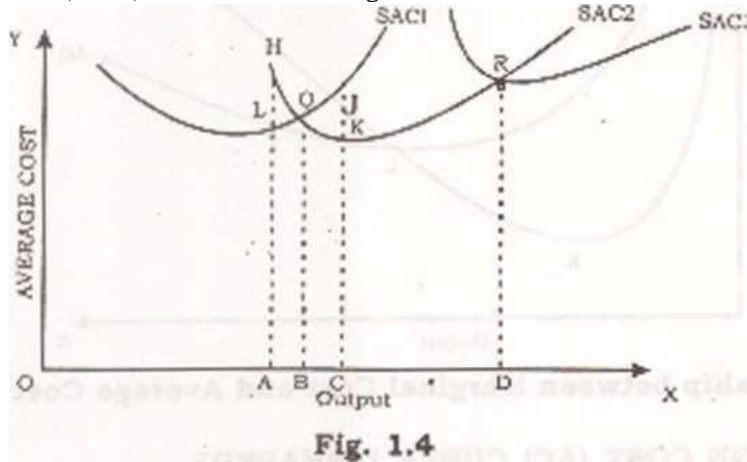
11.7 LONG RUN AVERAGE COST CURVE

In the long run, none of the factors is fixed and all can be varied to expand production and, therefore, the firm has no fixed costs in the long run. A long run cost curve depicts the functional relationship between output and long run cost of production. Long run average cost curve depicts the possible average cost of producing all possible level of output.

In order to understand the derivation of long run average cost curve, we consider the three short run average cost curves as shown in the figure 1.4. These short run average cost curves are also known as plant curves. In the short run, the firm can be operating on any short run average cost curve, given the size of the plant. It is seen that up to OB amount of output, the firm will operate on the short run average cost curve SAC, though it could also produce with short run average cost curve SAC₂ because up to OB amount of output production on SAC, curve entails lower cost than on SAC₂. For instance, if the level of output OA is produced with SAC, it will cost AL per unit and if it is produced with SAC₂, it will cost AH per unit. It is clear from the figure that AL is smaller than AH. Similarly, all other output levels upto OB can be produced more economically with the smaller plant SAC₁. than with the larger plant SAC₁. It is thus clear that in the long run the firm will produce an output which is larger than OB (but less than OD), than it will be economical to produce on SAC. It will be seen from the figure that the output ia larger than OB but less than OD, can be produced at a lower cost per unit on SAC₃ than on SAC_r. Thus, the output OC if produced on SAC_a costs OK per unit which is lower than. C.J which is the coat incurred when produced on SAC₁.ssss

Therefore, if the firm plans to produce between outputs OB and OD, it will employ the plant corresponding to short-run average cost curve SAC₂. If the firm has to produce an output which exceeds OD, then the cost per unit will be lower on corresponding to the short-run average cost curve SAC₁.

It is, thus, clear that in the long run the firm has a choice in the employment of a plant,



and it will employ the plant which yields possible minimum unit cost for producing a given output. The long run average cost curve depicts the least possible average cost for producing various levels of output when all factors including the size of the plant have been adjusted.

Suppose now that the number of alternative plants that the firm can have are very large. Then instead of having a wide area for each short period AC, now the LAC will have one point from each SAC, the point of tangency LAC and the relevant SAC. The LAC then envelops the SACs hence it is known as the 'envelop curve'. As Leftwich writes 'the point of tangency is taken to minimum cost for any given output, the firm should use the scale of plant whose short run average cost curve is tangent to the long-run average cost at that output.

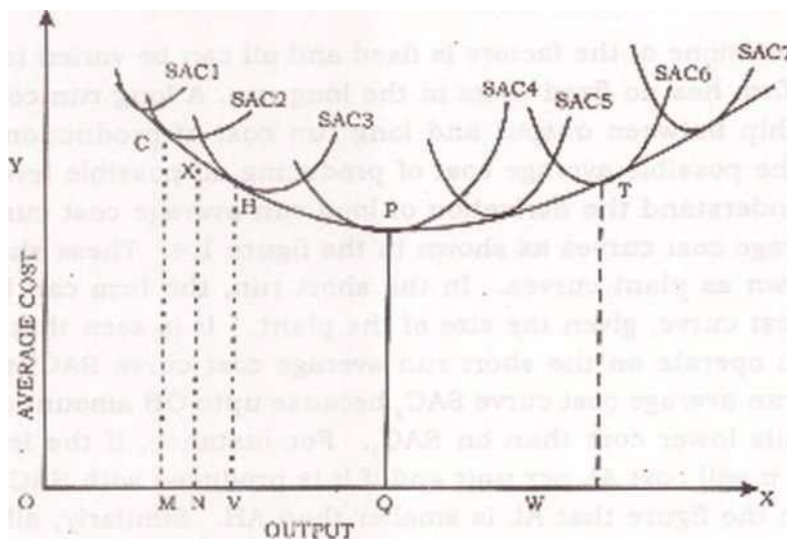


Fig. 1.5 Long Run Average Cost Curves

The LAC is tangent to only the lowest SAC at the minimum point of the latter. In case of all those plants which come earlier the point of tangency is prior to the minimum point of SAC, indicating that a

bigger plant reduces cost. But in the case of plants coming after the lower SAC, the points of tangency are to the right of the minimum of SACs implying that over utilization of a smaller plant reduces cost rather than the construction of a bigger plant. Thus, LAC is the locus of all those points which represent minima of cost of production for various output levels.

11.8 LONG-RUN AVERAGE COST CURVE IN CONSTANT COST CASE

If the production function is linear and homogeneous and also the prices of inputs remain constant, then the long run average cost will remain constant at all levels of output as depicted in fig. 1.6.

It will be noticed that all the short run average cost curves such as SAC₁, SAC₂ and SAC₃ have the same minimum average cost of production. This means that whatever the size of the plant, the minimum average cost of production is the same. This implies that all factors can be adjusted in the long run in such a way that the proportion between them always remains optimum.

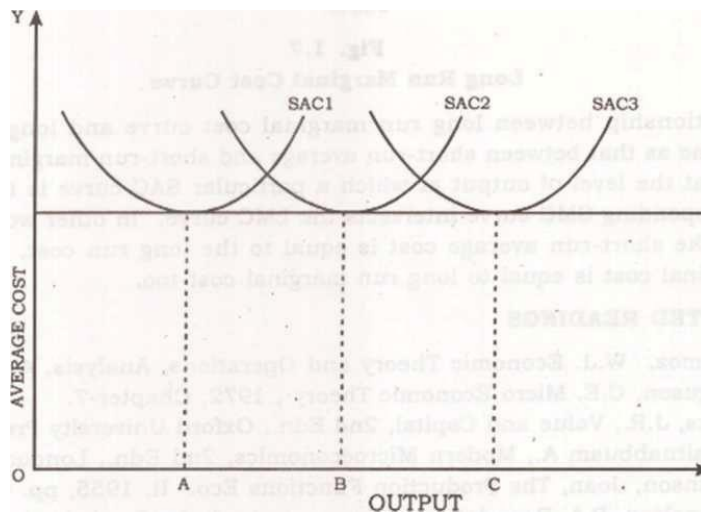


Fig. 1.6 Long Run Average Cost Curve

11.9 LONG-RUN MARGINAL COST CURVES

The long run marginal cost curve can be directly derived from the long run total cost curve, since the long-run marginal cost at a level of output is given by the slope of the total cost curve at the point corresponding to that level of output.

In the figure 1.7 long run marginal average cost curve which is U-shaped. It is noticeable that long run marginal cost (LMC) curve is flatter than the short-run marginal cost curves.

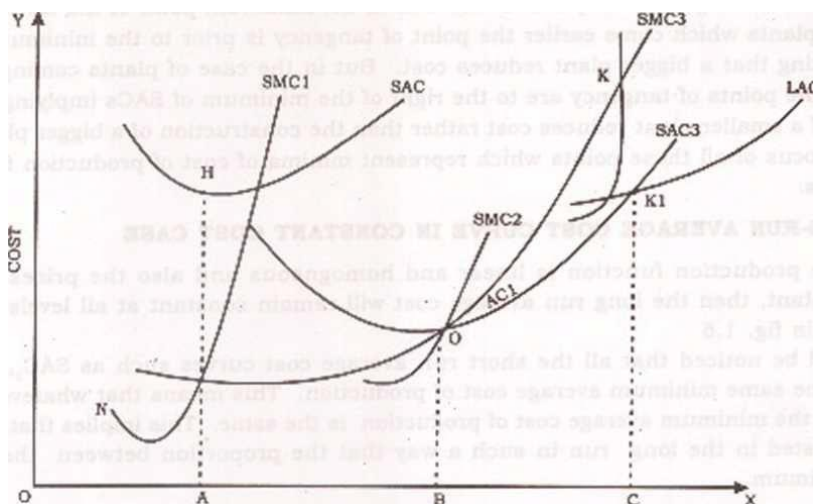


FIG. 1.7 Long Run Marginal Cost Curve

The relationship between long run marginal cost curve and long run average cost curve is the same as that between short-run average and short-run marginal cost curve. It is also seen that at the level of output at which a particular SAC curve is tangent to the LAC curve the corresponding SMC curve intersects the LMC curve. In other words, at the level of output where the short-run average cost is equal to the long run cost, the corresponding short-run marginal cost is equal to long run marginal cost L_{oo} .

11.10 Answer to Self-Check Questions

11.3 (a) Social Costs are the costs which society bears on account of production of a commodity.

11.3 (b) The costs which are incurred on the employment of variable factor of production and their amount can be altered in the short run when output rises or falls.

11.6 (a) Average cost = Total cost/Output

11.6 (b) Average Fixed Cost = TFC/TQ

11.6 (c) Increase.

11.11 Short Questions

1. Why is Average Cost Curve U-Shaped?

2. Explain Opportunity Cost and Alternate Costs.

11.12 Long Questions

1. What is Total Cost, Average Cost and Marginal Cost? Explain the relationship between average cost and marginal cost with the help of a table and diagram?

2. Why is the short-run average cost curve U-shaped? Also discuss the relationship between the short-run average cost curve and short run marginal cost-curve. Does this relationship hold good in the long run?

3. Why is the U-shape of the long-run average cost curve less pronounced than that of the short run average costcurve?

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Lesson No. 12

PRICE-OUTPUT DECISIONS UNDER PURE COMPETITION

STRUCTURE

- 12.1 The Market Forms
- 12.2 Price-output put Decisions in the Short-Period
- 12.3 The Short-Period Supply Curve of the industry.
- 12.4 Self-Check Questions
- 12.5 Price Output Decisions in the Long Period
- 12.6 Equilibrium and Increasing Returns
- 12.7 Answer to Self-Check Questions
- 12.8 Short Questions
- 12.9 Long Questions
- 12.10References

The main task of theory of production is to discover the nature of supply function of an industry. The supply function of curve of an industry is made up of the individual supply curves of the firms which make up the given industry. Hence we shall, first enquire into the nature of an individual firm's supply curve and on the basis of it shall reach certain conclusion with regard to supply curve of an industry under conditions of pure competition. But we must first be clear about the meaning of the term "pure competition".

12.1 THE MARKET FORMS

There are different forms of markets that can be observed in a capitalist economy. These can broadly be classified in to (a) perfect markets; and (b) imperfect markets. The latter type may further be classified into (i) monopoly (ii) monopolistic competition, (iii) oligopoly (of which duopoly is only a special case), (iv) monopsony and (v) bilateral monopoly.

A perfect market is one in which there prevails perfect competition. Competition in a market is regarded to be perfect, if the following conditions are satisfied. First, the good must be homogeneous, that is consumers or the buyers regard all the individual units of it as equal in all respects regardless of whether a unit of the good is being supplied by this firm or that firm. Second, the number of firms selling the particular good is so large that change in the supply of an individual firm has no significant effect on the total supply of the industry. Moreover, there is free competition among the firms. Again, there is a large number of buyers in the market, so large that a change in the demand of any one of them has no significant effect on the total demand for the good. Third, there is perfect mobility of buyers and sellers as well as of all the factors of production. This implies that buyers can freely move from one part of the market in order to sell at the highest possible price. Similarly, factors of production can also move from a low paid to high paid industry. Fourth, there is free entry into and a free exit from the industry, that is an individual firm is free to enter or leave the industry without any restriction. Fifth, there should be perfect knowledge on the part of the sellers as well as the buyers with regard to price being paid and charged. Sixth, there should be absence of cost movement or transport as between different parts of the market. Lastly absence of irrational preferences on the part of buyers is also assumed.

If all the above conditions are satisfied, there will tend to be one & only one price of a given good at any given time & the market will be said to be a perfect market.

However, it is almost impossible to come across such a market in real life. In this sense, it is only an abstraction and a logical concept. Chamberlin has given a less straight concept of "pure competition." Pure competition is said to exist in a market, if only the following conditions are satisfied:

- i) The good is homogenous.
- (ii) The number of sellers as well as buyers is very large and there is free competition among them.
- iii) The enter and exit are free: These are the minimum conditions necessary for there to be one and only one price of a good at any given time.

The important point to note is that in perfectly, even purely, competitive market an individual seller cannot influence the price of the good by his own individual action: He is not price maker but is only a price taker.

In principle, when competition in a market is perfect in some way or the other, the market is said to be imperfect. Some important forms of imperfect market are as follows:

- (i) Monopoly: When there is only one firm in the given industry producing and selling a good which has no close substitutes, but the number of buyers is large and there is free competition among them.
- (ii) Monopolistic Competition: When there is a large number of freely competing firms producing and selling products, though not identical, but similar and therefore, very close substitutes of one another.
- (iii) Oligopoly: When there are few competing firms so that a change in the output and price of any of them has a significant influence on the total supply of the good as well as the price of the good.

When the number of firms is so small as two only, the market form is described as duopoly. (iv) Monopsony: When there is only one buyer in the market where the sellers are large in the number and are freely competing among themselves.

(v) Bilateral Monopoly: When there is only one seller and also only one buyer of given good so that there is monopoly on both sides.

However, in the present lesson we shall be discussing price-output decisions on the assumption of pure competition only.

12.2 PRICE-OUTPUT DECISIONS IN THE SHORT-PERIOD

We would like to stress the point in the very beginning that under pure or perfect competition, an individual firm does not fix its price. The reason is that the elasticity of demand for the good of the individual firm under pure or perfect competition is infinite. This means that it can sell any quantity at the ruling price in the market. Therefore, it should have no motive to sell at price lower than the ruling price. On the other hand, if it raises its price the producers of the rival firms being perfect substitutes of it (the good being homogeneous); none will buy from all buyers will shift to the rival firms. Hence a competitive firm will not experiment with price-making. It will only try to adjust its output to the prevailing price situation in order to maximize profits or to minimize losses. If it is running at a loss in short. It is not a price maker but quantity adjuster. It takes the price as given, which has been determined by the interaction of forces of aggregate demand and aggregate supply of the commodity.

In the short period a firm can adjust its output without changing the size of its fixed plant. As a matter of fact, short period is defined as a period which is so short that it is not possible for an existing firm in the industry to change the size of its fixed plant. So we can say that in the short period the number and the size of the individual firms in the industry remain constant and the individual firm can change its output only by changing the quantities of the variable factors used with the fixed plant of the firm.

Now the question is how does an individual firm vary its output in response to change in the price of the good? For, this will provide the clue to the nature of the firm's supply curve in the short period. Since we assume that the objective of a firm is to maximize its profits or to minimize its losses in the short period, we must know the condition of the maximization of the profits. The necessary or the 'first order' condition of it is that the firm's marginal cost must equal its marginal revenue. If the firm's revenue is greater than it will be adding to its total costs by increasing its output, and thus will have increased

profits. Hence the firm will not be in equilibrium and will tend to expand its output. On the other hand, if the marginal cost is greater than the marginal revenue, it means that the additional output adds more to the total revenue and will tend to reduce its output. The profits are maximum or bases are minimum when the firm's marginal cost equals its marginal revenue. However, this is only a necessary but not as sufficient condition. The additional or "second order" condition is that to the right of equilibrium point, the marginal cost must be greater than the marginal revenue. If it is otherwise, as is the case at points of Fig.1 the firm's profits will be increased by an increase in its output. But both, the "first order" and the "second order" conditions are satisfied at P2. Therefore, the firm's profits are maximized at output Q2 and not at Q1 in Fig. 1

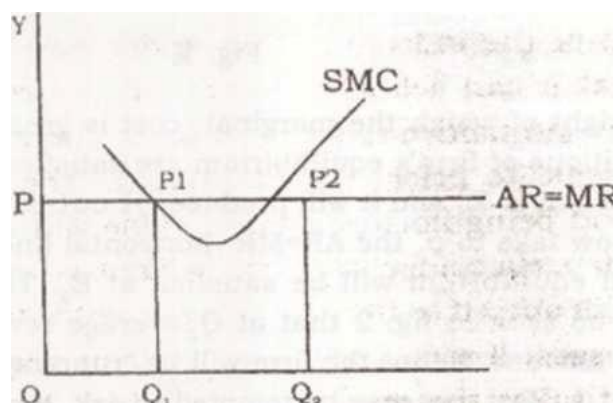


Fig.1

Keeping in view the argument of the above paragraph, we can now explain the output decision of the individual firm in the short period with the help of the following diagram. Under pure competition, the demand for the product of an individual firm is perfectly elastic. Therefore, the average revenue of the firm will remain constant with changes in its output as shown by the horizontal curve Fig.2. Therefore, the marginal revenue of the firm, as it was explained in the previous lesson E_1 will equal its average revenue, and also be constant. Thus, the various horizontal lines like $AR_1 = MR$, $AR_2 = MR$ In fig. 2 represent the average revenue as well as the marginal revenue of the firm at different levels of its output. Each $AR=MR$ line refers to particular price level such as P_1 , P_2 , P_3 ... etc.

Let us suppose that the ruling price is P_1 . $AR_1 = MR$ line will then represent the average as well as the marginal revenue of the firm. AVC curve represents the average as well as the marginal revenue of the firm. AVC curve represents the behaviour of the average variable cost of the firm in the short period, while SAC and SMC represent the behaviour of the short-period average costs and short-period marginal costs of the firm respectively, the rising SMC curve cuts the MR_1 line at E_1 . Where the short-period marginal cost equals the marginal revenue of the firm and to the right of which the marginal cost is greater than the marginal revenue. Hence both the conditions of firm's equilibrium are satisfied at E_1 . Therefore, at price p_1 the firm will be in equilibrium at E_1 and it will produce Q_1 output. It is earning here super normal profits. If the price now falls to p_2 the $AR=MR$ horizontal line also fall to the level $AR_2 = MR_2$. Now the condition of equilibrium will be satisfied at E_2 . Therefore, the firm will reduce its output to Q_2 . It can be seen in fig. 2 that at Q_2 average revenue of the firm is less than its average cost by $E_1 E_2$ amount. Hence the firm will be running at a loss, though loss will be the minimum at output IQ_2 . But, you may be tempted to ask why the firm does not shut down its plant and stop producing. The answer to this question is that the firm cannot leave the industry in the short period and hence it has to incur fixed costs even when it stops production. But by producing Q_2 out put it is able to recover at least a part of its fixed costs and thus its losers are less than would be, if it stopped production completely. If the price falls still further to P_4 than $AR_3 = MR_3$ line will represent the average and the marginal revenue of the firm. The equilibrium of the firm now takes place at E_3 and the firm decides to cut back its output to Q_3 . Here the price just equals the average price E_3

and the firm a further fall in the price, it can be seen by imagining a MR line below MR., line that the firm will produce and supply nothing at a price less than P. in Fig. 2 above which equals the average variable cost price P. is known as “shut down’ prices and point E₃ is known as “shut down* point of the firm.

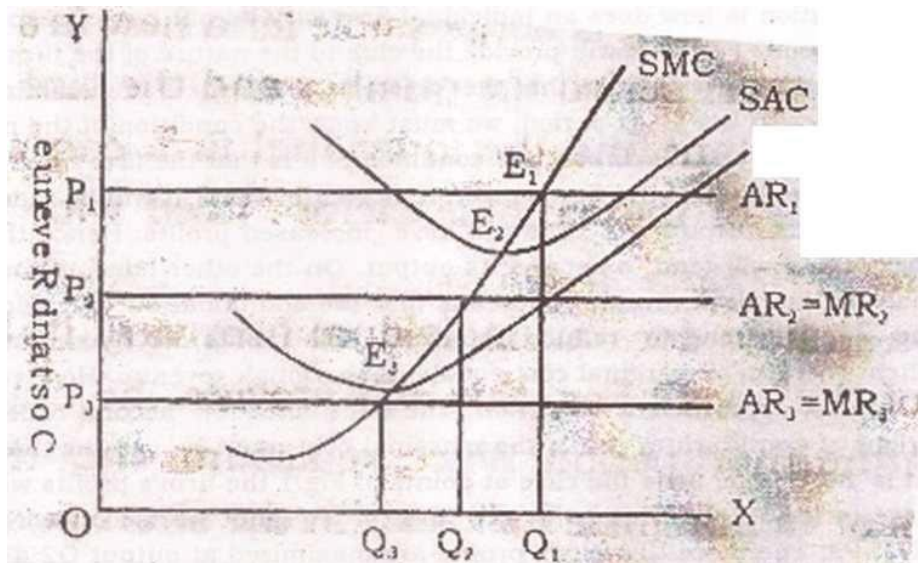


Fig. 2

The above analysis leads to the following conclusions: (i) The individual firm increases its output and supply with an increase in the price of the good concerned and reduces its output and supply with a decrease in the price which implies that the firms; Short period supply curve is positively sloped, that is rises upwards to the right; (ii) Since all points of equilibrium lie on the rising portion of the firm’s short period marginal cost curve it is this portion of the SMC curve which lies behind the shore period supply curve of die firm and explains the positive slope of the supply curve (iii) Since the firm slops producing at price* lower than the average variable cost therefore, the short period supply curve of the firm does not extend below the level of three minimum average variable cost as shown in Fig. 2. The supply curve of the firm is portrayed below

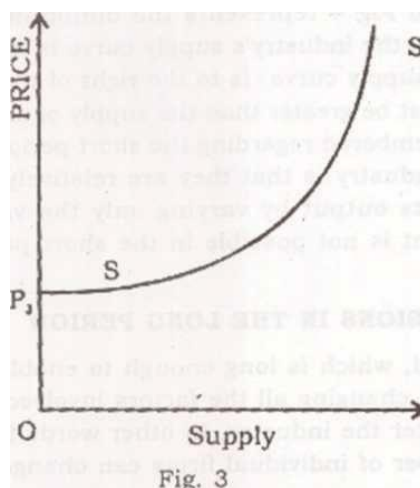


Fig. 3

12.3 THE SHORT-PERIOD SUPPLY CURVE OF THE INDUSTRY

An industry under pure competition is made up of a large number of firms. If for the sake of simplicity of analysis, We suppose, that all the individual firms employ identical factors of production and technology, all of them will have identical cost curves. Therefore, at any given price every firm will be producing the same

output as the other. In terms of Fig. 2 at price P , every firm will be producing OQ , output. If there are, say firms in the industry, the industry's output at price P_1 will be OQ_2 . and so on since at a price less than P_2 that is at a price less than the minimum average variable costs, no firm will produce any positive output, the industry's output, too will be Zero at any price less than P_3 .

What has been said above implies that the industry's short-period supply curve is only a magnified form of the individual firm's short-period supply curve. It is in fact, derived by the process of lateral summation of individual short period supply curve of all the firms in the industry or by multiplying the individual firm's supply curve by the total number of firms in the industry. However, it should be noted that the latter statement is true only if all the firms have identical cost curves. This naturally implies that the industry's short period supply curve is also positively sloped like the short- period supply curve of the individual firm. In fig 4 above S_2 , represents the short period supply curve of an individual firm while S_1 represents the supply curve of the industry. Both have positive slope as both are rising upwards to the right. As in Fig. 2 price P_3 in Fig 4 represents the minimum average variable costs of the individual firm. Like the firm's the industry's supply curve is also cut off at this level as shown in the figure. The industry's supply curve is to the right of the firm's supply curve, for at any price, the industry supply must be greater than the supply of an individual firm in the industry.

A final point to be remembered regarding the short period supply curve of the individual firm as well as that of the industry is that they are relatively inelastic because in the short period. A firm can change its output by varying only the variable factors while the other remain fixed. Full adjustment is not possible in the short period. Because the scale of the plant remains fixed.

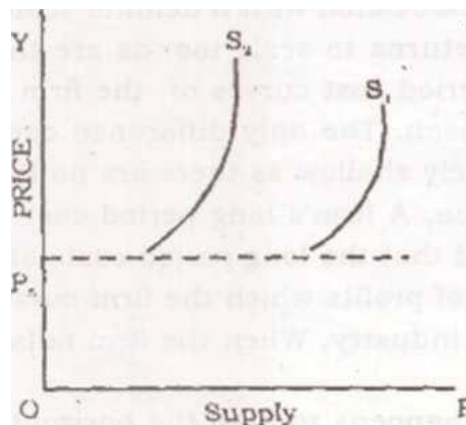


Fig.4

12.4 Self-Check Questions

12.4 (a) Under which market structure does a firm has no control over the price of the product.

12.4 (b) Name a market which have only two Firms.

12.5 PRICE OUTPUT DECISIONS IN THE LONG PERIOD

Long period is a period, which is long enough to enable the individual firm to change the scale of its operations by changing all the factors involved, and enables the existing firm to leave and new firms to enter the industry. In other words, long period is a period in which the size as well as the number of individual firms can change.

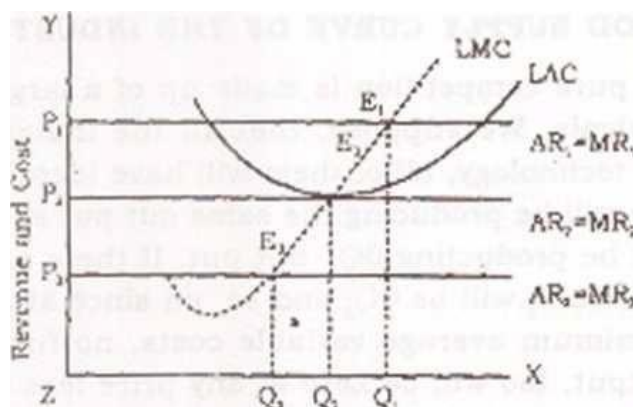


Fig.5

If the demand conditions for the product of the industry are such that an individual firm is earning super-normal profit, it will try to increase its scale. On the other hand, if the conditions are such that it is not possible to recover even costs, the firm will seek to decrease the scale of its operations. A long period is indeed made up of a number of short periods, each short-period is associated with a definite scale of the plant. If we assume that there are non-proportionate returns to scale too, as are the non-proportionate returns to factor proportions, the long period cost curves of the firm will also be U-shaped, as it was observed in the preceding lesson. The only difference compared to the short period cost curve, is that these are relatively shallow as there are no fixed costs in the short period, for they are ruled out by definition. A firm's long period cost curve is like those depicted in Fig.5 above. It should be noted that the long period costs of a firm include its normal profit that is that minimum amount of profits which the firm must earn in the long period if it has to continue to be in the given industry. When the firm fails to earn this minimum, it leaves the industry.

If the price of the good happens to be p_1 the horizontal $AR_1 = MR_1$ represents the firm's average revenue as well as marginal revenue. The firm will tend to produce that amount of output condition of profit maximization. Thus, the profit maximizing output will be Q_1 . But at this output, the firm's average revenue is much above the average cost. Hence, the firm will be earning super normal profit which will attract new firms into the industry. The competition will increase and consequently the price will come down to P_2 . Now the profit maximization output of the firm will be Q_2 at which the firm's average revenue just equals its average costs and the firm just manages to earn normal profit. Assuming all firms to be identical, every firm will fail to recover even its costs as would be the case at price P_3 in fig. 5. The firm fails to earn even normal profits. Hence the individual firms will begin to leave the industry. The total output and supply of the industry will decrease and the price will ultimately rise to p_3 so that the remaining firms are able to earn just normal profit. Thus, the point in Fig. 5 above represents the long period equilibrium of the firm and its long period equilibrium output is Q_2 .

If we focus our attention on the point E_2 of long period equilibrium of the firm, we can specify the conditions of the long period equilibrium of the firm which are as follows:

(i) the firm's long period marginal cost must equal its marginal revenue, (ii) the marginal cost must be rising and (iii) the average cost of the firm equals its average revenue. The last two conditions contain within themselves the following conditions also; (a) the firm's total costs equal its total revenue and therefore, (b) the firm earns just normal profits neither more nor less. Moreover, in the long period the firm's price or average revenue equals the average cost as well as the marginal cost; in other words, in the firm's long period equilibrium under pure competition, the firm's $AR = MR = MC = AC$

One thing must be noted with regard to long run supply curve of the industry that it is so derived by the lateral summation of the long run marginal cost curves of a given number of firms. It is so because the long run supply of a firm is determined when the price of the product equals both the marginal cost as well as the minimum average cost (price = $LMC = LAC$). Secondly, the number of firms in the industry goes on

changing as the price of product changes. Therefore, the quantity supplied by an industry in the long-run at a given price will be determined by the optimum output industry in the long-run at given price will be determined by the optimum output of a firm in the long run multiplies by the number of firms in the industry at that price.

12.6 EQUILIBRIUM AND INCREASING RETURNS

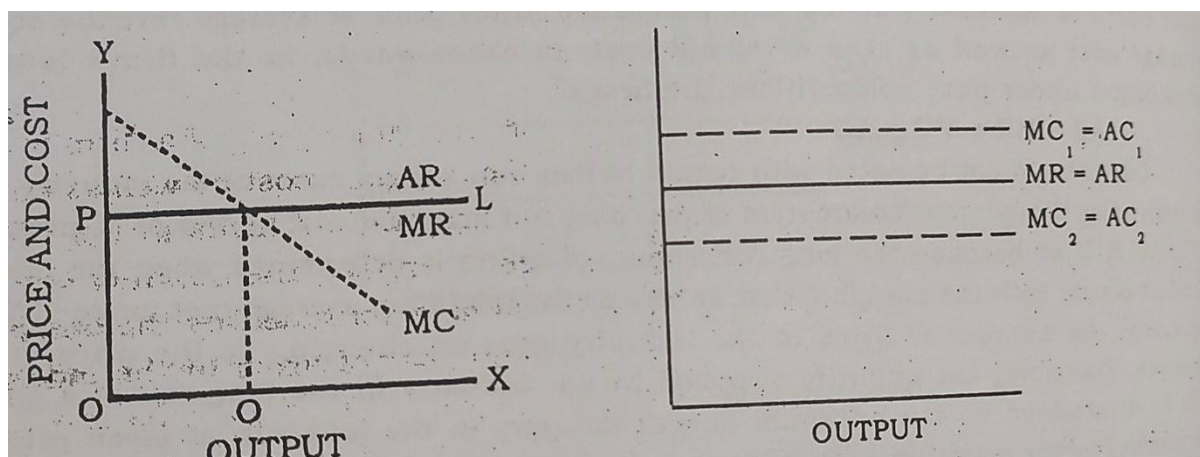
While discussing the conditions of a firm's equilibrium in section 2 above we have specified two conditions for a firm to be in equilibrium. First, the marginal cost must equal its marginal revenue. Second, to the right of the point of equality between the Me and MR (i.e., the point of equilibrium the Me must be greater than MR.

In the light of the above conditions, it can be seen that when the firm is producing its output under the law of increasing returns, its equilibrium under conditions of pure or perfect competition shall be in doubt. When the production of the firm is subject to increase returns, the marginal cost of the firm will go on falling with increasing output as shown by the MC curve in fig. 9 (i) below. But if the firm is operating under conditions of pure competition, its average revenue and marginal revenue will remain constant with increase in its output as indicated by the horizontal $P = AR = MR$ line in Fig. 9 (i) The firm's MC and MR are equal at output Q. But this is not the point of equilibrium output of intersection between the firm's MC and MR curves (i.e., at R) the second order conditions of the firm's equilibrium are not satisfied. To the right of R, the firm's MC is not greater than its MR. On the contrary, its MR is greater than its MC. The firm can very well see that it can increase its profits by expanding its output. But, if the increasing returns are not exhaustible the firm's marginal cost will go on falling, while its marginal revenue will remain the same. Hence equilibrium will not take place under pure competition if it continues to enjoy increasing returns.

However, it may happen that as a firm goes on expanding, it may become SO large that it may begin to control a very substantial portion of the total supply of the market. The market will become imperfect in some form or the other, it may be transformed into a monopoly or a duopoly or an oligopoly. In an imperfect, market the AH and MR curves of a firm fall downwards to the right. If the firm's MR is falling more rapidly than its MC the firm can attain a state of equilibrium under increasing returns. But there is no longer pure competition. Hence perfect as well as pure competition and static equilibrium are said to be incompatible under increasing returns. To quote Prof. Kaldor, "Long period static equilibrium and perfect competition are incompatible assumptions."

It may also be appreciated that the firm will not be in equilibrium at any positive output even when the firm is producing under constant returns. This can be illustrated with reference to Fig. 2 (ii) above. When there are constant returns, the firm's marginal costs remain constant. If the firm's marginal costs are represented by the horizontal line MC, no output is profitable. So, the firm will not produce any output. If the marginal costs are represented by the horizontal line MC₂, the firm's profit will go on increasing indefinitely with increase in its output. Hence the firm's profit will go on increasing indefinitely with increase in its output. Hence the firm's equilibrium will be indeterminate as long as there is pure competition. If the firm's Me line happens to coincide with its MR line, the equilibrium is again indeterminate, for it can take place anywhere on the MC = MR line.

However, it may be kept in mind that equilibrium of the firm under pure competition will take place if it is the industry and not the individual firm which is operating under increasing returns. This may happen when the growth of the industry' generates external economics for the individual firms.



12.7 Answer to Self-Check Questions

12.4 (a) Perfect Competition.

12.4 (b) Duopoly.

12.8 Short Questions

1. Discuss different market forms in detail.
2. Discuss the relevance of perfect competition and monopoly in the present context.

12.9 Long Questions

1. How will you derive the short-period supply curve of the industry?
2. Demonstrate that under pure competition the output tends to be optimum and the price tends to be minimum.
3. Do you agree with the view that the firm's equilibrium under competition is in determining when there are increasing returns?
4. Derive the supply curve of an industry from the cost curves of the individual firms and show that supply is more elastic in the long period than in the short period.
5. Discuss the fact the slope of the long run supply curve depends on the laws of production.
Prove that increasing returns and perfect competition are incompatible.
6. Bring out the distinctive features of the short-run supply curves of an industry under perfect competition.

12.10 References

- | | | |
|----------------------|---|---|
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PRICE-OUTPUT DECISIONS UNDER MONOPOLY AND DISCRIMINATING MONOPOLY

STRUCTURE

- 13.1 Monopoly-Main Features
- 13.2 Equilibrium Under Monopoly
- 13.3 Price-Discriminating Monopoly
- 13.4 Conditions for Discrimination
- 13.5 Self-Check Questions
- 13.6 When is Price Discrimination Profitable?
- 13.7 Condition for Equilibrium Under Price-Discriminating Monopoly
- 13.8 Degrees of Price Discrimination
- 13.9 Is Price-Discrimination Desirable
- 13.10 Self-Check Questions
- 13.11 Answer to Self-Check Questions
- 13.12 Short Questions
- 13.13 Long Questions
- 13.14 References

The two limiting cases of market situation are those of pure competition and pure monopoly. These are rarely found in the market. We have already discussed how price and output are determined in a perfectly competitive situation. We are now to study the way in which price and output are determined under monopoly and price discriminating monopoly.

The monopoly situation is an extreme form of imperfect competition. Monopoly can take the form of private monopoly or public monopoly. Similarly, there can be simple monopoly or discriminating monopoly. Under simple monopoly, the monopolist charges uniform price from all the customers of his product. But under discriminating monopoly he charges different price from different customers for the same product or charges different prices for different units of the product, from the same customer. Price discrimination occur when different units of the same commodity are sold for different prices for reasons not associated with differences in costs. The essence of monopoly is the firm's power to influence the price of a product.

It was A. Cournot who developed the theory of simple monopoly in his book *Researches into the Mathematical Principles of the Theory of Wealth* (1838).

13.1 MONOPOLY-MAIN FEATURES

The monopolist is the sole producer or supplier of the product. Under perfect competition there are numerous firms in an industry producing homogeneous product. No single firm exercise any influence over the price of the commodity. All the firms are merely price-takers. They are not price makers. They adjust their output to the level of prevailing price, determined by market forces. But under monopoly there is only one seller or supplier of the commodity. The monopolist thus constitutes both firm and industry. He has full control over the supply of the commodity. But on the side of demand there is perfect competition among the buyers as they happen to be in large number. The monopoly is on the supply side only. The control over supply of the product enables the monopoly firm to acquire exclusive power to fix any price for its product or to put any output on the market for sale leaving it to consumers to decide

about the market clearing price. The monopolist thus comes to exercise control over the price of his product. In other words, he is a price-maker and not a price-taker. He acts on the belief that the amount which he can sell depends on the price he would charge.

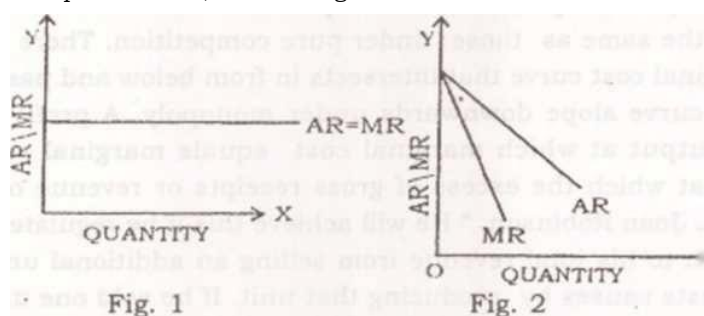
Secondly, the product of the monopolist has no close substitutes: if close substitutes are available, then monopolist does not enjoy monopoly power. It is then quite likely that he may incur heavy losses, if he raises the price of the produce beyond a certain limit, but it also does not mean that there are no substitutes at all. Substitutes are there but they are remote substitutes. Consequently, the monopolist faces very small competition that can be ignored. Thus, the cross elasticity of demand for the monopolist product is low or zero.

Thirdly, the monopoly can remain in existence only if strong barriers to the entry in to the industry exist. Unlike perfect competition where there is free entry and exit, there are barriers to entry in pure monopoly. Among the barriers are found patents and licensing by government agencies, raw material control, the establishment of brand names, pricing policy designed to keep rivals out of the industry, large capital investment necessary to enter the industry and the size of the market. The entry of new-firm is thus banned. Potential competitors can also be intimidated by threats of sabotage. Thus, various natural, legal and technological factors are responsible for the emergence and growth of monopolies. New firms cannot enter and compete with the monopoly firm, The monopoly firm thus continues to enjoy the privileged position even in the long run. A firm working under perfect competition can earn only normal profits in the long run because supernormal profits are eliminated with free entry of firms. On the other hand, the monopoly firm protects its supernormal profits by restricting their entry of prospective competitors in the market. The monopoly firm thus continues to enjoy certain privileges which are denied to competitive firm. The monopolist can increase the sales of his product by adjusting the price downward.

Fourthly, like a producer working under perfect competition, the monopolist also aims at maximization of his profits. Being a sole producer in the market he is able to fix any price for his product. He will be in a position to fix the price at a level higher than marginal cost thus obtain maximum net profits. "The prima facie interest of the owner of a monopoly is clearly to adjust the supply to the demand not in such a way that the price at which he can sell his commodity shall just cover his expenses but in such a way as to afford him the greatest possible revenues-Marshall".

The monopolist thus keeps this aim in view while fixing the price of his product.

Fifthly, under monopoly, the single monopoly firm constitutes the whole industry'. The demand curve for the monopolist's produce is also market demand curve for the product since by definition the monopolist is the only supplier in the industry. As the demand curve of the consumers for a product slopes downwards, the monopolist faces a downward sloping demand curve. It thus implies that the monopolist can expand the demand for his produce by lowering the price. The market demand curve facing downward the monopolist can expand the demand for his product curve since price is identical with average revenue. Unlike perfect competition, where average revenue curve is a horizontal straight line, average revenue curve of the monopolist is downward sloping. It shows the sales he would be able to have at different prices. Since average revenue curve slopes downwards. Throughout its length marginal revenue curve will also slope downward and lie below average revenue curve. It is because marginal revenue falls at a much faster rate than the average revenue. It implies that whenever the monopolist sells a large quantity, the price of his product falls, hence marginal revenue must be less than the price.



The average revenue and marginal revenue are related to each other through elasticity of AR curve, MR can be known with the help of the following formula:

$$MR = AR [e-1/e]$$

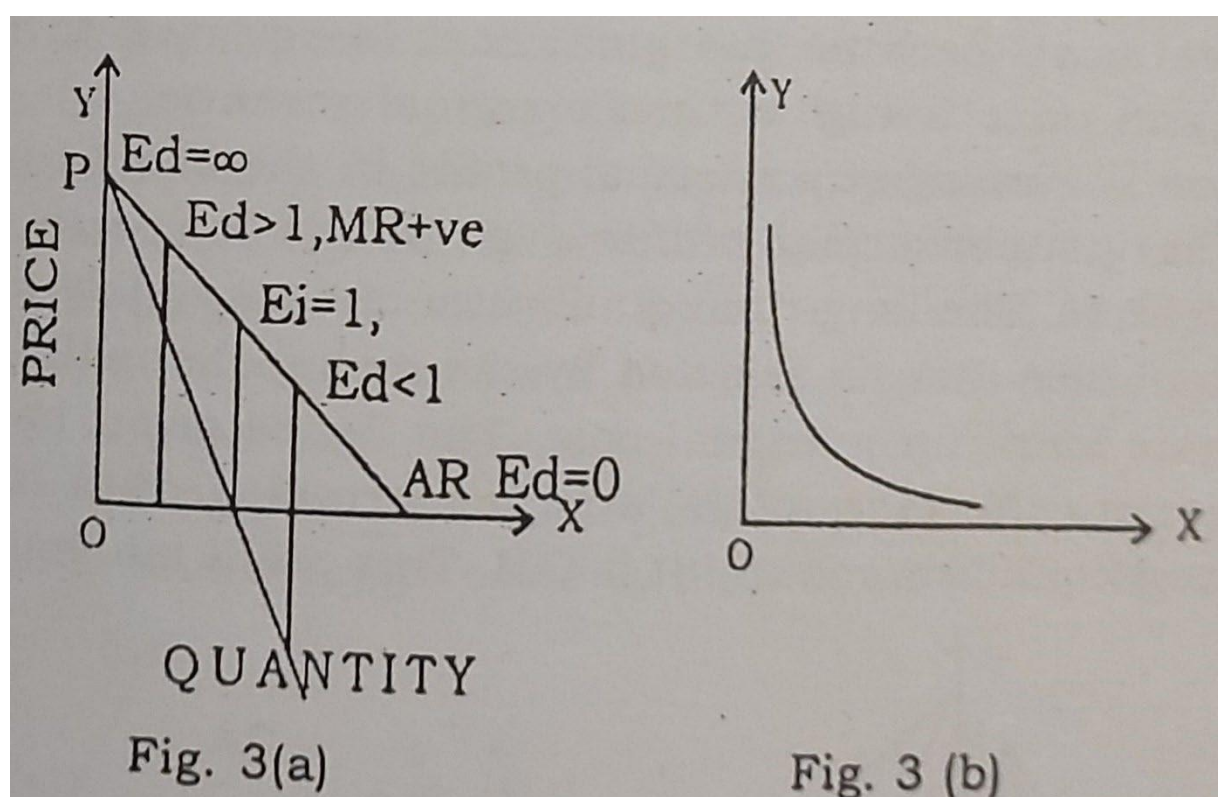
Here AR stands for average revenue and e for elasticity AR can also be known by the following formula:

$$\text{Price} = AR = MR [e-1/e]$$

Since, $[e-1/e]$ will be less unity, MR will be less than price. The extent to which MR lies below:

AR depends upon the value of the fraction $[e-1/e]$

It becomes evident from the diagram given above(3A) that where elasticity of AR curve is greater than unity, MR is always positive. Where it is equal to unity, MR is always Zero. In case the elasticity of AR curve is unit throughout its length like arectangular hyperbola, the MR curve will coincide with X- axis as shown with dotted line in Figure 3(b).



Where the elasticity of AR curve is less than unity, MR is negative and where elasticity of AR curve is Zero; the gap between AR and MR curve becomes wider and MR curve lies much below the X-axis as is shown in Figure 3(A).

13.2 EQUILIBRIUM UNDER MONOPOLY

The monopolist wants to maximize his profits. How does a profit maximizing monopolist select the level of output and price at which to produce? The feature of cost curves under monopoly are generally the same as those under pure competition. There is L-shaped average cost curve with a marginal cost curve that intersects in from below 3nd passes through its lowest point AR and MR curve slope downwards under monopoly. A profit maximizing producer will produce that output at which marginal cost equals marginal revenue. The monopolist will fix that price at which the excess of gross receipts or revenue over coats in maximum. In the words of Mrs. Joan Robinson, "He will achieve this if he regulates his output in such a

way that the addition to his total revenue from selling an additional unit is exactly equal to the addition to his costs causes by producing that unit.

If he sold one unit more, he would incur more of cost than he gained of revenue”.

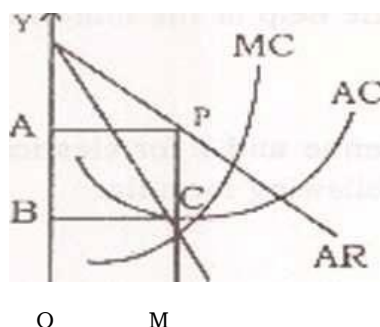


Fig.4

In other words, he will always tend to equate marginal revenue with marginal cost. The price at which this quantity can be sold is seen form the demand curve. This is illustrated in the diagram given below.

Here OM output represents profit maximizing output, price is represented by PM (or OA) ABCP rectangle represents the monopolist’s profits. As is evident, price under monopoly is higher than marginal cost, because marginal cost is equated to marginal revenue for maximization of profit and price is higher than marginal revenue.

The monopoly firm is earning supernormal profits in the short run (Fig.4). The Monopoly firm can continue earning supernormal profits even in the long-run provided it is able to block the entry of other firms. The long-run equilibrium of a monopoly firm resembles of short run, except that the plant size that is selected by the monopolist will be the one of at which marginal revenue equals long-run marginal cost. The figure given below illustrates it. The rectangle ABCP represents the monopolist’s supernormal profits in the long run. Price charged is PM (or OA) and equilibrium output is OM. This profit maximizing output is decided by MR-LMC (Fig. 5)

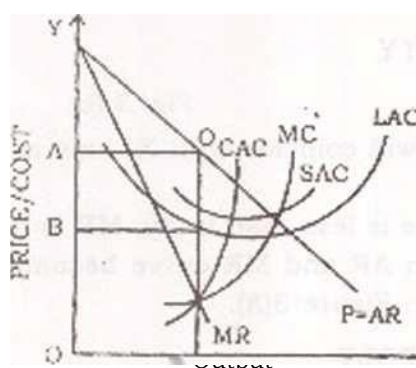


Fig.5

Monopoly price is function of the marginal cost of production and the elasticity of demand.

The monopolist reaches equilibrium when $MR=MC$. This has four implications:

1. At equilibrium, elasticity of demand is always more than one. A profit maximizing producer will always produce that level of output that falls within the elasticity range of demand curve (positive marginal revenue (Fig 3 A.). The equilibrium output is decided by MR-MC. Negative MC is highly unlikely as negative MC will imply that it costs less to produce a bigger quantity than a smaller one. It will thus be profitable for the producer to reach his equilibrium only in that range where MR is positive or when elasticity of demand is greater than unity.

However, in case of free goods, at equilibrium point, the elasticity of demand can be equal to one (where MR is Zero). The general conclusion is that a monopolist would be in a equilibrium only when the elasticity of demand for his product is greater than one.

2. Monopoly price is always greater than marginal cost.

$$\text{Price} = \left[\frac{e-1}{e} \right]$$

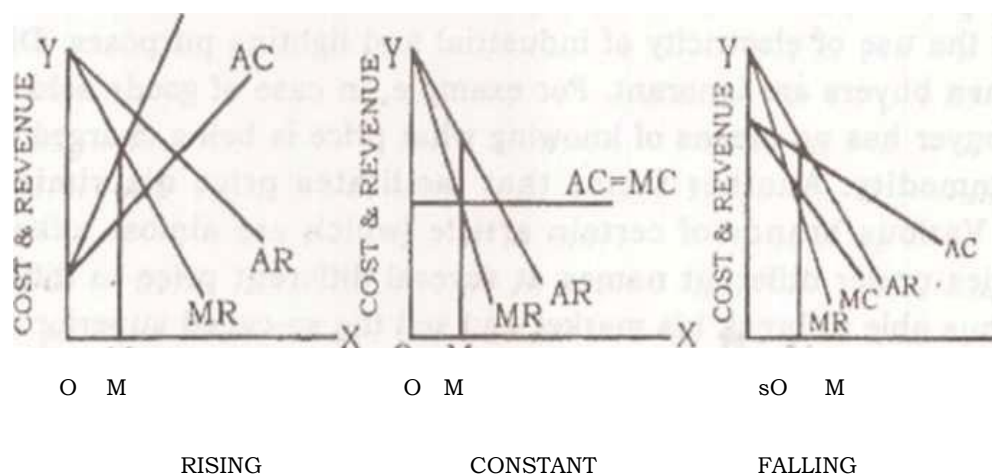
Since, $[e-1/e]$ will be more than unity, price will be higher than marginal cost. The gap between marginal cost and price will depend finally on the elasticity of demand for the product.

3. Excess of monopoly price over marginal cost measures the degree of monopoly power.

The Monopoly Power = $P - MC / P$ where P stands for price and MC for marginal cost.

The larger the difference between marginal cost and price, the greater would be in firm's monopoly power. If marginal cost is equal to Zero, the monopoly power is absolute indicating the monopolist's ability to charge a price for a free good as in the case of mineral water spring. If on the other hand, marginal cost is equal to price the monopoly of power is zero. It must indicate the competitive situation.

4. Under monopoly equilibrium is possible with rising, constant as well as falling marginal and average cost curves. All that is needed is that at equilibrium point the marginal cost curves must cut the marginal revenue curve from below. It is unlike perfect competition. Where equilibrium position requires rising marginal and average cost curves. The monopolist equilibrium with rising, constant and falling, marginal and average costs is illustrated in the figures given below.



13.3 PRICE-DISCRIMINATING MONOPOLY

A monopolist fixes price of his product in such a way that it yields him the maximum net revenue and the price is fixed at the point, where his marginal revenue equals marginal cost. Under simple monopoly, the monopolist charges one uniform price from all the customers for a single commodity. But this is not so under price-discriminating monopoly. Since the monopolist has a full control over the supply of the commodity, he is in a position to charge different prices from different customers for it. It often happens that monopolist finds it possible and profitable to sell a single commodity to different buyers. This can occur when the goods which are sold in the cheaper market cannot be bought from the monopolist and resold in the dearer market and when customers in the dearer market cannot transfer themselves into the cheaper market to get the benefit of the lower price. The act of selling the same article under a single control, at different prices to different buyers is known as price discrimination.

Price discrimination monopoly is likely to occur only when market is imperfect. The degree of price discrimination practiced depends upon the degree of imperfection in the market. Price discrimination is more likely to occur when there is monopoly of the product by a single seller or group of sellers.

13.4 CONDITIONS FOR DISCRIMINATION

Price discrimination becomes possible only when (i) no unit of demand can be transferred from one market to another and (ii) no unit of supply can be transferred from one market to another. These two conditions are two different sides of the same thing. Various examples can be given to further elaborate the conditions.

Discrimination can occur when the markets in which a monopolist is selling are divided from each other geographically. High transport costs may prevent resale of goods in a dearer market, bought from the cheaper market. Tariff barriers provide example. They facilitate splitting of markets. A monopolist may be selling at a lower price in an export market (in order to capture it) and a higher price in home market (in order to make up the losses). This is known as dumping. This is made possible by high tariffs because goods cannot be brought from the foreign (cheaper) market and resold in home (dearer) market, discrimination is most often practiced in the sale of direct personal services, where there is no possibility of transfer from one market to the another. For example, doctors charge different fees from their patients according to level of income and wealth of their patients. Discrimination is again possible when the same service is required in connection with clearly differentiated products. For example, railways can charge different rates for the transport of cotton goods and of coal without any fear that sales of cotton will be turned into loads of coal in order to enjoy a cheaper rate. Legal sanction also facilitates price discrimination. For instance, different rates are charged for the use of electricity for industrial and lighting purposes. Discrimination may occur again, when buyers are ignorant. For example, in case of goods sold on special orders, the individual buyer has no means of knowing what price is being charged from other buyers for similar commodity. Another factor that facilitates price discrimination is product differentiation. Various brands of certain article (which are almost alike) may be sold as different qualities under different names at several different prices to different buyers. The monopolist is thus able to break his market and sell the so-called superior varieties to the rich people at the higher prices and so-called inferior varieties to the poor people. In this way the market is split up, and the monopolist can sell what is substantially the same thing at several prices. The device of making the same thing appear in different guises will also serve to save the monopolist from the reproaches of injustice between customers some time put difficulties in the way of price discrimination.” (Joan Robinson). Then there are those cases in which there is actual difference in the various varieties of the product and different prices are charged for different varieties. In such cases, price discrimination is said to be practiced if extra prices charged for the so-called superior varieties are not proportional to the extra costs incurred on them.

It is clear from above that price discrimination becomes possible only when one unit of the commodity sold in one market can be transferred to another, and when no buyer is able to transfer himself from dearer market to cheaper market to buy the commodity or service at the lower price. Price discrimination depends upon the ability of the monopolist to split up and keep the markets separate.

13.5 Self-Check Questions

13.5 (a) What is the shape of AC and MC when AR and MR are falling?

13.5 (b) The larger the difference between marginal cost and price, the _____ would be in firm's monopoly power.

13.6 WHEN IS PRICE DISCRIMINATION PROFITABLE?

We have seen above the conditions which make price discrimination possible. It is quite likely that the monopolist may be able to charge different prices in separate markets, yet it is not profitable for him to do so. Price discrimination becomes profitable only when elasticity of demand for products is different in

different markets at the single monopoly price. If elasticity of demand is the same in both markets it would not pay the monopolist to charge different price in these markets. If elasticity of demand is the same in both markets, marginal revenue in the two markets in every price of the product will also be same. It is so because

$$MR = AR (e-1/1)$$

When marginal revenues at every prices of product are the same in both markets, it will not pay the monopolist to transfer any quantity of the product from one market to another and charge different prices for the same product in these markets. When elasticity of demand is different in both markets at the same monopoly price, only then it is to the advantage of the monopolist to charge different price in different markets. It is then in his interest that he must discriminate in prices in different markets. It is then in his interest that he must discriminate in prices if he wants to maximize his profits. If he does not do so and charge a single monopoly price (on the basis of aggregate marginal revenue and marginal cost of output) in both the markets where elasticities of demand are different, he is not maximizing his profits. "For if he charges the same price in each market, he will find that at that price, "the marginal revenue obtained by selling an increment of output in each market separately is greater in some markets than in others. He can therefore increase his profit by selling less in those market elasticity of demand is less and the marginal revenue smaller, and selling more in those markets where elasticity of demand is higher and the marginal revenue greater.

Now the question is how long will the monopolist go on transferring the output from the market with low elasticity of demand? He will go on doing till marginal revenues in both markets are equalized. To quote Mrs. Joan Robinson, the monopolist will "adjust his sales in such a way that the marginal revenue obtained from selling an additional unit of marginal revenue in each market is equal to the marginal cost of the whole output." It follows from above that when marginal revenue in each market are equalized in two markets (having different elasticities of demand at the single monopoly Price)' prices charged would be different. The monopolist would charge a higher price in market with low elasticity of demand and a low price in market with high elasticity of demand.

13.7 CONDITIONS FOR EQUILIBRIUM UNDER PRICE DISCRIMINATING MONOPOLY

Under simple monopoly, producers reach his equilibrium when his marginal revenue equal his marginal cost of output. A price discriminating monopolist has to sell in different markets having different elasticities of demand. He is to take two decisions (i) how much total output should reproduce and (ii) how much output should he sell in each market, und at what price should he sell in each market? The answer is provided by Mrs. Joan Robinson, "The monopoly output under price discrimination is determined by the intersection of the monopolist's marginal cost curves with the aggregate marginal revenue curve." This total output is made up of the amount sold in the two markets in each of which marginal revenue is equal to the marginal cost of the whole output. The price in each market will be the demand price for the amount of output sold there.

The price discriminating monopolist will thus produce that level of output at which aggregate marginal revenue equals marginal cost of the total output. He will be maximizing his profit when marginal revenue in each market is same and also equal to marginal cost of the whole output. In other words, price discriminating monopolist will reach his equilibrium when:

(I) Aggregate Marginal Revenue (AMR) = Marginal cost (MC)

(II) $MR_1 = MR_2 = MC$

13.8 DEGREES OF PRICE DISCRIMINATION

Price discrimination can be classified according to the extent to which it is practice. A monopolist may practice three categories of price discrimination:

First Degree Price Discrimination

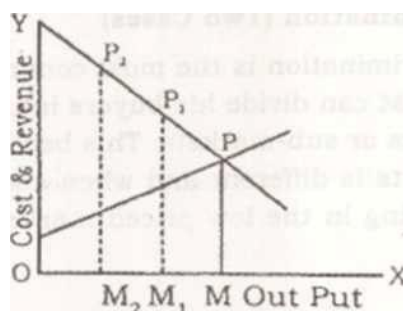
Second Degree Price Discrimination

Third Degree Price Discrimination

Prof. A.C. Pigou in his books, "The Economics of Welfare has given a good account of the degree of price discrimination. While explaining them he says: A first degree, in such a way that the price expected for each was equal to the demand price for it, and no consumer's surplus was left to buyers. A second degree would obtain if monopolists were able to make in separate prices, in such way that all units with a demand price greater than X were sold at price X and greater than Y at price y, and so on. A third degree would obtain if the monopolists were able to distinguish among his customers in different groups, separated from one another more or less by some practicable mark, and could charge a separate monopoly price from the members of each group. This degree, it will be noticed, differs fundamentally from either of the proceeding degrees, in that it may involve the refusal to satisfy in the market, demand represented by demand price excess of those which, in another market are satisfied.'We now discuss them in more detail.

(I) First Degree Price Discrimination

In first degree discrimination, the monopolist charges a consumer a different price for each unit of the good. He charges each buyer the highest price that he will pay for each unit of the good he gets. The monopolist thus leaves no consumer surplus with the consumer.



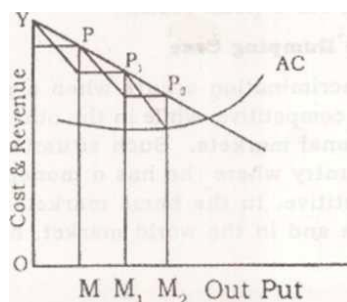
As illustrated in Fig. 7, the monopolist has sold three units of the commodity at three different prices P_2M_2 , $P_1 M_1$ He has not sold all three units at uniform price of PM which he would have charged under simple monopoly. He has obtained from each buyer the higher price which he was willing to pay rather than go without the thing, "Under the first-degree price discrimination, realizes the entry utility obtained by consumer surplus with them. Again, under first degree price discrimination, average revenue and marginal revenue curves coincide with each other as demand curve of the buyer becomes marginal revenue curve for the seller."

This is unlike simple monopoly where marginal revenue lies below average revenue curve for the seller."

This is unlike simple monopoly where marginal revenue lies below average revenue curve. (II) Second Degree Price Discrimination

In second degree price discrimination, buyers are divided into different groups of classes and from each group or class. In other words, the monopolist charges from each group that price which a margined individual of that group is just willing to pay. According to prof. Pigou, the monopolist will charge separate price in such a way that all units of the commodity with a demand price greater than say x are sold at a price x, all units with a demand price greater than y but less than x at a price y and so on. Thus is Fig. 8, OM block of units is sold at PM Price, Mth unit has a demand price PM and earlier units have a demand price greater than PM as shown by the DP position of demand curve DD. Under second degree price discrimination OM Units are sold at PM price. Thus, consumer enjoys no consumers surplus on earlier units are sold at PM price. Thus, consumer enjoys no consumer surplus on earlier units as shown by the

shaded area. Similarly, MM_1 block of units are sold at P_2M_3 price and M_1M_2 block units at P_2M_3 price. Consumer enjoys surplus satisfaction to the extent of shaded areas shown in these respective block units.

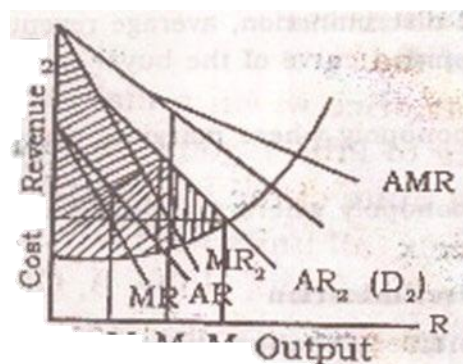


(III) Third Degree Price Discrimination (Two Cases)

The third-degree price discrimination is the most common form of price discrimination. It is practiced when the monopolist can divide his buyers into two or more market and charge different price in different markets or sub markets. This becomes possible when the elasticity of demand in different sub-markets is different and when each market is isolated from other market so that no consumer buying in the low-priced market can resell the product in the high-priced market.

First Case

The monopolist divides his total market into two sub-markets on the basis of elasticity of demand. Suppose he divides his total market into sub-market market-I and market-II taking elasticity of demand into consideration. As illustrated in Fig. 9 overleaf D_1 and D_2 curves Aggregate demand curve shows the total amount that would be sold at each price if the price were the same in both markets, and aggregate marginal revenue shows the number of sales that would correspond to each value of marginal show the marginal revenue were the same in both markets. This curve will show the marginal revenue obtained by the discriminating monopolist. The monopolist will maximize his profits by producing that level of output at which marginal cost curve intersects the aggregate marginal revenue curve. This represented OM output in the figure. This total output OM is to be sold in two markets in such a way that marginal revenue in two markets are equal to each other and also to marginal cost of the output. OM is thus the total output and equal to $OM_1 + OM_2$. MC is the marginal cost of the whole output OM . OM_1 is sold at the price M_1P_1 in market 1, and OM_2 is sold at the price M_2P_2 in market II. The shaded area shows the monopolist's profit which is equal to the area lying under aggregate marginal revenue curve (total revenue) minus the area lying under the marginal cost curve (total costs).



Second Case: equilibrium in the Dumping Case

A special case of price discrimination occurs when a producer is selling in two markets, one of which is perfectly competitive, while in the other he has a monopoly. This can often be noticed in

international markets. Such situation arises when a producer sells his product in his home country where he has a monopoly and also in the world market which is perfectly competitive. In the home market, he confronts a monopoly downwards-sloping demand curve and in the world market, he faces a perfectly elastic demand curve.

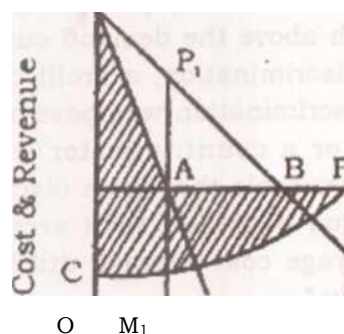


Fig.10

Since the producer faces perfect competition in the world market. The average revenue and marginal revenue curves are indicated by horizontal straight line $ARW = MRW = ARH$ and MRH represent average and marginal revenue curve in the home market, Me is the Marginal cost curve of output. Equilibrium level of output is determined when MC intersects aggregate marginal revenue curve $DABP$ at P . OM is total output sold. This output is so distributed in both markets in such a way that marginal revenues in both markets are equal to each other and also to marginal cost i.e. market at PM . Thus OM , is sold in home market at $P_j M_j$ price, and OM amount of output is sold in world market at PM price. As is evident from the figure 10, the producer charging a lower price in the perfectly competitive world market and a higher price in the home market. He is said to dumping in the world market. He is earning profits to area $CPAD$.

It can be concluded that existence of price discrimination depends on the difference between the elasticities in the markets in which it is possible to sell. Monopolist on the basis of elasticity of demand divides total market into sub-markets. Highest price is charged in the least elastic market and lowest price is charged in the most elastic market. Price charged thus depends upon the degree of elasticity of demand.

13.8 IS PRICE DISCRIMINATION DESIRABLE?

(a) We are now to examine how far price discrimination is harmful or advantageous to customers of monopolist and to the society as a whole. According to G.J. Stigler, "Economics are considerably divided on the best pricing policy for an industry whose existence required discrimination.* It is generally agreed that consumers are better off if a single price is charged for the same commodity. But various cases can be cited in which price discrimination is beneficial. Some commodities whether services might not be produced at all if sellers were not able or were not allowed to practice price discrimination. The important question then is without discrimination of the supply completely stops. Let us take the cases of railway. Railway cannot operate if 'Cost of Service' principle is adopted. They can work only if permitted to charge according to the principle of what the traffic will bear i.e., charge higher freight rates for materials that have a higher value per ton than for materials for lower value. Similarly, higher rates are charged from customers of electricity for lighting purpose than from customer of electricity for industrial production. Such situations may be found in which costs of production cannot be covered by receipts, unless price discrimination is permitted. Commenting on the desirability of price discrimination than under simple monopoly, that there may be cases in which no output would be produced at all if price discrimination werenot possible. If the average cost curve of a certain product lay above the demand curve for it throughout its length no profit could be made by producing it under any one price system. But if the average cost curve, through above the demand curve, lay at some point below the average revenue curve

under price discrimination, a profit could be made and some output would be produced provided that discrimination was possible. It may happen, for instance, that a railway would not be built, or a country doctor would not set up in practice, if discrimination were forbidden. It is desirable that price discrimination should be permitted in such cases, for the average revenue is greater than average utility to the consumers, if average revenue is greater than average cost average utility will also be greater, and the investment will lead to gain to society.

The following illustration makes it clear. In the figure, the line D is the ordinary demand (AR), showing amount that can be sold at prices that are same to all buyers AP curve shows the average price P_1 and P_2 . AP curve is thus constructed in the same way. As is shown in the figure, AC curve lies above D but below AP. No output would be produced if the firm had to sell at single price on D curve, but there is output with price discrimination since the firm is able to cover its cost. Thus, the output of a commodity or service becomes profitable under discriminating monopoly which could be produced at all under simple monopoly.

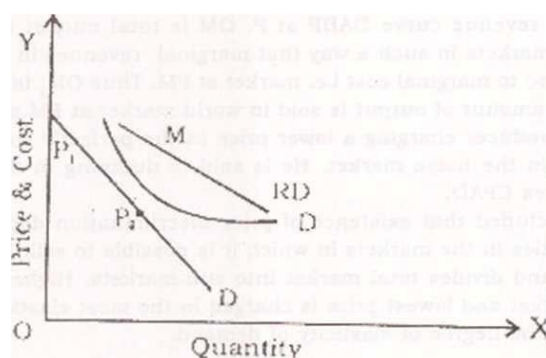


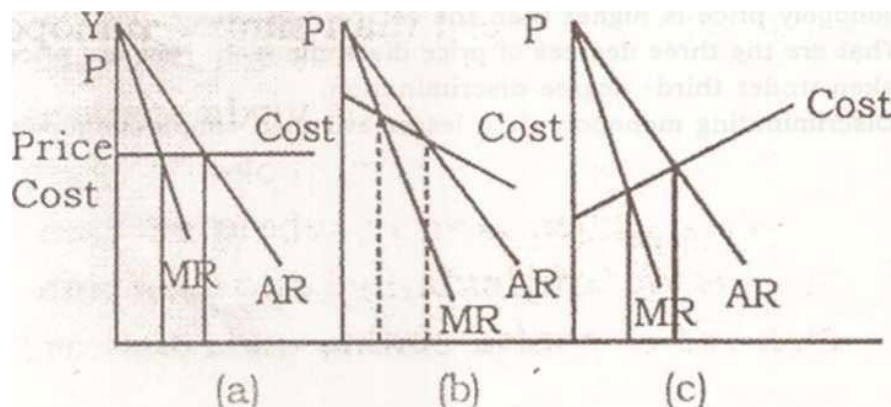
Fig.11

(b) Price discrimination is socially desirable when it makes possible for weaker sections of the society to have access to a certain essential good or service (like that of a doctor) which would otherwise not be possible under simple monopoly, again in many situations, weaker markets (with lower demand prices) are served and offered output at lower prices, while the same is refused in stronger markets (with higher demand prices).

(c) When price discrimination is practiced. Some sections of the society are affected adversely who are required to pay higher prices. (This is especially true in the case of a good which is produced under law of increasing cost). But if higher price is charged from richer sections and lower price from poorer sections, it helps to mitigate inequalities in the society. It benefits the society as a whole. But if the good is produced under the law of decreasing costs or constant costs, it is quite likely that nobody is affected adversely. The enlarged output of the product under discriminating monopoly becomes available to all customers at comparatively lower prices as compared to the price under simple monopoly.

(d) Will the output of a product under price discrimination be larger or smaller than or equal to the output produced under simple monopoly? The answer depends upon many factors, "if the monopolist were ever able to practice perfect discrimination, he would have an output as large as the purely competitive output with the same demand and cost conditions. This is because the monopolist treats the consumer's demand curve as his own marginal revenue curve. He equates demand with marginal cost, as in the equilibrium of pure competition." If we consider simple monopoly versus discriminating monopoly, then output of the product under first degree price discrimination will be twice as large as output under simple monopoly, if the production is subject to constant cost (Fig. 12). But if the output of the product is subject to law of diminishing costs, or increasing costs, then output of the product under simple monopoly (fig. 12b in the first case) and less than twice as large as output under simple monopoly (Fig. 12c in second case). The figures given above illustrate this. Discrimination of the second degree tends to approach first degree price discrimination with an increase in the number of prices. Outcome thus tends to be as under

degree price discrimination. Its output is large under second degree price discrimination than if the monopolist had a single price.



When a monopolist practices third degree price discrimination, his output can be equal to, or less than, or greater than his output at a single monopoly price. It depends on the shape of demand curves in the monopolist's two markets. If the demand curves in the separate markets are linear, market with the less elastic demand is equal to the expansion in the market with the more elastic demand. But when demand curves are concave and more elastic demand curve is more concave than the less elastic demand, the output will increase by the introduction of price discrimination. On the other hand, when more elastic demand curve is less under price discrimination than under simple monopoly.

However, Mrs. Joan Robinson in her authoritative discussion on price discrimination, comes to the conclusion that, in all likelihood, output is large with price discrimination than without it. Sometimes output is possible only with price discrimination.

13.9 Self-Check Questions

13.9 (a) The output and price will be determined when the _____ and MC cut the MR from its below.

13.9 (b) Condition of Equilibrium under price discrimination monopoly occur when _____

13.10 Answer to Self-Check Questions

13.5 (a) U-Shaped

13.5 (b) Greater

13.9 (a) $MC=MR$

13.9 (b) Aggregate $MR=MC$

13.11 Short Questions

1. Explain Degrees of Price Discrimination.
2. explain conditions for equilibrium under Price Discriminating Monopoly.

13.12 Long Questions

1. What is monopoly? How is the price of a commodity produced and sold by a monopolist determined?
2. How does a monopolist fix the price of his produce? Is it inevitable that the monopoly price is higher than the competitive price?
3. What are the three degrees of price discrimination. How are price output decisions taken under third-degree discrimination.

4. “Discriminating monopoly is a lesser evil than simple monopoly. Do you agree?”
5. What conditions must be present for price discrimination to be possible under monopoly?
Under what circumstances might discrimination be possible but not profitable?!

References

1. John Robinson : Economics of imperfect Competition, Chapter 3, 4, 5.15
2. A.C. Pigou : The Economics of Welfare
3. G.J. Stigler : The theory of price.

Lesson No. 14

PRICE-OUTPUT DECISIONS UNDER MONOPOLISTIC COMPETITION

STRUCTURE

- 14.1 Meaning of Monopolistic Competition
- 14.2 Monopolistic Competition: Some Analytical Problems
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14.1 MEANING OF MONOPOLISTIC COMPETITION

In order to understand how price-output decisions are taken and how equilibrium is determined under monopolistic competition. We must first try to understand the meaning of the term, "monopolistic competition".

A very simple way of defining the term, monopolistic competition is to state that it is a market form in which there is a large number of freely competing firms producing products which are in some way or the other, differentiated from one another, and selling these products to a large number of freely competing buyers.

A careful scrutiny of the above definition of monopolistic competition will bring out the following defining characteristics of the market form which bears the label of "monopolistic competition."

(a) Large Number of Firms: In this market form the number of firms is very large such that each of them is producing an insignificant part of the total supply of 'Products' belonging to the group. Moreover, there is free competition among these firms. This means that there is no explicit, or implicit that is, no open or hidden, agreement among them not to compete. (b) Large Number of Buyers: This market form is also characterized by a large number of buyers such that each one of them is buying only an insignificant part of the total supply of products belonging to the group. And, as in the case of the firms selling their 'products', there is free competition among the buyers also.

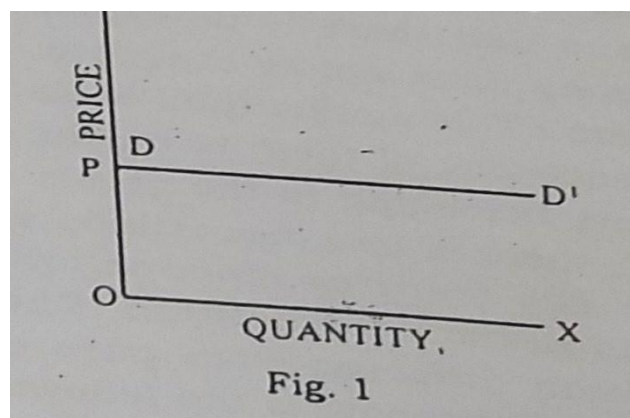
As regards the above two features monopolistic competition resembles pure competition as well as perfect competition. The special feature which makes monopolistic competition different from pure competition as well as perfect competition and also from monopoly is the following one:

Differentiated Products: In the market form known as monopolistic competition, each firm produces and sells a product which is differentiated, in some respect or other, from the similar products produced and sold by its rivals. This differentiation is brought about through various means such as giving a particular

brand name or design or color or fragrance or packaging, etc. For example, a large number of firms may be producing and selling toilet soap but each firm gives a particular brand name to its own individual brands belong to the same 'Lux', 'Hamam', 'palmolive' and so on. All these individual brands belong to the same 'group' of toilet soap but each one is, at the same time, distinguished from the others in the same group.

Now, how does this particular product characteristic make monopoly? Well, under the last mentioned three market forms that is, under pure Competition, perfect competition and monopoly the product is homogenous. This means that all believe that there is no difference at all between the units of the commodity regardless of whether they are produced and sold by any one firm or the other. In the language of economics, we can say that under these conditions the product of any one firm is a perfect substitute product produced and sold by any other firm in the industry. This means that the product, produced and sold by the different firms belonging to groups are not identical, though they are similar to one another. In the language of economics, they are not perfect substitutes of one another but they are not perfect substitutes.

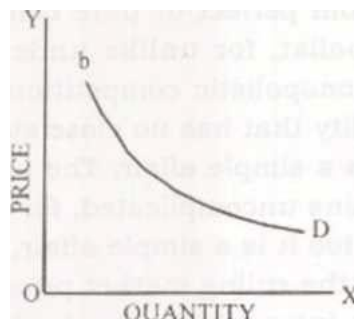
What is the importance of the distinction between close substitutes and perfect substitutes? When the product of the different firms are perfect substitutes of one another as they are when the products of the different firms are perfect substitutes of one another as they are when the product or the commodity is homogenous or standardized as is the case under pure and perfect competition a firm which lowers its price even slightly in relation to the price charged by the rival firms will attract all the customers of the rival firms, and if this firm raises its price even slightly compared to the price charged by its rivals, then it will lose all its customers to the rival firm and will not be able to sell even a single unit. In other words, when the products of the rival firms are perfect substitutes, the demand curve facing an individual firm or its sales curve (which are one and the same thing) is a horizontal line showing infinite or perfect elasticity of demand as shown in the following figure¹.



In the above figure, DD' is the perfectly elastic demand curve facing an individual firm. It should be kept in mind that this type of demand curve is valid only in the case of an individual firm under pure and perfect competition. It will not be valid under monopoly, because although the product of a monopolist is homogeneous, yet he has, by definition, no rival producing even a close substitute not to speak of a perfect substitute.

Where there is a large number of freely competing firms producing and selling products which are close, though not perfect, substitutes of one another as is the case under monopolistic competition, a lowering of the price charged by any one firm will not take away the customers of the rival firms, because some customers of the rival firms may be too much attached to their particular brands of the product to be attracted towards the brand of the firm lowering its price. For the same reason an individual firm under these conditions will not lose all its customers to its rivals if it alone raises its price. This implies that

under these conditions (That is, under monopolistic competition), the demand curve facing an individual firm is less than the perfectly elastic. In other words, this demand curve or sales curve facing the individual curve will be sloping downwards towards the right (that is, it will have negative slope) unlike the horizontal demand or sales curve under pure or perfect competition. The model of such a negatively sloping demand curve is giving below:



The implication of what we explained above is that under monopolistic competition the individual firm enjoys some degree of monopoly power over its price and output in spite of the free competition from the large number of rivals. Thus, monopolistic competition is a market form in which elements of monopoly co-exist with elements of free competition, and it is on account of this that this particular form of market is described as monopolistic competition." Thus, we find that the distinction between perfect substitutes and close substitutes in relation to which we distinguish between pure and perfect competition, on the one hand, and monopolistic competition, on the other, is of great analytical importance. It is of great help to us in analyzing the price-output decisions of firms under the different market conditions.

Before we proceed further it will not be out of place to mention that until the publication of two books, more or less at the same time in 1932, one the Economics of Imperfect Competition by Ms. Joan Robinson and the other, the Theory of Monopolistic Competition by E.H. Chamberlin, the only recognized market forms in the science of economics were perfect competition. It was only after the publication of the above said two books that with some time gap the analysis of price-output determination under monopolistic competition and imperfect competition entered the text books on micro economics. Although there are some differences of detail between the theory of imperfect, competition as developed by Joan Robinson and the theory of monopolistic competition as expounded by Chamberlin (Chamberlin has been vehemently claiming that his brand of the theory is different from that of Joan Robinson), yet the essential results emerging from the two theories are more or less the same.

14.2 MONOPOLISTIC COMPETITION: SOME ANALYTICAL PROBLEMS

The analysis of price-output determination under monopolistic competition is complicated compared to its analysis under perfect competition or monopoly. This is due to some problems which arise on account of the nature of monopolistic competition.

One of these problems is related to the determining of the nature of the sales curve of a firm under monopolistic competition. Since in this market form individual firms produce differentiated products, each one of them is in a position to exercise some monopoly power over, the price and output of its own brand of product so that we can say, as we have explained above, that the sales curve of an individual firm in this market form is less than perfectly elastic which makes it different from perfect or pure competition, we can also say. for sure, that the sales curve of as monopolist, for unlike under monopoly, largo number of clear substitutes arc available under monopolistic competition. Under monopoly there is one and or.ly one firm producing a commodity chat has no close substitute. Therefore, the determining of the side curve of a monopolist is a simple affair. The Sides curve of the industry is also the sales curve of the firm and it remains uncomplicated, for there are no rivals to complicate the matter. Under perfect competition too it is a simple affair, for the sales curves of all individual firms are horizontal at the level of the ruling market

price which means that all of them have identical sales curve. But under arc inter-related due to their products being close substitutes of one another. You cannot determine the position of the sales curve of any one firm unless you know the position of the sales curves of all the other firms. Any change anywhere is most likely to affect the sales curves of all others. This complicates the matter. It is difficult under the circumstances to specify how the sales curve of each firm in the "group" will stand in relation to the sales curve of the other firms.

Similar difficulties arise on the side of supply and costs also. It is not necessary that two firms will be using identical inputs as well as one and the same technology. Rather the greater probability under monopolistic competition is that they would be using some inputs at least which are different. This complicates the problem of fixing the position of the cost curves of an individual firm in relation to the cost curves of the other firms.

Still another type of analytical problems arises on account of the fact that unlike under perfect competition and monopoly equilibrium under monopolistic competition need not come about only through changes in price and output. There are at least two other channels also open under monopolistic competition. The alternative routes are changes in the type or quality of product produced by a firm which is described as product variation. The other alternative is undertaking selling costs and changing them in order that a firm may have an edge over its rivals. This highlights a very important feature of monopolistic competition. Competition under monopolistic competition also takes the form of "improving" one's product in relation to the similar products of others or it may take the form of advertising and otherwise providing one's sides (which involves selling costs apart from the production costs) at the expense of the rival firms such firms of competition is known as "non-price competition", the existence of which under monopolistic competition complicates are competing on more than one basis, that is, on the basis of price output variation as well as on the basis of product variation and variation in selling costs, situation becomes worse confounded.

14.3 HOW TO SIMPLIFY THE ANALYTICAL PROBLEMS

Faced with the rather quite formidable problems of analysis as explained above, we have to adopt the scientifically recognized method of adopting some simplifying assumption, E. I. Chamberlain who is the founder of the theory of monopolistic competition made some appropriate assumptions in order to put the above explained analytical difficulties out of the way.

In the first place, he made the simplifying assumption that all the firms belonging to a "group" under monopolistic competition have identical sales curve. This implies that at any given price each firm will have only a proportionate share in the total sales of the given "group" of products. For example, if there are one hundred firms each firm have one hundredth part of the total sales of the "group" at any given price.

Similarly, the problem on the supply side is also solved by making the simplifying assumption that all individual firms have identical cost curves.

Since the above assumptions are highly unlikely to be fulfilled in real world Chamber rightly describes these assumptions as "heroic" assumptions. Nevertheless, non-fulfillment of these assumptions in real life is not likely to change the essential results of the model. Therefore, this simplifying assumption, though "heroic", are methodologically warranted.

The problem of the existence of alternative routes to equilibrium can be tackled by treating one route at a time on the simplifying assumption that the other alternatives are absent. That is to say, we can first assume that there are no selling costs and the product is constant so that only price and output are variable. We may, then assume that the price is constant and there are no selling costs but the product is variable. Thereafter, we can assume that price and product are constant but there are variable selling costs. Once we are able to grasp the essentials of the model of monopolistic competition in these simplified forms, it will not be difficult to understand a more complicated model in which monopolistic competition

takes place not on the basis of price output variation only but on the basis of simultaneous variations in price output, product and selling costs.

14.4 EQUILIBRIUM THROUGH PRICE-OUTPUT VARIATION

We shall, first, see how equilibrium under monopolistic competition takes place when only price and output are variable. In the following analysis we shall essentially follow the analysis of Chamberlain given in his Theory of Monopolistic Competition. We make the generally accepted behavioral assumption that the motive of a firm is to maximize its net profits, we also know that the condition of maximum profit is that the firm's marginal costs must equal its marginal revenue in such a manner that any increase in its output beyond this point of equality between its marginal revenue will make its marginal cost greater than its marginal revenue. This requires us to enquire about the nature of the cost curves and the revenue curves of a firm operating under monopolistic competition.

We have already made, following Chamberlain, the simplifying assumption that all firms have identical cost curves. As regards the nature or shape of a firm's cost curves in this market form, they will be of the usual u-shaped type.

The next problem is to hypothesize about the shape of the average revenue curve which is the same as the sales curve and the marginal revenue curve of a firm under monopolistic competition though for simplicity's sake we have assumed that these curves are identical for all firms. One thing we can say for certain regarding the shape of the average revenue or sales curve of a firm, namely that it will be sloping downwards towards the right because under monopolistic

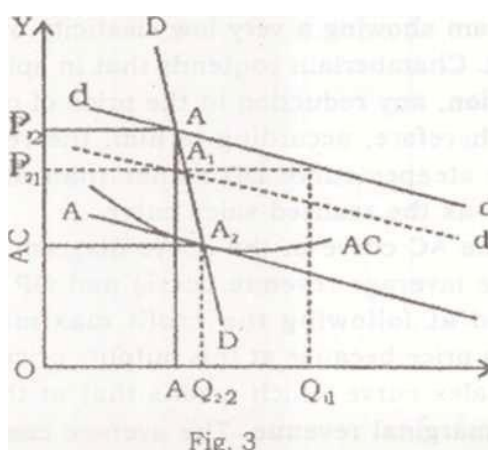


Fig. 3

competition the demand for the product of an individual firm is less than perfectly elastic, as we have already explained above. It is because the products of different competing firms are not perfect substitutes of one another, though they are close substitutes. But what about the positions of the sales curve of an individual firm? It is not easy to determine it for the sales curves of individual firms under monopolistic competition are inter-related. Any change in the price of one or more firms will cause a shift in the sales curves of the other firms. Another problem is to make some reasonable hypothesis about the elasticity of the sales curve of an individual firm, that is whatever it will be high or low. Though it will be certainly less than infinity. If we make the assumption that whatever an individual firm may do to its own price, the rival firms will stick to their prices and outputs, then the sales curve (average revenue curve) of the firm contemplating change in its price and output will be relatively more elastic like the demand curve in the above diagram. The behavioral assumption underlying this hypothesis is believed by many people to be realistic in the context of monopolistic competition. The argument is that since there is a large number of firms, therefore, if any firm lowers its own price, its adverse effect on the sales of the rival firms will be widely distributed so that each rival firm will have a very small and insignificant impact on its sales which it will

ignore rather than indulge in a competitive price cutting, Therefore, the individual firm contemplating a reduction in its price can reasonably expect that the rival firms will not initiate or retaliate by reducing their prices as well they will instead stick to their prevailing prices. Thus, on this assumption the individual firm contemplating reduction in its price can expect its sales to increase proportioning much more than the reduction in its price, because its product is a very close substitute of the products of the other firm, Chamberlain names the sales curve (dd' in the above diagram) drawn on this assumption as the expected sales curve.

However, Chamberlin points out. if one firm can make this type of behavioral assumption to plan its strategy, there is nothing which can prevent others to make the same behavioral assumption. And, if all of them or even most of them proceed from this assumption, there will be all round reduction in the prices of the products of the 'group'. In that case no one can have a special advantage over the other. The sales of the products or the "group" as a whole will increase due to the all-round fall in price, but each firm will have only a proportionate share in the total increase in the sale of the 'group'. The means that under this changed behavioral assumption, any given reduction in price of a firm will bring about a rather very small increase in its sales compared to the earlier case mentioned above. In this case the sales curve on the average revenue curve of an individual firm will be sleep like the DD curve in the above diagram showing a very low elasticity over it compared to that on the did curve which is rather fiat. Chamberlain contends that in spite of the large number of firms under monopolistic competition, any reduction in the price of one firm is likely to be followed by others earlier or later. Therefore, according to him, the realized or the actual sales are likely to increase along the steeper curve DD rather than along the flatter curve did, He names the steeper DD curve as the realized sales curve.

Let us suppose That the AC- curve in the above diagram is the firm average cost curve DD is the actual sales curve (average revenue curve) and OP is the ruling price this ruling price is most likely arrived at following the profit maximizing principle. Each firm is producing oq quantity at this price because at this output- price each is maximizing its profits on the basis of the actual sales curve which means that at this output- price the marginal cost of each firm equals its marginal revenue. The average cost curve AC has its companion marginal cost curve and the actual sales curve DD has its companion marginal revenue curve but there have not been shown in the diagram above in order to avoid complications. Moreover, unlike John Robinson, Chamberlain himself has not used these marginal curves in his analysis.

The important thing to note is that although every firm under our simplifying assumption is earning maximum profits at the price OP and output oq at which its marginal cost equals its marginal revenue in the basis of the actual sales curve DD, yet in Chamberlain's model this is not the position of equilibrium. It is only a position of short period equilibriums. It is because at this price an individual firm will tend to increase its profits on the basis of the expected sales curve did. The individual firm may think that if it reduces its own price the other firms will not follow suit and therefore, it will expect its sales to expand along with output oq will maximize its profits on the basis of the expected sales curve DD. But sooner or later the other firms will also follow suit. It is not improbable that all of them may be trying to follow this strategy simultaneously in pursuit of higher profit either because each does not know what the others are planning or due to sheer shortsightedness. As a result of it all the firms will reduce the price to op and increase the output to OQ, However, their actual sales will expand not along did but along D So they will fail to increase their profits. Now as the price goes on following the expected sales curve dd will go on sliding down along the DD curve as shown in the above diagram. At price op, the expected sales curve dd' slides down along the DD curve as shown in the above diagram. At price op the expected sales curve did slides down to the position DD. The assumption of Chamberlain is that the firms will not learn from their previous experience and will think of increasing their profits once again to expand their individual sales along the shifted DD curve. This process of price competition will go on till the expected sales curve did slides down to the position DD. The assumption of Chamberlin is that the firms will not learn from their previous experience and will think of increasing their profits once again by expecting to expand their

individual sales along the shifted dd curve. This is the position of the final equilibrium of the individual firms as well as the “group” so each firm will be producing and selling oq_2 output and changing $opod_2$ price which first equals the average cost inclusive of the normal profit. The position A_2 represents stable equilibrium because in this position no firm can expect to earn more than normal profit by expanding its sales along the expected sales curve dd as to the right of A_2 the average cost is greater than the price. And it is also higher on the left of it. Hence there will be no tendency towards increase or decrease in output. Each firm, if it is in a displaced form from this position, will tend to return to this position which makes the position A_2 the position of stable equilibrium.

The above explain the process of equilibrium. Under monopolistic competition when any price and output are variable and, moreover, when there is no entry into or exit from the “group” and the number of firms remains constant.

14.5 EQUILIBRIUM WITH ENTRY AND EXIT

However, the assumption of constant number of firms in the preceding analysis was only a simplifying assumption. We shall relax this assumption and allow the number of firms to increase or decrease due to free entry as well as free exit.

If we carefully look at the initial position of “equilibrium” a in the above diagram we shall notice that here the price on the average revenue op is higher than the average cost as the point a lies above the AC curve, this means that the existing firms are earning supernormal profits. These supernormal profits will attract new firms into the group in the long period. As a result of it the individual share of each firm will now be less than before at each level of price. This means that the actual sales curve DD for each firm will go on shifting to the left as number of firms goes on increasing till it becomes tangent to the average cost curve AC as shown in the following diagrams.

In Fig. 4 above, the actual sales curve DD becomes tangent to the average cost curve AC at point E due to the increase in the number of firms. There are now the supernormal profits which have been competed away. But if we stick to our assumption that each firm continues to believe that whatever it may do to its own price and output the rival firms will continue with their prices and output that they are already charging and producing then, each one will face an expected sales curve like dd in the above diagram and will, therefore, expect to increase its profits by expanding its output and sales along dd curve. This means that E is not a position of long

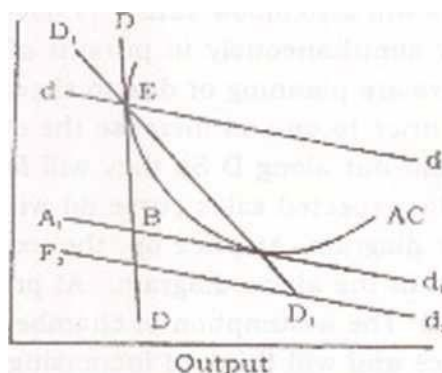


Fig.4

period stable equilibrium. Since everyone is behaving like that actual sales increase along them all into profits this short-sighted price competition will continue and the expected sales curve for each firm will go on sliding downwards along the DD curve till it takes the position d_1d_1 in Fig. 4

above in which position this expected sales curve becomes tangent to the cost curve AC . The actual price in this position will be indicated by the point B where the expected sales curve d_1d_1 cuts the actual sales curve DD . Obviously any further price reducing will not be able to convert losses into profits. But there will still be equilibrium because in position B , each firm looking at its expected sales curve d_1d_1 , can hope to

reduce its bears. So price-cutting competition continues and the expected sales curve goes on sliding down along DD still further till it attains a position like d_2d_2 when further expansion of output will not even reduce losses. When this happens, some firms will start leaving the "group". As a result of it the actual sales curve will start relating upwards as with each exodus of firms, the individual share of a firm in the total sales will go on increasing. This exodus of the "group" will go on till the upward relating actual sales curve DD takes the position $D_1 D_1$ when it cuts the cost curve AC at the point E. where expected sales curve $d_1 d_1$ is tangent to the cost curve AC. This is (E_1) the position of long period stable equilibrium of the firms as well as the 'group' under monopolistic competition. Each firm in this position will be earning just normal profits and none can expect to increase its products by expanding along the expected sales curve $d_1 d_1$ or by contracting along it. Hence, there will be no tendency towards change in the output and price of any firm or the 'group'.

The above analysis shows that under monopolistic competition no firm earns supernormal profits in the long-run. In this respect it resembles perfect competition. But since under monopolistic competition sales curve or the average revenue curve is falling, the marginal revenue is less than price. But in equilibrium marginal revenue equals to marginal cost. Hence price under monopolistic competition but resembles monopoly. Moreover, since equilibrium under monopolistic competition takes place at the point of tangency between the expected sales curve and the average cost curve of the firms and since the expected sales curve is downward sloping on account of which it can be tangent to the average cost only to the left of the minimum point on it, the equilibrium output will be less than the optimum output which gives rise to the phenomenon of excess capacity.

14.6 Self-Check Questions

14.6 (a) In excess capacity the average total cost is ____.

14.6 (b) A market structure with many firms selling differentiated products is called monopolistic competition. (T/F)

14.7 EQUILIBRIUM THROUGH PRODUCT VARIATION

Unless entrepreneurs under monopolistic competition are assumed to be incorrigible price competition, they are bound to learn from experience the futility of price-cutting competition and think of alternative basis of competition. One possible alternative which is quite prevalent in this type of market firm is product variation.

A firm may try to project its individual product as a qualitatively better product than its rival products. The product may or may not be genuine improved product but if the firm succeeds in projecting it as such, the firm can increase its output and sales without changing the price. In order to analyze the process of equilibrium in this context we shall assume that numerous varieties of one and the same product are possible. This is meaning of a product being variable. Secondly, price will be assumed to be constant at the "group" level so that it will give us a sales curve or average revenue curve that is horizontal as it is under perfect competition. However, its significance under monopolistic competition is different. Under perfect or pure competition horizontal average revenue or sales curve signifies that the firm can sell as much as it likes at the going price. But under monopolistic competition it signifies no more than the price remains fixed. As regards sales, a given variety of the product can be sold up to a definite quantity, though this quantity will most probably be for a variety of product which is successfully projected as an improved product. Lastly, it is assumed that an improved product has higher costs.

The first task for us is to explain the choice of the optimum variety of the product which we may simply describe as the optimum product. Let us suppose that a firm is contemplating the producing of a particular variety where costs are represented by the AC, curve in the following diagram. The firm expects to sell OQ_1 quantity of it. This implies a profit area $PR_1S_1T_1$ since pp is the price line

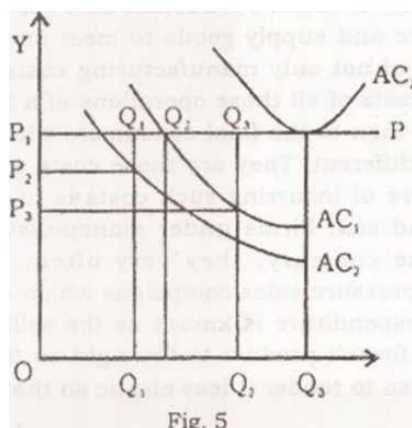


Fig. 5

showing fixed price at OP and the average cost at the expected sales of OQ_1 units is Q_1S_1 . The firm will consider other possibilities also. Every 'improved' product will have a higher average cost curve like the AC , in the above diagram. The firm in this case expects to increase sales up to OQ_1 units which yields on expected profits equaling the area $PR_2S_2T_2$ which is greater than the area $PR_1S_1T_2$. If any further improvement in the product raises the AC curve two such and helps in increasing the sales rather in adequately the area of profit that will average in that case will be smaller than the area PR_2TS_2 . In this situation the second product having AC as its average cost curve gives the highest possible profit. So this is the optimum product and the firm will choose the variety for production and earn the said profits, this is a situation of only short equilibrium of the firm.

In the long-run the rival firms will initiate this successful innovation of the pioneer firm. This will tend to reduce the sales of the individual firm. It is not only the existing firms which will offer competition by improving their own products bringing them clear and closer to that of the pioneer firm. The abnormal profit will attract new firms also which will further intensify the competition. This will ultimately reduce the sales of the individual firm to OQ only. When this happens, all firms will be selling OQ at which the price OP just equals the average cost QR . All earn just normal profits and everyone is producing less than the optimum output cause in lot of excess capacity.

Assuming that sooner or later same firm hits upon a new improvement yielding larger than the normal profits, the process of product competition in the long period will again take place and ultimately one again each firm will be earning just normal profits. The long-run stable equilibrium will be reached when the successive improvements raise the average cost curve AC_3 to a position like AC in our above diagram where it becomes tangent to the horizontal price line PP . Any further improvement will not help in even recovering the average cost, for the average cost curve will now lie above the price line. Well, this is the outside limit which is attainable if in the case of the product having AC . as its average cost curve the sales of the individual firms is OQ_3 but this amount of sales may not necessarily be attained. If such a product is associated with a smaller number of sales there will be losses. In that case equilibrium may take place with an 'inferior variety in the case of which the AC curve will intersect than be tangent to the horizontal price line. 14.8 EQUILIBRIUM THROUGH VARIABLE SELLING COSTS

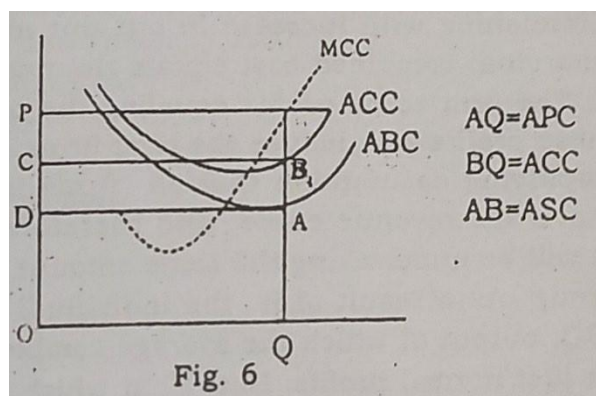
A special feature of monopolistic competition is the existence of selling costs. Selling costs are different from production costs. Production costs of a firm are those cost, which a firm incurs in order to produce and supply goods to meet an independently given demand for them. They are comprised of not only manufacturing costs but also costs of transport, storing, handling, etc. that is costs of all those operations of a firm which it has to undertake to manufacture the goods and then to the final consumers whose demand for them is taken as a datum. Selling costs are different. They are those costs which a firm incurs in order to influence demand. The objective of incurring such costs is to try to adjust demand to

what the firm wants to produce and sell. Firms under monopolistic competition do not accept demand as a datum. On the contrary, they very often, try to influence it through advertisement and other high-pressure sales campaigns which entail, expenditure in addition to the production costs. This expenditure is known as the selling costs. Their objective is to shift the demand curve of the firm's product to the right so that large quantity of it can be sold at a constant price, and also to render it less elastic so that the firm has a greater degree of monopoly power.

In order to explain equilibrium through variation in selling costs we shall make some simplifying assumptions. We shall assume the price to be given and constant. The production will be assumed to be given and constant.

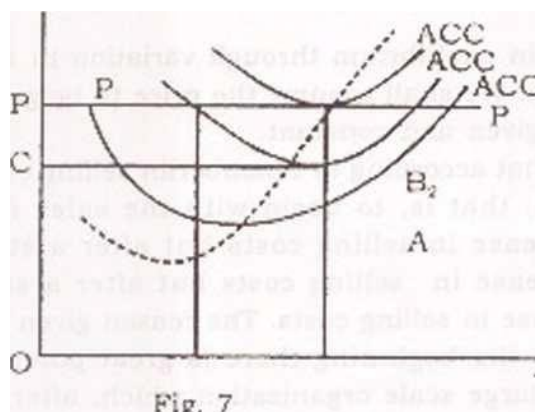
We should note that according to Chamberlin selling costs are subject to the law of Non-Production of Returns; that is, to begin with the sales of a firm increase more than in proportion to the increase in selling costs but after a stage, they increase less than in proportion to the increase in selling costs. The reason given by Chamberlin in support to the assumption is that in the beginning there is great potential to exploit the economies of division of labor and large-scale organization which, after a point, are depleted giving rise to diminishing returns. Moreover, after a point consumers resistance to sales campaigns also increases. This assumption of non-proportional returns to selling costs implies that the average selling cost curve of a firm will be U-Shaped implying that the average selling costs will be increasing after a point.

Our first task is to explain how the equilibrium size of selling costs is determined. We can explain it with the help of the following diagram.



The APC curve in Fig.6 represents the average production costs of the firm. It is U- Shaped as production is subject to law of non-proportional returns. If we add average selling costs (ASC) to the average production costs, we get the average combined costs (ACC). The Curve ACC in Fig.6 represents the average combined cost of the firm under consideration. It is also U-shaped, since both of its components (APC and ASC) are subject of non-proportionate returns. The above fig.6 does not show the average selling costs directly. But the vertical distance between the ACC curve and the APC curve at each level of output and sales represents the average selling costs (ASC) at the level. MCC is the marginal combined cost curve. Since price is fixed at level of the horizontal line PP represents the average revenue of price line. Assuming that the firm can sell any amount provided it is willing to undertake the appropriate amount of selling costs, the horizontal line PP will represent the marginal combined cost curve (MCC) intersects the marginal revenue (- average revenue) line PP because this is the condition of maximizing profits. This condition is satisfied at point E in our diagram. Thus, the Firms' equilibrium output and sales arc OQ and QB is the average combined cost while QA is the average production cost. The difference between the two (QB- QA=AB) is average selling costs. Multiplying it with the equilibrium profit maximizing output OQ(=AD) we get the optimum size of the selling costs for our firm. This is represented by the area of the rectangle ABCD in our above diagram.

The above optimum selling cost are arrived at on the assumption that while it resorts to selling costs the other firms in the groups will not imitate its strategy. Once this particular amount



of soiling costs is adopted, it becomes for the firm a sore of fixed costs which per unit of output and sales will go on diminishing. In the following diagram APC is the average production cost curve and ACC is the average combined cost curve. The vertical difference between these two curves indicates the average selling costs which because of the fixed total selling costs go on diminishing with increase in output and sales. The firm produces OQ output at Which the marginal combined cost equals the marginal revenue which equals the price OP that is fixed. The firm earns profits equaling the area PEBC, but this is only short period equilibrium. These profits will induce the rival firms also to resort Lo selling costs and under our initials simplifying assumption that all firms in the group; have identical cost curves and sales or average revenue curve and therefore, identical marginal curves also, each firm will be undertaking the same amount of selling cost. It will also attract new firms into the group. As a result of it the individual firm will go on diminishing till each firm produces. OQ. output at which the average combined cost equids price OP so that none earns more than just normal profits. Rut E, at which this equality takes place is not a position of stable equilibrium. Some firms any in this position think of increasing the selling costs in order to intensify its welling campaign. This will raise the average combined cost curve upwards but the firm may also succeed in selling large quantities on account of which profits may again emerge in the short period. But soon others will also follow suit and new firms will also enter in as a result of which the share of each firm in the total sales will go on decreasing till it earns no more than just normal profits. Such rounds of competition on the basis of variation in selling costs may go on until the average combined cost. ACC becomes tangent to the horizontal price line PP like the ACC, curve in Fig. above. This point of tangency is the position of long run stable equilibrium because now there is no possibility fox any firm to increase profits by increasing selling costs. For any attempt will push the ACC curve above the price line indicating losses at each and every level of output.

14.9 Answer to Self-Check Questions 14.6 (a)

Minimized

14.6 (b) True

14.10 Short Questions

- (a) What do you mean by Monopolistic Competition.
(b) Discuss some Analytical problems under Monopolistic Competition.

14.11 Long Questions

- (a) Distinguish between perfect competition and monopolistic competition.
(b) Explain the equilibrium of a firm under monopolistic competition situation through price output variation.

14.12 References

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PRICING AND OUPUT UNDER OLIGOPOLY

STRUCTURE

- 15.1 Cost, Demand and Product Differentiation
- 15.2 Pure and Differentiated Oligopoly
- 15.3 Collusion Versus Independent Action
 - (a) Perfect Collusion
 - (b) Imperfect Collusion
 - (c) Independent Action
- 15.4 Perfectly Organized collusive Oligopoly Models (a)
 - The Centralized Cartel
 - (b) The Model of Market-Sharing Cartel
- 15.5 Self-Check Questions
- 15.6 Unorganized Collusive Oligopoly Models
 - (a) The Model of the Low-Cost Price Leader
 - (b) The Model of the Dominant
- 15.7 Unorganized Non-Collusive Oligopoly Models
- 15.8 Game Theory and Oligopoly Models
- 15.9 Self-Check Questions
- 15.10 Some Possible Strategies
 - (a) Minimax
 - (b) Unwarranted Assumption
 - (c) Price Rigidity
 - (d) Fusion
 - (e) Collusion
 - (f) Aggression
- 15.11 Answer to Self-Check Questions
- 15.12 Short Questions
- 15.13 Long Questions
- 15.14 References

Oligopoly is market structure where there are a few sellers selling either identical products or differentiated products. If the products are identical, it is the case of pure oligopoly; if the products are differentiated, it is the case of differentiated oligopoly. A single seller, occupies a position of sufficient importance in the market as changes in his price activities do have repercussion on the others in the market as changes in his price activities do have repercussion on the others in the market. The other seller reacts to the market activities on the one, and their reactions, in turn, have reactions, in turn, have repercussions on him. The individual seller is aware of this inter-dependence and in changing his price, output sales promotional activity, or quality of product, he must take the reactions of others into account. Thus a few sellers in oligopoly make all the difference, in the sense that each seller is producing a large and a significant portion of the market output so that its actions and reactions are of importance to the

other sellers. It is very unlike a firm in perfect competition where it is producing as small and insignificant portion of the market output and where it cannot influence the price by its own individual action. Oligopoly pricing is not as clear and precise as the theories of perfect competition and monopoly. It is due to the uncertainty with regard to the rival's reaction to the various kinds of activities on his part. It is also due to the fact that oligopoly covers a wide range of cases, each with its unique characteristics. Thus, the oligopoly situation cannot be generalized like the position of other market structures. As such, several models will be developed which cover a large part of the oligopoly situations in the real world.

15.1 COST, DEMAND AND PRODUCT DIFFERENTIATION

Here it is assumed that the oligopolistic firm buys its resources competitively. Its cost curves are like those of purely competitive firm and the pure monopolist. In other words, the costs of a firm in oligopoly can be rising upwards.

It is the demand conditions that differentiate oligopoly from other market structures. Since what one firm is able to do in the market is conditioned by ways in which other firms react to the market activities of the one. The extent of this oligopolistic uncertainty is highly variable from case to case. In certain cases, the firm knows the actions and reactions and so can be certain about its demand curve while in most other cases these actions and reactions are not known and knowable and it is very difficult to predict the demand curve under such a situation. Thus, when the firm does not possess this knowledge, the position and the shape of the demand curve it faces, are highly conjunctural. What makes oligopolistic market structure different from others is the interdependence of demand among the firms of an industry.

15.2 PURE AND DIFFERENTIATED OLIGOPOLY

When the firms in oligopoly are selling identical products, it is called pure oligopoly and when they are selling slightly differentiated products, it is called differentiated oligopoly. The decision between differentiated oligopoly and pure oligopoly does not really matter in our analysis of pricing and output. As a practical matter, sellers in the most oligopolistic industries sell differentiated products. Nevertheless, some of the fundamental principles of differentiated oligopoly, as well as pure oligopoly are seen most clearly when we assume that pure oligopoly, a cluster of prices may occur. Televisions may range between Rs. 2580 to 3,000. The various levels reflect consumers' views regarding the respective qualities of the different seller's wares and the availability of different markets. The analysis is simplified if we assume that our oligopoly exists. It does not distort the basic pricing principles seriously, by reducing a cluster of prices to single market price for the product.

15.3 COLLUSION VERSUS INDEPENDENT ACTION

There is a tendency among the oligopolistic firms to form a collusion although, collusive arrangements are very difficult to maintain. Their tendency towards collusion is indicated by the three types of incentives that exist in the oligopolistic market structure. First, the firms in oligopoly can increase their profits by decreasing the competition and acting in a more or less monopolistic fashion. Second, collusion can decrease the oligopolistic uncertainty which is so much the characteristic of oligopolies and which reduces the profits considerably by not enabling the firms to act in the monopolistic manner. In the third-place collusion among the firms already in the industry - will facilitate blocking of newcomers from entering into that industry. However, once the collusion comes into existence, there is also a tendency on the part of a single firm breaking away from the collusion in order to enhance the profits. It is possible to classify oligopoly on the basis of degree of collusion present in its structure. The following three forms may be distinguished.

- (a) Perfect Collusion
- (b) Imperfect Collusion
- (c) Independent Action on the Part of individual Firms.
- (d) Perfect Collusion

Perfect collusion can take the shape of cartel arrangements. A cartel is a formal organization of the producers within a given industry, its purpose is to transfer management decisions and functions of

individual firms to a central association in order to improve the profit positions of individual firms. Cartels are prohibited in some countries but they have existed extensively in some countries and on an international place. The extent of the functions transferred to the central organizations varies in different cartel situations. We will make a mention of only the representative cartel situations. The first is the centralized Cartel; it implies a complete cartel control over the number firms. The second is market-sharing Cartel Meaning thereby that only fewer functions are transferred to the centered association.

The centralized cartel implies that decision-making with regard to pricing, output, sales and distribution of profits is accomplished by the central association, which markets the product determines the prices; determines the output that each firm is to produce and divided profit among member firms. Member firms are represented in the central association, the cartels policies presumably result from exchange of ideas, negotiations and compromises. The market sharing cartel is a somewhat looser form of organization. The firm forming the cartel agree on market shares with or without any understanding regarding prices. Member firms do their own marketing but are careful to observe the cartel agreement.

(b) Imperfect Collusion

Very often cartels are not allowed and there is a legal ban of the formation of cartels. So formal organization having the shape of a cartel cannot exist. Things cannot be settled in black and white. As such, informal agreements or tacit arrangements are arrived at in order to avoid the legal implications. Under such form of agreements, the firms agree to fix prices and outputs and thus escape from prosecution and under the antitrust laws. The price leadership arrangements of a number of industries-steel, automobiles, sugar and others are typical of this class. Tacit unorganized collusion can occur in many other ways also. Gentlemen's agreements of various sorts with regard of pricing output market sharing and other activities of the firms within the industry can be worked out on the lunch table or on so the social occasions of different kinds.

(c) Independent Action

Many times, collusive agreements are not arrived at, instead firms of an industry do it alone. There two possible outcomes of such independent action. First the firms acting independent often do not know the reactions of other firms to its own price formation. It very often invokes retaliatory action which results with industry's stability overtime. Firms may have learnt by experience what the reactions of rivals will be to action on their part and may voluntarily avoid any activity that will rock the boat. It is just possible that the management of each firm is well satisfied with present prices, outputs and profits and is content to let things continue as they are rather change and start a chain reaction in the shape of price war. Such a situation is described as price stability.

We shall take now these models one by one.

15.4 Perfectly Organized collusive Oligopoly Models

Let us first take up the two cases of perfectly organized collusive oligopoly of the purpose of determining the price and output. The analysis assumes short-run where the individual firms do not have the time to change their plant size nor is it possible for new firms to enter the industry.

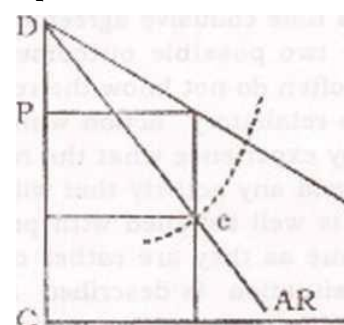
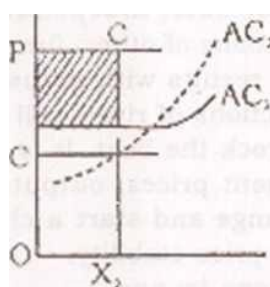
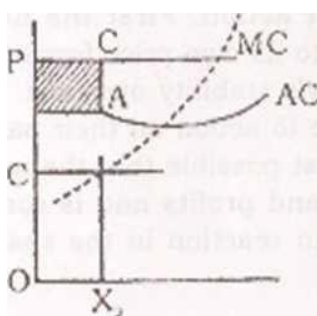
(i) The completely Centralized: It refers to collusions in its most complete form. Its purpose is the joint or monopolist maximization of industry profits by several firms of the industry or complete monopolistic price and output determination by the cartel will rarely be achieved in real world, although it may be approached in some industries.

(ii) In a completely centralized cartel, individual firms in an industry surrender the powers to make price and output decisions to a central association. Quotas to be produced are determined by the association and so is the distribution of industry's profits. Policies adopted are to be those which will contribute most to total industry's profits. Policies adopted are to be those which will contribute most, to total industry profits. To simplify the analysis, let us take two firms in an industry' producing identical products. These two firms join and form a central association to which they delegate the authority to decide not only the total quantity and the price at which it must be sold so as to attain maximum group profits, but also the allocation of production among the participating members. The authority of the central

association is complete. Clearly the central association will have access to the cost figures of the individual firms and for the purposes of the present model we unrealistically assume that the association can have its market demand curve and the corresponding MR curve. From the horizontal summation of the MR curves of the individual firms, the market MC curve is derived the firm acting as multi plant monopolist, will set the price as defined by the intersection of the industry MR and the MC curves.

(a) The Centralized Cartel

The cost structures of the individual firms are shown in the fig. 1-A and 1-B From the horizontal summation of the MC curves we obtain the market MC curve. This is implied by the profit maximization goal of the cartel; each level of the industry output should be produced at the same MC, clearly the resulting total is the output that can be produced at this common, lowest cost. Given the demand curve DD in Fig. 1C: the monopoly solution, which maximizes joint profits is determined by the intersection of MR and MC at the point. The total output is X and it will be sold at Price P. Now the central association allocates the production among firm A and Firm B as a monopolist will do, that is by equating the MR with the individual MCs. Thus, Firm A will Produce X_1 and firm B will Produce X_2 .

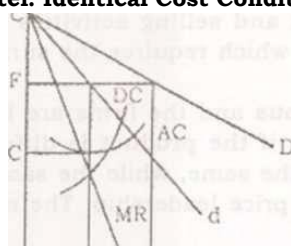


Note that the firm with lower costs produces a large amount of output. However, this does not mean that it will also take a large share of the attained joint profit. The total industry profit is the sum of the profits from the output of the two firms denoted by the shaded areas of figures 1-A and 1-B. The distribution of profits is decided by the central association of the cartel.

(b) The Model of Market-Sharing Cartel

This form of collusion is more common in practice because it is more popular. The firms agree to share the market, but keep a considerable degree of freedom concerning the style of their output, their selling activities and other decisions. We illustrate the market-sharing cartel with the determination of quotas. This method of sharing the market is the agreement on quotas, that is, agreement on the quantity that each member may sell at the agreed price. If all firms have identical costs, the monopoly solution will emerge with the market being shared equally by the member firms. For example, if there are only two firms with identical costs, (each firm will set at the monopoly price one-half of the total quantity demanded in the market at that price. Suppose that the two firms are also producing identical products and homogeneity of the product will establish the rule of a single price in the product market.

Market-Sharing Cartel: Identical Cost Conditions with two firms



O x X

Fig.2

In the figure 2. the industry demand curve for the product is DD. Each firm faces demand curve for its own output. Each has a short-run average cost curve and a short-run marginal cost curve represented by SAC and SMC respectively. The marginal revenue curve faced by each firm is MR profit maximizing output for each firm will be X, at which SMC is equal to MR. Each firm will want to charge price P. Together the firms will produce an industry output of X that will fill the market at price P. Such will be the case since did lies halfway between the market demand curve and the price axis.

Another popular method of sharing the market is the definition of a region in which each firm is allowed to sell. In this case of geographical sharing of the market, the price as well as the style of the product may differ: There many examples of regional market-sharing cartels, some operating at international level. However, a regional split of the market is inherently unstable. The regional agreements are often violated in practice either by mistake or intentionally, by the lowcost firms who have always the incentive to expand their output by selling at a lower price openly defined or by secret price concessions or by reaching adjacent markets through advertising.

It should be obvious that the cartel models of collusive oligopoly are closed models. If entry is free the inherent instability of cartels is intensified: the behavior of the entrant is not predicated with certainty. It is not certain that the new firm will join the cartel. On the contrary if the profits of the cartel members are lucrative and attract new firms in the industry the newcomer has a strong incentive not to join the cartel, because in this way its demand curve will be more elastic and by charging a slightly lower price than a cartel, it can secure a considerable share in the market on the assumption that the cartel members will stick to their agreement. Cartels being aware of the dangers of entry will either charge a low price so as to make entry unattractive or may threaten a price war on this newcomer. If entry occurs and the cartel carries out its threat of price war, the new comer may still survive, depending on his cost advantage and his financial strength in with standing possible losses during the initial period of his establishment, until he reaches the size which will allow him to reap the full scare economics that he has over those enjoyed by the existing firms.

15.5 Self- Check Questions

15.5 (a) Pure Oligopoly based on the _____ products.

15.5(b) Name Perfectly Organized Collusive Oligopoly Models.

15.6 UNORGANISED COLLUSIVE OLIGOPOLY MODELS

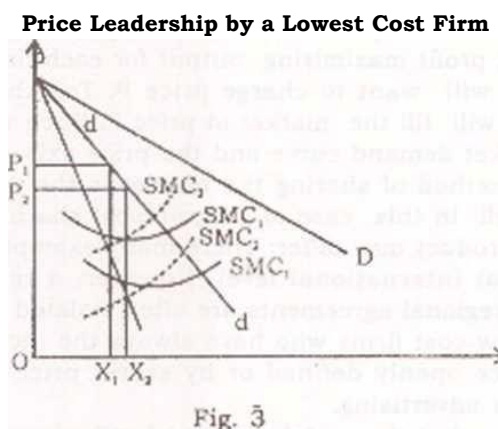
When cartels are not allowed to take shape, some tacit or gentlemen's agreements take place to avoid the legal prosecution. Such form of collusion is price leadership. In its form of coordinated behavior of oligopolists one firm sets the price and others follow it, because it is advantageous to them or because they prefer to avoid uncertainty about their competitors' reactions even if this implies departure of the followers from the profit maximizing position. Price leadership is widespread in the business world. It may be practiced either by explicit agreement or -informally. In nearly all cases price leadership is cases since open collusive agreement are illegal in most countries.

Price leadership is more widespread than cartels, because it allows the members full freedom regarding their product and selling activities and thus is more acceptable to the followers than a complete cartel, which requires the surrendering of all freedom of action to the central association.

If the product is homogenous and the firms are highly concentrated in a location the price will be identical. However, if the product is differentiated prices will differ, but the direction of their change will be the

same, while the same price differentials will broadly be kept. There are various forms of price leadership. The most common types of leadership are given here.

(a) The model of the Low-cost price leader: Let us suppose that there are k firms in the industry, that a tacit market sharing arrangement has been established with each firm assigned half the market, the product is homogenous and that one firm has lower cost than the other. A conflict of interests occurs with regard to the desirable price to the change:



In figure the market demand curve is DD . Each firm faces demand curve dd . The cost curves of the high-cost firm are SAC_1 and SAC , and those of the low-cost firm are SAC_2 and SMC_2 . The marginal revenue curve of each firm is mr . The high-cost firm will want to produce an output or X , and charge a price of P . whereas the low-cost firm will want to produce and output of X_2 and charge a price of P_2 .

Since the low-cost firm can afford to sell at a lower price than the high-cost firm can, the latter will have no option but to sell at the price set by the low-cost firm. Thus, the low-cost firm becomes the price leader. This sort of situation has several ramifications, depending on the comparative cost structures of the firms, the number of firms or the industry, the shape and the position of the market demand curve and the share of market that each firm is to receive.

Although the price leadership model stresses the fact that the leader sets the price and the follower adopts it, it is clear that the firms must also enter into a market agreement, formally or informally, otherwise the follower could adopt the price of the leader but produce a lower quantity than the level required to maintain the price set by the leader in the market, and thus push (indirectly by not producing enough output) the leader to a non-profit maximizing position. In this respect the price follower is not completely passive; he may be coerced to adopt the leader's price but unless tied by a quota-share agreement (formal or informal) he can push the leader to a non-profit maximizing position.

(b) The model of the Dominant: In this model, it is assumed that there is a large dominant firm which has considerable share of the total market, and some smaller firms, each of them having a smaller market share. To avoid large scale price cutting tacit collusion may occur in the form of price leadership by the dominant firm. Suppose the dominant firm sets the price for the industry and allows the small firms to sell wheat they desire at that price. The dominant firm then fills out the market.

Under the situation, each small firm will behave as if it were in a competitive market. It can sell all it wants to sell at the price set by the dominant firm. It faces a perfectly elastic demand curve at the level of the established price. The marginal revenue curve of the small firm coincides with the demand curve faced by it; hence to maximize profits the small firm should produce the output at which its marginal cost equals marginal revenue and the price set by the dominant firm.

A supply curve for all small firms combined is obtained by summing the marginal cost curves of all the small firms horizontally. It shows how much all small firms together will place on the market at each possible price. The curve is labeled MCs in Figure 4.

Price Leadership by a Dominant Firm

price in the same direction but less than the change of the original seller; they may engage in extensive advertising campaigns or they may react in many other ways. Inability of the individual seller to predict which reactions will occur and in what degree will they occur, results in an absolutely certain behavior on the part of the firm. It leads to either price wars or price rigidity. Let us analyze these situations.

(a) The Model of Price Wars: A persistent danger of price wars exists in oligopolistic industries characterized by independent action on the part of individual firms. Little of precise nature can be said about these. One seller may lower his price to increase his sales. But this move takes customers away from the rivals, and the rivals, may retaliate with a vengeance. The price war may spread throughout the industry, with each firm trying to undercut others. The end result may well be disastrous for some individual firms.

The specific cases in which price wars are varied but they originate from the interdependence of sellers. A new firm opening up in a locality or an existing firm attempting to revive lagging sales may be the initiating factor. Surplus stocks at existing prices and limited storage facilities have touched off price wars in many industries. In a young industry, sellers may not have learned what to expect of rivals or they may be scrambling to secure an established place in the industry and may inadvertently start a price war in the industry and may inadvertently start a price war.

In the Fig. 5 we note two reaction curves: The curve 1 shows A's reaction to price set by firm B it shows the best price that firm A would like to charge given the price of B. The curve shows B's reaction to the price set by A or in other words it shows the best price that firm B would like to

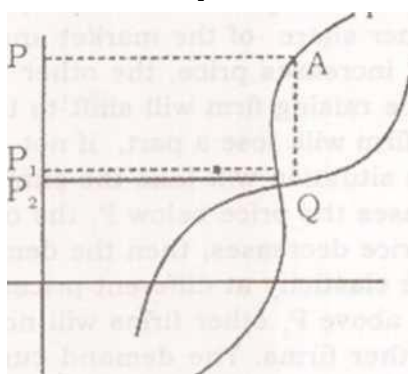


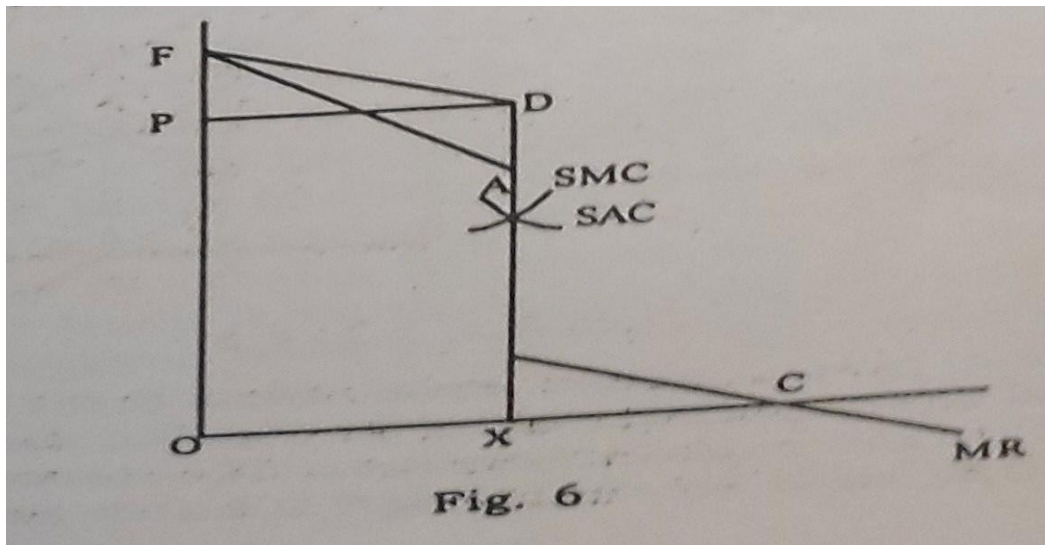
Fig.5

charge given the price of A. If firm B charges a price of P firm A would like to charge a price of P_A . And if firm A sets the price of P_{A1} firm B would like to charge a price of P_1 to which A's reaction would be that it would like to charge a price of P_{A1} set by A would be that it would set a price of P_2 and so we go on approaching the equilibrium point Q at the intersection of the two reaction curves. With the curves as drawn the equilibrium is stable. We may note here that the reaction curves as drawn the equilibrium is stable. We may note here that the reaction curves themselves may not be stable for instance of Q both firms are unprofitable. Either one may eliminate or absorb the other, or there may be collusion of a new set of curves to raise the prices to higher levels.

Maturity on the part of the long-established industry may substantially lessen the dangers of price wars. Individual firms may at least have to learn what to do and may carefully avoid any activities that conceivably could touch off price wars. They may have established a price or a cluster of prices that is tolerable to all from the point of view of profits. Such price is thought by many to be rather rigid over time, although there is no clear-cut evidence that this is the case individual firms are thought to engage in non-price competition rather than in price rivalry in order to increase their respective shares of the market and profit.

(b) The Model of Price Rigidity: An analytical device frequently used to explain oligopolistic price rigidity is the kinked demand curve. There are a few assumptions of this model. First, it assumes that the industry is a mature one either with or without product differentiation. A price or a cluster of prices fairly

satisfactory to all firms has been established. Second if one firm lowers price other firms will follow or undercut it in order to retain their shares of the market. For price



decreases, the individual firm cannot hope to do more than hold its former share of the market and it may not succeed in doing even that much. Third, if one firm increases price, the other firms will not follow the price increase. The customers of the price raising firm will shift to the others, now relatively lower priced firms, and the price raising firm will lose a part, if not all, of its share of the market.

The demand curve in such a situation will take the shape of FDE as in Fig.6. The firm has established price P. If it decreases the price below P the other firms follow and it retains only its share of the market. For price decreases, then the demand curve faced by the firm is DE and it will have about the same elasticity at different prices as the market demand curve. Should the firm increase the price above P other firms will not follow and it loses a pair of all of its share of the market to other firms. The demand curve faced by the firm for price increased is FD and at each possible price it will have considerably greater elasticity than the market demand curve. The demand curve FDF. is not smooth one it has a kink in it at the established price P.

Corresponding to the kinked demand curve FDE, the marginal revenue curve (FABC line) is discontinuous ac output X. Given the cost structure represented by SAC and SMC, SMC cuts MR in the discontinuous portion. Output X and price P are the profit maximizing output and price. This is a fairly rigid price in the sense that any cost changes for example represented by SAC₁ and SMC₂ which cut the MR within the discontinuous portion AB, give no incentive to the oligopolistic firm either to change the price or the output. But in case the cost changes are sharp enough to cut the MR either in the FA or BC portions, it will impel the oligopolist to change the price and output.

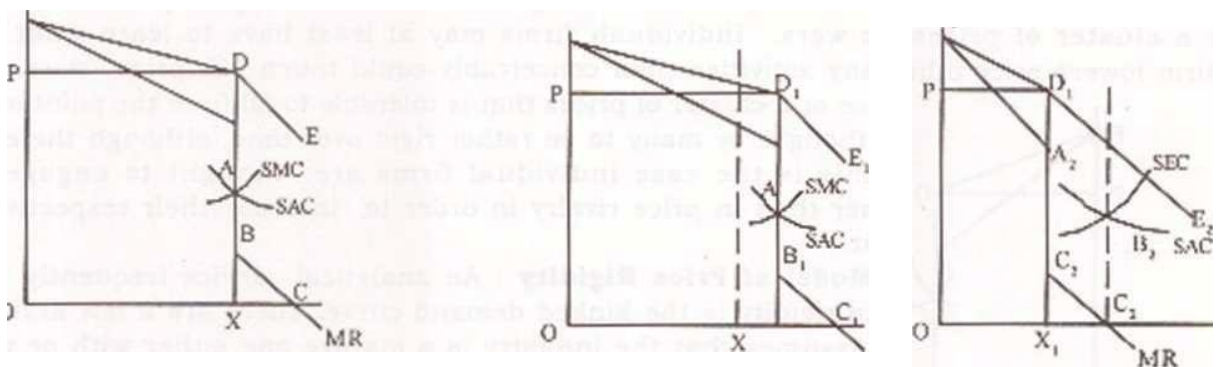


Fig. 7.1, 7.2, 7.3

Similar price rigidity is maintained even when there are changes in the demand. Let the initial position of the oligopolist be as in Fig. 7.1 Assume his costs do no change and the market demand for the produce increases. The demand curve faced by oligopolist shifts to the right to $F_1D_1E_1$ as is shown in Fig.7.2 but it remains kinked at price P. The marginal revenue curve moves to the right also with its discontinuous segment always occurring at the output at which demand curve is kinked if the increase in demand is limited one so that MR cuts MC in the discontinuous segment always accruing at the output at which demand curve is kinked if the increase in demand is limited one so that MR cuts MC in the discontinuous portion (A_1B_1) the firm will continue to maximize profits at the price P but at the large output X_1 A decrease in market demand shifts the firm's demand curve to the left, to $F_2D_2E_2$ as is shown in fig. 7.3. Here again there is no incentive to change the price although output decreases, until the demand curve shifts far enough to left of the MC curve to intersect the B_2C_2 Segment of the MR curve. This price remains stable at P level.

15.8 GAME THEORY AND OLIGOPOLY MODELS

Oligopoly is characterized by a specific form of uncertainty. Here the uncertainty arises from the reactions of the competitors, not from unpredictable world conditions. Furthermore, this uncertainty is multilateral of the outcome of each firms' actions depends upon the behavior of every other firm in the field.

The Payoff Table: We can draw a payoff table for each firm, showing its potential profit from each action of its own and of its opponents. For simplicity let us assume that there are only two firms and limit their actions to changing prices. In the table, the prices of firm A are listed along the left margin and prices of firm B across the top. For every pair of prices, the profit of each firm is shown. As profits are shown in the lower left portion of each cell and P profits in the right portion of each cell. For example, if A sets a price of 80 paise and a price of 70 paise, as profit will be Rs. 7000 and profit of B will be Rs. 22,000. The table shown that firms are not identical. In general, B is a more profit-making firm than A. We have also assumed that there is some sort of product differentiation, so that it is conceivable for a firm to make profit even if its price is higher than that of its competitor.

15.9 Self-Check Question

- (a) Name Unorganized Collusive Oligopoly Models.
- (b) Name Unorganized Non-Collusive Oligopoly Models.

15.10 SOME POSSIBLE STRATEGIES

Various courses of actions are possible in the face of uncertainty. Here we will discuss the six most common strategies.

(a) **Minimax:** Each firm may wish to play it safe. It therefore, considers the worst that can happen at each price it might set. A, for example may lose Rs. 7.00 if it charges Rs. 1 or 4000 if it charges 90 paise, at 80 paise, it is guaranteed a profit of at least Rs. 3000 and at 70 and 60 paise a profit at least Rs. 2000. It will therefore, choose 80 paise which guarantees at least Rs. 3000. Similarly b could calculate its worst possibilities at each price. These are in order of Rs. 6000, 80000, 12000, 10000, and 4000 ranging from the highest to the lowest Price. B will also choose 80 paise which guarantees at least Rs. 12000. Actually, since each will set a price of 80 paise, as profit will be Rs. 10000 and B's profit will be Rs. 25,000.

(b) **Unwarranted Assumption:** Sometime a businessman believes that his opponent's prices will remain stable even when his prices change. If A believes that B will continue to charge 80 paise it will find it better to charge 70 paise, for that will increase its profit to Rs. 11000. If B then feels that A' a price will remain 70 paise. B too will find it worthwhile to cut the price to 70 paise thereby increasing its profits form Rs. 18000 to Rs. 20000. This new position is table for neither finds it worth to changer the price further. Such behavior is because the Businessman involved must be alert enough to maximize its profits but enough not to expect reaction from his competitor.

(c) Price Rigidity: Assume it is each firm's expectation that its competitor will match the price cuts, no price increases. This means that the firm in the table expects to move up the column and down the diagonal. If A and B both are charging 80 paisa A will forest a profit of Rs. 5000 at 90 paisa and zero ill Rel. If firm A cuts prior it expects a profit of Rs. 8000 at 70 paisa and 2000 at 60 paisa. Since all of these profits are less than Rs. 100000 it is worth while staying at paisa, it will not change its price.

The sickness of oligopolistic prices is evident here. If the two firms make this assumption, they will continue to charge whatever their prices happened to be when they first came into competition. Obviously, such prices must be explained by history rather than by current alone. (d) Fusion: In a regulated economy, the best possibility for all firms is to unite. In this way the firms can maximize the total profits and then divide it between them. With this policy the firms in the table will do best if each sets a price of Rs. 1 making a total profit of Rs. 45,000 such fusion has been achieved by means of trust and mergers.

(e) Collusion: Firms often agree to follow parallel courses of action while maintaining separate identities. Although such agreements are held illegal in many countries yet they are often hard to detect. For example, let us suppose that both firms are charging a price of 80 paisa after a series of price cuts at this stage the sales managers might launch together and agree that each will raise price to 90 paisa. The limit of such collusion is only the diversity of the firm in the industry. Suppose for example, B would rather have the prices raised to Rs. 1 but would not. Collusion generally fails because there is no single act that is best for all concerned. That is why collusion is confined to simple agreements. More elaborate conspiracies and settlements, require written memoranda and a method of settling grievances but collusion on the other hand, is kept on an informal basis.

(f) Aggression: Sometimes a firm engages in aggressive activity, sells a price at which its competitor will lose money, hoping to drive him out of the market. Usually, this price is unprofitable even to the aggressor and the outcome of such a contest depends mainly on the financial resources of the two companies and not upon their operating efficiency. Such aggression, therefore is seldom in the interest of public.

These six cases do not exhaust the possibility, but instead supplement the explanation of oligopoly behavior outline in the earlier part.

15.11 Answer to Self-Check Question

15.5 (a) Homogeneous

15.5 (b) The centralized Model and The Model of Market-Sharing Cartel.

15.8 (a) The Model of Low- Cost Price Leader and The Model of the Dominant.

15.8 (b) The Model of Price Wars and The Model of Price Rigidity.

15.12 Short Questions

(a) Explain game theory in Oligopoly Models.

(b) Explain Price Rigidity and Aggression strategy to face the uncertainty.

15.13 Long Questions

1. Explain the Market Sharing Cartel.

2. Explain the circumstances under which the oligopolists act as a single monopolist.

3. Price rigidity or price war are the common characteristics of oligopolies acting independently. Explain.

4. Explain some of the possible strategies open to the oligopolist with the help of game theory.

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PRICE-DISCRIMINATION AND MONOPOLY

STRUCTURE

- 16.1 Conditions for Discrimination
- 16.2 When is Price Discrimination Profitable?
- 16.3 Conditions for Equilibrium under Perfect Discriminating Monopoly
- 16.4 Degrees of Price Discrimination
 - (a) First Degree Price Discrimination
 - (b) Second Degree Price Discrimination
 - (c) Third Degree Price Discrimination (Two Cases)
- 16.5 Is Price Discrimination Desirable?
- 16.6 Self-Check Questions
- 16.7 Answer to Self-Check Questions
- 16.8 Short Questions
- 16.9 Long Questions
- 16.10 References

A monopolist fixes price of his product in such a way so as to yield him the maximum net revenue and the price is fixed at the point where his marginal revenue equals marginal cost. Under simple monopoly, the monopolist charges one uniform price from all his customers for a single commodity. But this is not so under pricing discriminating monopoly. Since the monopolist has a full control over the supply of a commodity, he is in a position to charge different prices for different customers for it. It often happens that monopolist finds it possible and profitable to sell a single commodity at different prices to different buyers. This can occur when goods which are sold in the cheaper market cannot be brought from the monopolist and resold in the dearer market cannot transfer themselves into the cheaper market to get the benefit of the lower price. The act of selling the same article under a single control, at different prices to different buyers is known as price discrimination.

“Under conditions of perfect competition price-discrimination could not exist even if the market could be easily divided into separate parts. In each section of the market the demand would be perfectly elastic, and every seller would prefer to sell his whole output in that section of the market in which he would obtain the highest price. The attempt to do so, of course, would drive the price down to the competitive level, and there would be only one price throughout the whole market”.....(Joan Robinson)

Price discriminating monopoly is likely to occur only when market is imperfect. The degree of price discrimination practiced depends upon the degree of imperfection in the market. Price discrimination is more likely to occur when there is monopoly of the product by a single seller or group of sellers.

16.1 CONDITIONS FOR DISCRIMINATION

Price discrimination becomes possible only when (i) no unit of demand can be transferred from one market to another and (ii) no unit of supply can be transferred from one market to another. These two conditions are two different sides of the same thing. Various examples can be given to further elaborate the conditions.

Discrimination can occur when the markets in which a monopolist is selling are divided from each other geographically. High transport costs may prevent resale of goods in a dearer market, bought from the cheaper market. Tariff barriers provide another example. They facilitate splitting of markets. A monopolist may be selling at a lower price in export market (in order to capture it) and at a higher price in home market (in order to make up the losses). This is known as dumping. This is made possible by high tariffs because goods cannot be bought from the foreign (cheaper) market and resold in home (dearer) market. Discrimination is not often practiced in the sale of direct personal services, where there is no possibility of transfer from one market to the another. For example, doctor charges different fees from their patients according to level of income and wealth of their patients. Discrimination is again possible when the same service is required in connection with clearly differentiated products. For example, railways can charge different rates for the transport of cotton goods and of coal without any fear that sales of cotton will be turned into loads of coal in order to enjoy a cheaper rate. Legal sanction also facilitates price discrimination for instance different rates are charged for the use of electricity for industrial and lighting purpose. Discrimination may occur again when buyers are ignorant. For example, in case of goods sold on special orders, the individual buyers have no means of knowing what price is being charged from other buyers for a similar commodity. Another factor that facilitates price discrimination is product differentiation. Various brands of a certain article (which are almost alike) may be sold as different qualities under different names at several different prices to different buyers. The monopolist is thus able to break up his market and sell the so-called inferior to the poor people. "In this way the market is split up, and the monopolist can sell what is substantially the same thing at several prices. The device of making the same thing appear in different guises will also serve to save the monopolist from the reproaches of injustice between customers which sometimes put difficulties in the way of price discrimination." (Joan Robinson). Then there are those cases in which there is actual difference in the various varieties of the product and different prices are charged for different varieties. In such cases price discrimination is said to be practiced if extra price charged for the so-called superior varieties are not proportional to the extra cost incurred on them.

It is clear from above that price discrimination becomes possible only when no unit of the commodity sold in one market can be transferred to another, and when no buyer is able to transfer himself from dearer market to cheaper market to buy the commodity or service at the lower price. Price discrimination depends upon the ability of monopolist to split up and keep the market separate.

16.2 WHEN IS PRICE DISCRIMINATION PROFITABLE?

We have seen above the conditions which make price discrimination possible. It is quite likely that the monopolist may be able to charge different price in separate markets, yet it is not profitable for him to do so. Price discrimination becomes profitable only when elasticity of demand for the product is different in different markets at a single monopoly price. If elasticity of demand is the same in both markets it would not pay the monopolist to charge different prices in these markets, marginal revenue in the two markets at every price of the product will also be the same.

It is so because:

$$MR = (e-1)/1$$

When marginal revenues at every price of product are the same in both markets, it will not pay the monopolist to transfer any quantity of the product from one market to another and charge different prices for the same product in these markets. When elasticity of demand is different in both markets at the same monopoly price, only then it is to the advantage of the monopolist to charge different prices in different markets. It is then in this interest that he must discriminate in prices if he wants to maximize his profits. If he does not do so and charge a single monopoly price (on the basis of aggregate marginal revenue and marginal cost of the output) in both the markets where elasticities of demand are different, he is not maximizing his profits. "For if he charges the same price in each market, he will find that, at that price, the

marginal revenue obtained by selling an increment of output in each market separately is greater in some markets than in others. He can therefore increase his profit by selling less in those markets where elasticity of demand is less and the marginal revenue smaller, and selling more in those markets where elasticity of demand is higher and the marginal revenue greater.

Now the question is how long will the monopolist go on transferring the output from the market with low elasticity of demand to the market with high elasticity of demand? He will go on being so till marginal revenues in both markets are equalized. To quote Mrs. Joan Robinson, the monopolist will “adjust his sales in such a way that the marginal revenue obtained from selling an additional unit of output in any one market is the same for all markets. And his profits will be at a maximum when the marginal revenue in each market is equal to the marginal cost of the whole output.” It follows from above that when marginal revenues are equalized in two markets (having different elasticities of demand at the single monopoly price) prices charged would be different. The monopolist would charge a higher price in market with low elasticity of demand and a low price in market with high elasticity of demand.

16.3 CONDITIONS FOR EQUILIBRIUM UNDER PERFECT DISCRIMINATING MONOPOLY

Under simple monopoly a producer reaches his equilibrium when his marginal revenue equals his marginal cost of output. A price discriminating monopolist has to sell in different markets, having different elasticities of demand. He is to take two decisions: (i) how much total output should be produced and (ii) how much output should be sold in each market, and at what price should be sold in each market? The answer is provided by Mrs. Joan Robinson, “The monopoly output under price discrimination is determined by the intersection of the monopolist’s marginal cost curve with the aggregate marginal revenue curve. This total output is made up of the amount sold in the two markets, in each of which marginal revenue is equal to the marginal cost of the whole output. The price in each market will be the demand price for the amount of output sold there.”

The price discriminating monopolist will thus produce that level of output at which aggregate marginal revenue equals marginal cost of the total output. He will consider marginal cost of the whole output. In other words, price discriminating monopolist will reach his equilibrium when:

(a) $\text{Aggregate Marginal Revenue (AMR)} = \text{Marginal Cost (MC)}$

(b) $\text{MR}_1 = \text{MR}_2 = \text{MR}_3$

16.4 DEGREES OF PRICE DISCRIMINATION

Price discrimination can be classified according to the extent to which it is practiced. A monopolist may practice three categories of price discrimination:

First degree Price discrimination

Second Degree Price Discrimination

Third Degree Price Discrimination

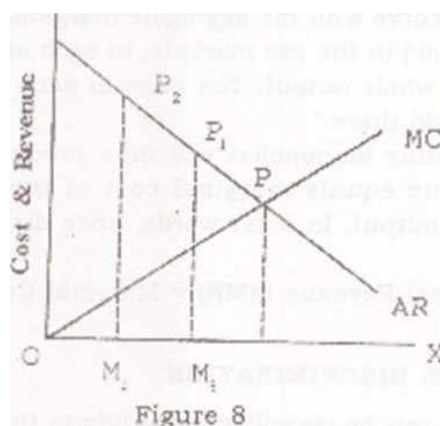
Prof. A.C. Pigou in his book, *The Economic of Welfare* has given a good account of the degrees of price discrimination. While explaining them he says: “A first degree would involve the charge of a different price against all different units of commodity in such a way that the price expected for each was equal to the demand price for it, and no consumer’s surplus was left to the buyers. A second degree would be obtained if a monopolist were able to make separate prices, in such a way that all units with a demand price greater than x were sold at price x and greater than y at price y , and so on. A third degree would be obtained if the monopolist were able to distinguish among his customers, in different groups, separated from one another more or less by some practicable mark, and could charge a separate monopoly price to the members of each group. This degree, it will be noticed, differs fundamentally from either of the preceding degrees, in that it may involve the refusal to satisfy in one market, demand represented by demand prices excess of those which in another market, are satisfied”.

We now discuss them in more detail

(a) First Degree Price Discrimination

In first degree discrimination, the monopolist charges from a consumer a different price for each unit of the good. He charges each buyer the highest price that he will pay for each unit of the good he gets. The monopolist thus leaves no consumer surplus with the consumer.

As illustrated in Fig 8 the monopolist has sold three units of the commodity at three different prices P_2 , P_1 , P . He has not sold all three units at the uniform price of P which he would have charged under simple monopoly. He has obtained from each buyer the higher price which he was willing to pay rather than go without the thing, "Under the first-degree price discrimination, the monopolist realizes the entire utility obtained by consumers and leaves no consumer surplus with them. Again, under the first-degree price discrimination, average revenue and marginal revenues curves coincide with each other as demand curve of the buyer becomes marginal revenue curve for the seller. This is unlike simple monopoly where marginal revenue curves are rising upward for the seller. This is unlike simple monopoly where marginal revenue lies below average revenues curve.



(b) Second degree Price Discrimination

In second degree price discrimination, buyers are divided into different groups or classes and from each group or class a different price is charged which is the lowest demand price of that group or class. In other words, the monopolist charges from each group that price which a marginal individual or that group is just willing to pay. According to prof. Pigou, the monopolist will charge separate price in such a way that all units of the commodity with a demand price greater than, say x , are sold at a price x , all units with a demand price greater than y but less than x at price y and so on. Thus in Fig. 8 OM block of units is sold at PM price. M th unit has a demand price PM and earlier units have demand a price greater than PM as shown by the DP position of demand curve DD . Under second degree price discrimination OM units are sold at PM price. Thus, consumer enjoys no consumer's surplus on M th Unit, but he enjoys consumer surplus on earlier units as shows by the shaded area, Similarly, MM_1 block of units are sold at P_1M_1 price, and M_1M_2 block of units at P_2M_2 price. Consumer enjoys surplus satisfaction to the extent of shaded areas shown in these respective block units.

(c) Third Degree Price Discrimination (Two Cases)

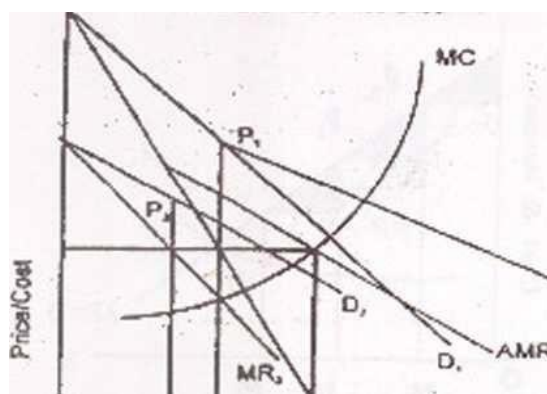
The third-degree price discrimination is the most common form of price discrimination. It is practiced when the monopolist can divide his buyers into two or more markets and charge different prices in different markets or sub-markets. This becomes possible when the elasticity of demand in different sub-markets is different and when each market is isolated from other market so that no consumer buying in the low prices market can re-sell the product in the high price market.

First Case

The monopolist divides his total market into two sub-markets on the basis of elasticity of demand. Suppose he divides his total market into sub-market I and market II taking elasticity of demand into

consideration. As illustrated, in Fig. 10 D_1 and D_2 are demand curves of two markets. They both slope downwards to the right MR_1 and MR_2 are the corresponding marginal revenues curves AMR is aggregate marginal revenues which has been derived by adding up laterally MR_1 at MR_2 .

AD is aggregate demand curve which is derived by lateral summation of D_1 and D_2 curves. Aggregate demand curve shows the total amount that would be sold at each price if the prices were the same in both markets, and aggregate marginal revenue shows the number of sales that would correspond to each value of the marginal revenues if the marginal revenues were the same in both markets. This curve will show the marginal revenues obtained by the discriminating monopolist. The monopolist will maximize his profits by producing that level of output at which marginal cost curve intersects the aggregate marginal revenue curve. This is represented by OM output in the figure. Thus, total output OM is to be sold in two markets in such a way that marginal revenues in two markets are equal to each other and also to marginal cost of the whole output. OM_1 is sold at the price M_1P_1 , in market 1, OM_2 is sold at the price M_2P_2 in market II. The shaded area shows the monopolist's profits which is equal to the area lying under aggregate marginal revenues curve (total revenues) minus the area lying under the marginal cost curve (total cost).

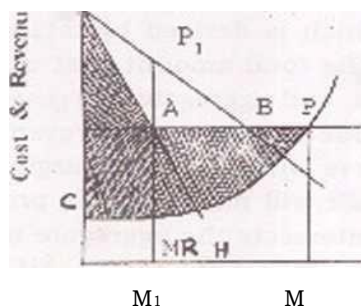


O M₂ M₁ M
Output

Fig.10

Second Case: Equilibrium In the Dumping Case

A special cases of price discrimination occurs when a producer is selling in two markets, one of which is perfectly competitive, while in the other he has a monopoly. This can often be noticed in international markets. Such situation arises which a producer sells his product in his home country where he has a monopoly and also in the world market which is perfectly competitive. In the home market, he confronts a downward sloping demand curve and in the world market, he faces a perfectly demand curve (Fig. 11).



Since the producer faces perfect competition in the world market the average revenues and marginal revenues curve are indicated by horizontal straight line $Ar_w=MR_w$. AR_H and MR_h represent average and

marginal revenues curve in the home market. MC is the marginal cost curve of output. Equilibrium level of output is determined when MC intersects aggregate marginal revenues curve DABP. P_{OM} is the total output sold. This output is to be distributed in both markets in such a way that marginal revenues in both markets are equal to each other and also to marginal cost. Thus, OM is sold in home market at P_{MI} price and MM amount of output is sold in world market at P_{PM} price. As is evident from the figure 10, the producer is charging a lower price in the perfectly competitive world market and a higher price in the home market. He is said to be dumping in the world market. He is earning profit equal to the area CPAD.

It can be concluded that existence of price discrimination depends on the difference between the elasticities in the market in which it is possible to sell. Total market is divided into sub-markets by monopolist on the basis of elasticity of demand. Highest price is charged in the least elastic market and least price is charged in the most elastic market. Price charged thus depends upon the degree of elasticity of demand.

16.5 IS PRICE DISCRIMINATION DESIRABLE?

(a) We are now to examine how far price discrimination is harmful or advantageous to the customers of monopolist and to the society as a whole. According to G. J. Stigler, "Economists are considerably divided on the best pricing policy for an industry whose existence required discrimination." It is generally agreed that consumers are better off if a single price is charged for the same commodity. But various cases can be cited in which price discrimination is beneficial. Some commodities and services might not be produced at all if sellers were not able or were not allowed to practice price discrimination. The important question then is: is discrimination objectionable when the supply of the commodity will be smaller without discrimination or the supply completely stops. Let us take the case of railway. Railways cannot operate if 'Cost of Service' principle is adopted. They can work only if permitted to charge according to the principle of what the traffic will bear, i.e., charge higher freight rates for materials that have a higher value per ton than for materials of lower value. Similarly, higher rates are charged from customers of electricity for lighting purpose than from customers of electricity for industrial production. Such situations may be found in which costs of production cannot be covered by receipts unless price discrimination is permitted. Commenting on the desirability of price discrimination, Mrs. Joan Robinson has observed, "Since average revenue is greater under price discrimination than under simple monopoly, there may be cases in which no output would be produced at all if price discrimination were not possible. If the average cost curve of a certain product lay above the demand curve for it throughout its length no profit could be made by producing it under any one price system. But if the average cost curve though above the demand curve, lay at some point below the average revenues curve under price discrimination, a profit could be made and some output would be produced provided that discrimination was possible. It may happen, for instance, that a railway would not be built or a country doctor would not set up in practice, if discrimination were forbidden. It is clearly desirable that price discrimination should be permitted in such cases, for the average revenues of the monopolist cannot be greater than average utility to the consumers. If average revenue is greater than average cost, average utility will also be greater, and the investment will lead to gain to society. Figure 12 shows the case of a monopoly in which profitable production is possible only under price discrimination suppose the monopolist has two markets. The demand in one market is inelastic as shown by demand curve D_1 . The demand in the other market is quite elastic as shown by the demand curve D_2 . The curve AC shows his average cost of production which lies much above his demand curve in the first market. The monopolist has the aggregate demand curve of the two markets shown by LMN with a kink at the point M. Even this demand curve lies below his average cost curve at all levels of output. If the monopolist charges a single price in both markets, there is no way of recovering his entire cost as the AC curve entirely lies above the D_1 & D_2 curves. By charging different prices in the two markets, however, the monopolist may be able to survive if the monopolist finds that his marginal cost of production gives him the

profit maximizing outputs OQ_1 , and allocates O to the first market and O to the second market and he is able to charge the price P_1 in the first market and Q_2P_2 in the second, the weighted AR curve is now LMN . The AC curve now touches the AR curve the firm is now viable. To earn profit the monopolist fixes price at Q_1P_1 . Thus, the aggregated average revenue becomes higher than his average cost at these levels of output.

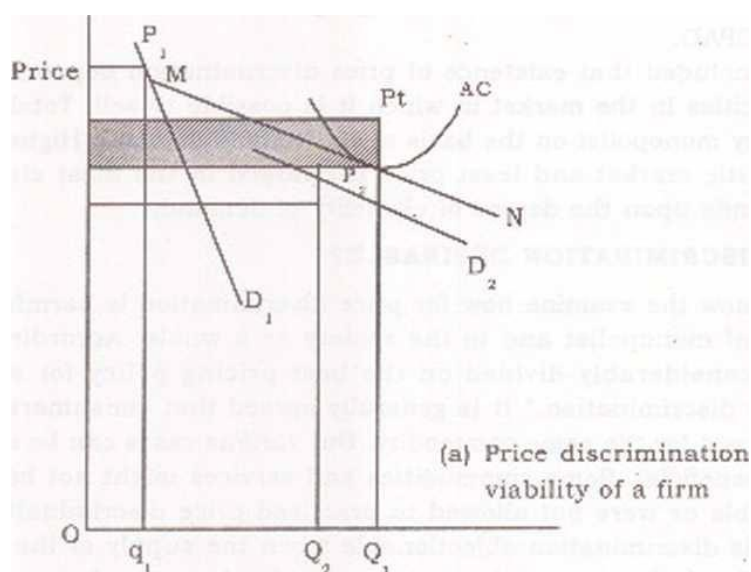


Fig.12

(b) Price discrimination is socially desirable when it makes possible for weaker section of a society to have access to certain essential good or service (like that of a doctor) which would otherwise not be possible under simple monopoly. Again, in many situations, weaker markets (with lower prices) are served and offered output at lower prices, while the same is refused in stronger markets (with higher demand prices).

(c) When price discrimination is practiced, some sections of the society are affected adversely who are required to pay higher prices (this is especially true in the case of a good which is produced under law of increasing cost). But if higher prices are charged from richer sections and lower price from poorer sections, it helps to mitigate inequalities in the society. It benefits the society as a whole. But if the good is produced under the law of decreasing costs or constant costs, it is quite likely that nobody is affected adversely. The enlarged output of the product under discriminating monopoly becomes available to all customers at comparatively lower prices as compared to the price under simple monopoly.

(d) Will the output of a product under price discrimination be larger or smaller than or equal to the output produced under simple monopoly? The answer depends upon many factors, "If the monopolist were ever able to practice perfect discrimination, he would have an output as large as the purely competitive output with same demand and cost conditions. This is because the monopolist treats the consumer's demand curve as his own marginal revenue curve. He equates this marginal revenue with his marginal cost. Thus, he equates demand with marginal cost as in equilibrium of pure competition." If we consider simple monopoly versus discriminating monopoly then output of the product under first degree price discrimination will be twice as large as output under simple monopoly, if the production is subject to constant cost (fig. 12a). But if the output of the product is subject to law of decreasing cost of increasing returns, then output of the product under first degree price discrimination would be more than twice as large as output under simple monopoly (fig. 12b in the first case) and less than twice as large as output under simple monopoly (Fig. 12c in the second case). The figure given above illustrates this. Discrimination of the second degree tends to approach first degree price discrimination of the second-degree tends to approach first degree price discrimination with

an increase in the number of prices. Outcome thus tends to be as under first degree price discrimination. It follows that output is large under second degree price discrimination than if the monopolist has a single price.

When a monopolist practices third degree price discrimination, his output can be equal to, or less than, or greater than his output at a single monopoly price. It depends on the shape of demand curves in the monopolist's markets. If the demand curves in the separate markets are linear, then total output is the same as with a single price. With two markets, this means that the reduction in the market with the less elastic demand is equal to the expansion in the market with the more elastic demand. But when demand curves are concave and more elastic demand curve is more concave than the less elastic demand, the output will be increased by the introduction of price discrimination. On the other hand, when more elastic demand curve is less concave than the less elastic demand curve, the total output will be less under price discrimination than under simple monopoly.

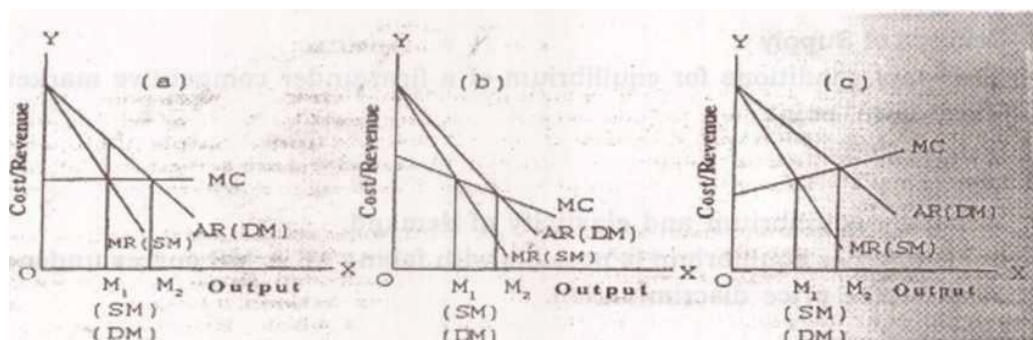


Fig.13

However, Mrs. Joan Robinson in her authoritative discussion on price discrimination, comes to the conclusion that, in all likelihood, output is large with price discrimination than without it.

Sometimes, output is possible only with price discrimination.

16.6 Self-Check Questions

16.6 (a) Equilibrium will reach in price discriminating monopolists when _____.

16.6 (b) How many degrees are there for price discrimination.

16.7 Answer to Self-Check Questions

16.6 (a) Aggregate Marginal Revenue = Marginal Cost.

16.6 (b) Three.

16.8 Short Questions

1. Variable proportions production function.
2. Indivisibility of a factor of production
3. Under the law of variable proportions in which stage producer would like to produce.
4. Importance of the theory of production
5. Elasticity of substitution.
6. Whether MC continues to fall as long as AC falls?
7. Show diagrammatically the relationship between AR & MR and elasticity of demand.
8. Concept of Supply
9. Necessary conditions for equilibrium of a firm under competitive market.
10. 'Shut down' point
11. Long period
12. Monopoly
13. Monopoly equilibrium and elasticity of demand.
14. Show whether equilibrium is possible with falling AC & MC curves under monopoly.

15. First degree price discrimination.
16. Dumping
17. Contract curve
18. Marginal revenue
19. Conditions for equilibrium under price discrimination monopoly.

16.9 Long Questions

1. What do you understand by production function. Explain the law of Returns to scale.
2. Explain Cobb-douglas Production Function alongwith its properties.
3. How would you derive the short period supply curve of a firm under pure competition.
4. Discuss the fact that the slope of the long-run supply curve depends on the laws of production. Also show that increasing returns and perfect competition are incompatible.
5. Explain with diagrams the determination of monopoly price under different cost conditions.
6. How does a monopolist fix the price of his produce? Is it inevitable that the monopoly price is higher than the competitive price?
7. What are the three degrees of price discrimination? How are price output decisions taken under third-degree price discrimination.
8. Do you agree that 'Discrimination monopoly is a lesser evil than simple monopoly.'

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- | | |
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CONCEPT OF REVENUE & BREAK-EVEN ANALYSIS STRUCTURE

- 17.1 Meaning
- 17.2 Total Revenue (TR)
- 17.3 Average Revenue (AR)
- 17.4 Marginal Revenue (MR)
- 17.5 Relationship between TR, AR and MR
- 17.6 Behavior of AR and MR under Perfect Competition.
- 17.7 Behavior of AR and MR under Imperfect Competition.
- 17.8 Self-Check Questions
- 17.9 Relationship between AR and MR
- 17.10 Relationship between AR, MR and Elasticity of Demand
- 17.11 Significance of Revenue Curves
- 17.12 Definition of Break-Even Point
- 17.13 Assumption of Break-Even Analysis
- 17.14 Break-Even Point in Terms of Physical Units
- 17.15 Break-Even Point in Terms of Sale Value
- 17.16 Self-Check Questions
- 17.17 Contribution
- 17.18 Margin of Safety
- 17.19 Profit Volume Ratio
- 17.20 Limitations of Break-Even Analysis
- 17.21 Important/Significance of Break-Even Analysis
- 17.22 Profit Volume Analysis
- 17.23 Forecasting Profit Position of Different Price Levels
- 17.24 Self-Check Questions
- 17.25 Answer to Self-Check Questions
- 17.26 Short Questions
- 17.27 Long Questions
- 17.28 References

17.1 MEANING

Every producer, after producing a product is interested to sell his product in the market. The revenue of a firm, together with its cost, determines profit. In this chapter, we study the concept of revenue. The term 'revenue' refers to the receipt obtained by a firm from the sale of certain quantities of a commodity at various prices.

17.2 TOTAL REVENUE

The sale proceeds which a firm receives after selling its output in the market is known as total revenue.

Total Revenue = Price x quantity sold

In the words of Professor Liebhafisky, "Total revenue may be defined generally as the revenue from sales obtained by a seller. It is equal to the number of units of the commodity multiplied by the per unit selling price."

17.3 AVERAGE REVENUE

Average Revenue is the revenue per unit of output sold. It is found by dividing total revenue by the number of units sold. In the words of Prof. Liebhafsky, "Average revenue is defined as total revenue divided by the number of units sold. Average revenue is, thus, merely another term meaning price of the product."

$$\text{Avg. Revenue} = \text{Total Revenue} / \text{No. of units sold}$$

As a matter of fact, average revenue means price. As consumer's demand curve illustrates the relationship between price and quantity demanded, it also represents the average revenue or the price at which various units of the commodity are sold, since price paid by a buyer constitutes the revenue from the seller's point of view.

17.4 MARGINAL REVENUE

Marginal revenue is addition made to the total revenue by the sale of an additional unit of the commodity. In the words of MC Connel, 'Marginal revenue is the addition to total revenue which results from the sale of one more unit of output. Marginal revenue can be expressed as

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

Here, MR - Marginal Revenue

TR_n Total Revenue of n Units

TR_{n-1} Total Revenue of (n - 1) Units

To illustrate the concept of marginal revenue, toby sale of 10 units total revenue equals Rs. 1000 and by the sale of 11 units, total revenue increases to Rs. 1100, then marginal revenue is Rs. 100 (being the difference between Rs. 1100 and Rs. 1000).

17.5 RELATIONSHIP BETWEEN TR, AR AND MR

Before we study the relationship between AR and MR under different cases, let us understand these concepts with the help of a table and diagram.

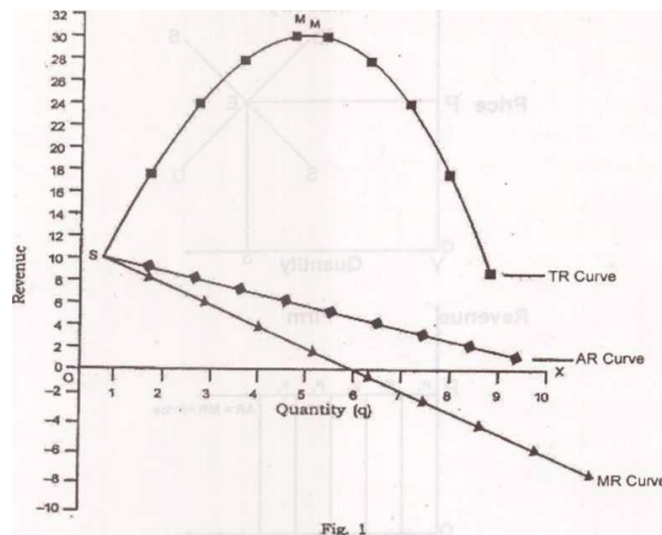
	Units Sold (q)	Price or AR (TR/q)	TR (Pq)	MR (TR _n - TR _{n-1})
MBA-CC (FIRST YEAR – SEM I) 1 to 10. increase 10 to then remains and	1	10	10	10
	2	9	18	8
	3	8	24	6
	4	7	28	4
	5	6	30	2
	6	5	30	0
	7	4	28	- 2
	8	3	24	- 4
	9	2	18	- 6
	10	1	10	- 8

3
ME 103
TR
from
30,
30

The table shows that as price falls from Rs. 10 to Rs. 1, the output sold increases from ultimately falls from 30 to 10. We find that when AR falls, MR falls more than that, i.e., from Rs. 10 to 0 and then becomes negative. TR increases initially at a diminishing rate; it reaches maximum and then starts falling.

The Fig. 1 shows that TR curves starts from S. It is known as initial total revenue. The TR rises from S to M. At M, TR is maximum. After that, it falls. Thus, TR rises, reaches maximum and then falls.

In the same figure, AR and MR start from point S. AR falls, MR also falls but MR is much below AR. MR falls, reaches zero and then it becomes negative. AR falls but remains positive throughout. When average revenue functions are linear (straight lines), the rate of fall of marginal revenue is double the rate of fall of average revenue.



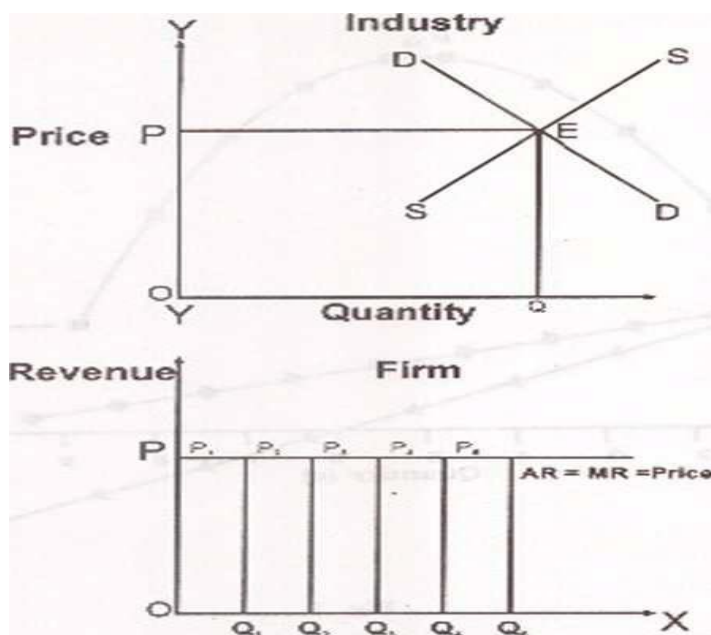
17.6 BEHAVIOUR OF AR AND MR UNDER PERFECT COMPETITION

If AR is constant, MR will also be constant. In this case AR and MR will be equal. It happens under perfect competition where AR curve and MR curve of the firm will coincide. The curves drawn will be horizontal i.e., parallel to X-axis. Now, we can show with the help of following table and diagram the relationship between TR, AR and MR:

Units Sold	Price (AR)	TR	MR
1	10	10	10
2	10	20	10
3	10	30	10
4	10	40	10
5	10	50	10

As we increase output, price or AR remains the same, i.e., Rs. 10. TR increases but by a

constant rate. MR is also constant i.e., Rs. 10 and it is equal to AR. In Fig. 2



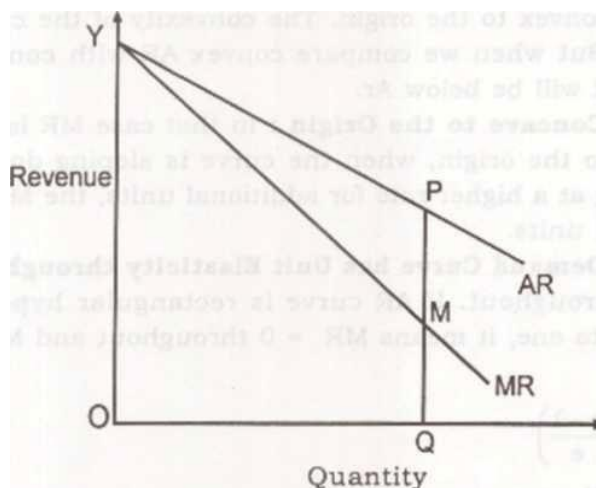
As shown in Fig. 2 at price, OP, the seller can sell any amount of the commodity. In this case the AR curve is the horizontal line. The MR curve coincides with the AR. It is so because additional units are sold at the same price as before. In that ease $AR = MR$. A noteworthy point is that OP price is determined by Demand and Supply of industry and the firm only follow.

17.7 BEHAVIOUR OF AR AND MR UNDER IMPERFECT COMPETITION:

If AR falls, MR also and MR falls faster than the AR. In that ease MR is below AR. The downward slopping of AR and MR curves is actually found in case of a firm. It can be shown with the help of a table and diagram.

Units Sold	Price (AR)	TR (pxq)	AR (TR/q)	MR ($TR_n - TR_{n-1}$)
1	10	10	10	10
2	9	18	9	8
3	8	24	8	0
4	7	28	7	4
5	6	30	6	2

The above table shows that as AR or price falls from Rs. 10 to Rs. 6, the TR increases from Rs. 10 to Rs. 30 at a diminishing rate. MR in this case falls from Rs. 10 to Rs. 2. MR is the rate at which TR changes. When we compare AR with MR, we find that AR falls at a slow rate whereas MR falls at a faster rate, (see Fig. 3)



AT OQ Output, AR is PQ whereas MR is MQ

$$PQ > MQ$$

$$AP > MR \text{ (Since } AR=P)$$

$$\text{Or } P > MR$$

17.8 Self-Check Questions

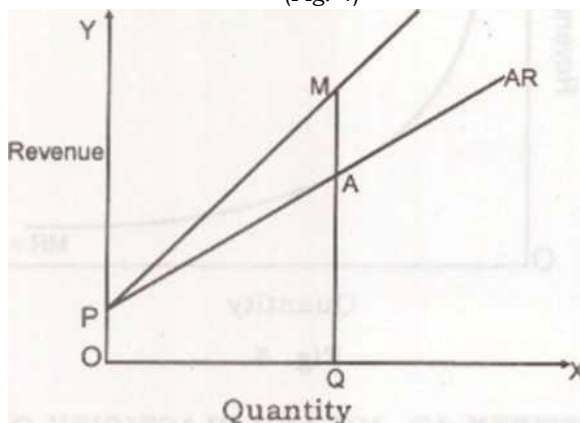
17.8 (a) How do you calculate Average Revenue.

17.8 (b) What is Marginal Revenue?

17.9 RELATIONSHIP BETWEEN AR AND MR

(1) If AR Curve is rising upward from Left to Right: Then MR curve will also rise upward. This means that MR will be greater than AR. And the revenue curves drawn will show that MR curve is above AR curve

(Fig. 4)



In the above diagram, we find that AR and MR starts from the same point P. AR rises upwards from left to right. The MR curve also rises upward and MR curve is above AR curve. It shows:

$$MQ > AQ$$

Or

$$MR > AR$$

(2) If AR Curve is a Straight-Line Downward Sloping: Then MR curve will pass through middle of any perpendicular drawn to drawn to the Y-axis.

(3) If AR Curve Is Convex to the Origin: It means, as more and more of commodities are sold, convexity of the AR shows that AR falls but at a slower rate. In case of MR, the curve will be again convex to the origin. The convexity of the curve shows that MR falls but at a slower speed. But when we compare convex AR with convex MR, MR will be falling faster than AR and MR will be below Ar.

(4) If AR Curve is Concave to the Origin: In that case MR is also concave to the origin. AR curve is concave to the origin, when the curve is sloping downward from left to right, means that AR is falling at a higher rate for additional units, the MR curve will also fall at a higher rate for additional units.

(5) If AR Curve or Demand Curve has Unit Elasticity throughout the Length: In that case MR will be zero throughout. If AR curve is rectangular hyperbola, in that case elasticity of demand is equal to one, it means $MR = 0$ throughout and MR will coincide with X-axis (Fig.5)

$$M = A \left(\frac{e-1}{e} \right)$$

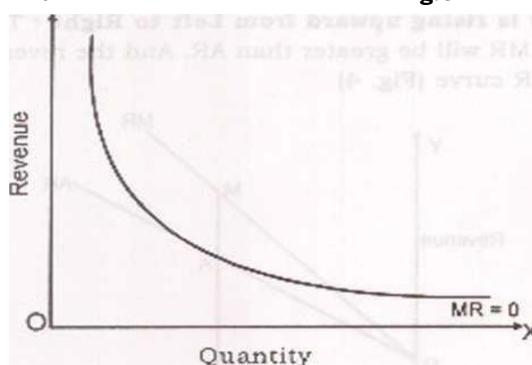
If $e = 1$, then

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

$$= A (0/1) = 0$$

$$M = 0$$

Fig.5



17.9 RELATIONSHIP BETWEEN AR, MR AND ELASTICITY OF DEMAND

AR, MR and elasticity of demand are related to each other in a special way. The proposition that MR equals price minus the ratio of price to elasticity of demand at that price can be proved with the help of Fig. 6:

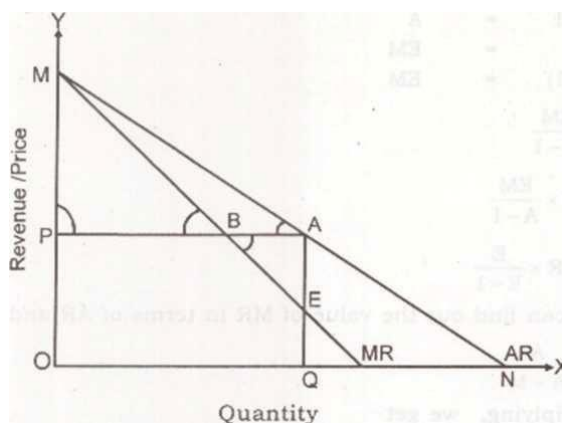


Fig.6

It has already been explained that AR curve of a firm actually constitutes the demand curve for the firm's product. Therefore, elasticity of demand at any point on a consumer's demand curve amount to the elasticity of demand on the given point on the firm's AR curve. Elasticity of demand at point P on the AR curve in the figure given above equals AN/AM . This measure of point elasticity of demand is helpful in demonstrating the relationship between AR, MR and elasticity of demand at point A on the given demand curve MN.

Elasticity of demand at point A on the given demand curve MN is as follows:

$$E \text{ at point A} = \frac{AN}{AM}$$

$$\begin{aligned}
 &AM \\
 &= AQ/MP \text{ (AQN and MPA are similar triangles and hence the ratio of their} \\
 &\text{sides are same)} \\
 &= AQ/AE \text{ (since, MP = AE)}
 \end{aligned}$$

In the above figure QA is price or AR, while AE equals AR – MR. Therefore, E at

$$\begin{aligned}
 \text{point A} &= AQ/AE \\
 &= AR/AR-MR \\
 &= A/A-R
 \end{aligned}$$

Here, A = Average Revenue or Price

M = Marginal Revenue

E = Elasticity of Demand

With the help of this, we can find out the formula for price and MR.

$$E = A/A-M$$

By cross-multiplication, we get

$$\begin{aligned}
 EA - EM &= A \\
 EA - A &= EM \\
 A(E-1) &= EM \\
 A &= EM/A - 1
 \end{aligned}$$

$$\begin{aligned}
 \text{OR} \quad A &= M \times \frac{EM}{A-1} \\
 A &= MR \times \frac{E}{E-1}
 \end{aligned}$$

Similarly, we can find out the value of MR in terms of AR and elasticity of demand.

$$E = A/A - M$$

By cross-multiplying we get

$$\begin{aligned}
 EA - EM &= A \\
 EM &= EA - A
 \end{aligned}$$

Dividing both side by E, we get

$$M = A - A/E$$

Since AR equals Price

$$M = \frac{P - P}{E}$$

From this relationship, we can maintain that MR equals price minus the ratio of price to elasticity of demand. It is evident from this relationship that MR is always less than price, with one exception, because it is calculated by subtracting some value, represented by P/E from price.

The exception occurs under conditions of perfect competition wherein demand is perfectly elastic because the coefficient of elasticity is infinitely large and the term to be subtracted is infinitely small and may be taken as zero.

Through the application of this formula, it can be seen that MR is always positive at any point where elasticity of AR or demand curve is greater than unity and MR is always negative where elasticity of the AR curve or the demand curve is less than unity.

17.11 SIGNIFICANCE OF REVENUE CURVES:

The main points of the significance of AR and MR curves are as under:

(1) Estimation of Profits and Losses: A producer finds out whether he is making supernormal profits, normal profits or sustaining losses. For this purpose, he compares AR with AC:

- (i) If $AR > AC$, the firm makes the supernormal profits.
 - (ii) If $AR = AC$, the firm earns normal profits.
 - (iii) If $AR < AC$, the firm sustains losses.
- (2) Equilibrium: The other point of importance of AR and MR curves is to know how much a producer should produce. The firm will be in equilibrium at that point where $MR = MC$. This is a general condition for the firm under all market situations.
- (3) Capacity Utilization: It is through revenue curves that we come to know whether a firm is producing to its full capacity or not e.g., under perfect competition, if AR curves are tangent to AC curve at its minimum point, the firm will be producing at its full capacity.
- (4) Price Changes: The concepts of AR and MR are also useful to the factor services (such as rent, wages, interest and profits) in determining their prices. In factor pricing, they become inverted U-shaped. The AR and MR curves become ARP and MRP (Average Revenue Productivity and Marginal Revenue Productivity).

BREAK-EVEN ANALYSIS

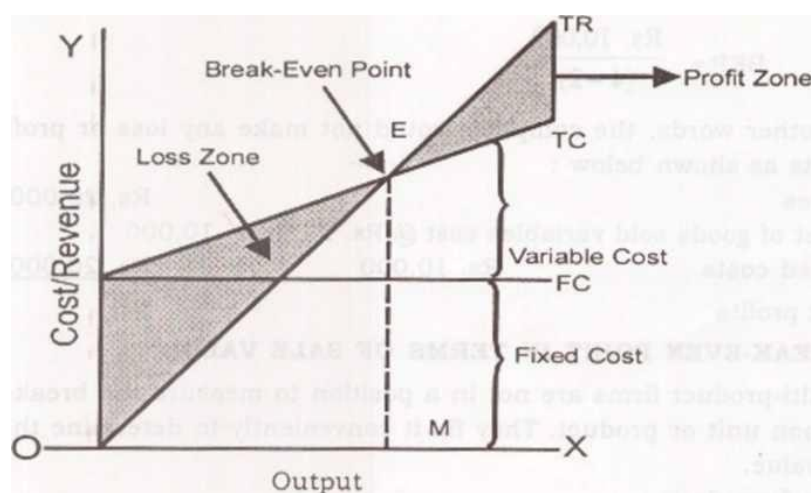
Break-even analysis reveals the relationship between the volume and cost of production on the one hand and revenue and profits obtained from the sale on the other hand. Break-even analysis involves the study of revenues and cost of a firm in relation to its volume of sales and specifically the determination of that volume at which the firm's cost and revenue will be equal. It magnifies a set of inter-relationship of fixed costs, the level of activity and sales mix to the probability of the concern.

17.12 DEFINITION OF BREAK-EVEN POINT

According to Horngren, "The break-even point is that of activity (sales volume) where total revenues and total expenses are equal. It is the point of zero profit."

In words of Matz and Curry, "Break-even analysis indicates at what level cost and revenues are in equilibrium."

The break-even point may be defined as that level of sales where total revenue received from the sale of a product is equal to the total cost of the product. A break-even chart can be defined as an analysis in graphic form the relationship of production and sales of profit. It can be explained with the help of adjoining diagram.



In the diagram 9, fixed cost (FC) curve is parallel to X-axis. TC curve rises upward. Total cost curve and total revenue curve analysis equalizes each other at point E which is breakeven point. Hence, OM is the break-even output where total cost is equal to total revenue. In the diagram, shaded area before the output OM is loss zone whereas shaded area after point E output OM is profit zone area.

17.13 ASSUMPTIONS OF BREAK-EVEN ANALYSIS

1. All costs are either perfectly variable or absolutely fixed throughout the production process.

2. All revenues are perfectly variable with change in the volume of production.
3. The volume of sale and production are equal. It means whatever is produced is also sold.
4. In case of multi-product firms, the product-mix is stable.

The break-even point can be expressed in terms of units produced or in terms of sales.

17.14 BREAK-EVEN POINT IN TERMS OF PHYSICAL UNITS

This method is convenient for the single product firm. The break -even volume is the number of units of produce which must be sold to earn enough revenue just to cover all expenses, both-variable and fixed. The break-even points are reached when sufficient number of units have been sold so that the total contribution margin of the unit sold is equal to the fixed cost. The formula for calculating the break-even point is

$$\text{BEP} = \text{Fixed Costs} / \text{Contribution Margin per unit}$$

where, the contribution margin is; Selling price - Variable costs per unit.

Example: Suppose the fixed costs of factory are Rs. 10,000 per year, the variable costs are Rs. 2.00 per unit and the selling price is Rs. 4.00 per unit. The break-even point would be:

$$\text{BEP} = 10000 / (4 - 2)$$

In other words, the company would not make any loss or profit at a sales volume of 5,000 units as shown below:

Sales	Rs. 20000
Variable Cost	(Rs. 10000)
Fixed Cost	<u>(Rs. 10000)</u>
	NIL

17.15 BREAK-EVEN POINT IN TERMS OF SALE VALUE

Multi-product firms are not in a position to measure the break-even point in terms of any common unit or product. They fix it conveniently to determine their break-even point in terms of value. The formula is:

$$\text{BEP in value} = \frac{\text{Fixed cost}}{\text{P/V Ratio}}$$

P/V Ratio

$$\text{Here, P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

Sales

Example, Let Sales = Rs. 10000

Variable Costs = Rs. 6000

Fixed costs = Rs. 3000

$$\text{Contribution ratio} = \frac{10000 - 6000}{10000} = 4$$

$$\text{BEP value} = \frac{3000}{4}$$

Verification:

Sales Value = Rs. 7.50

Less Variable cost = 6*750 = Rs. 4500

Fixed Cost = Rs. 3000

Net Profit = Nil

Example: Sales were Rs. 15,000 producing the profit of Rs. 400 in first week of December. In next week, sale goes to Rs. 19,000 and profit to Rs. 1200. Find BEP

Solution: Increase in sale = Rs. 19000

(-) 15000Rs. 4000

Increase in point $1200 - 400 = 800$ Increase in variable cost = $4000 - 800 = \text{Rs. } 3200$

Over sales of Rs. 4000 Variable cost = 3200

Hence, VC per Rs. Of sale is = $3200/4000$ Hence, for sale of Rs. 15,000, fixed costs Will be $20 \times 15000 -$ Rs. 3000 (-) Profit Rs. $400 - 2600 - \text{Variable costs} - .80 \times 15000 - 12,000$ Contribution ration = $\frac{S - V}{S}$

$$= \frac{15000 - 12000}{15000}$$

$$= 0.2$$

Now, BEP = FC/ Contribution Ratio

$$= 2600/0.2 = \text{Rs. } 13000$$

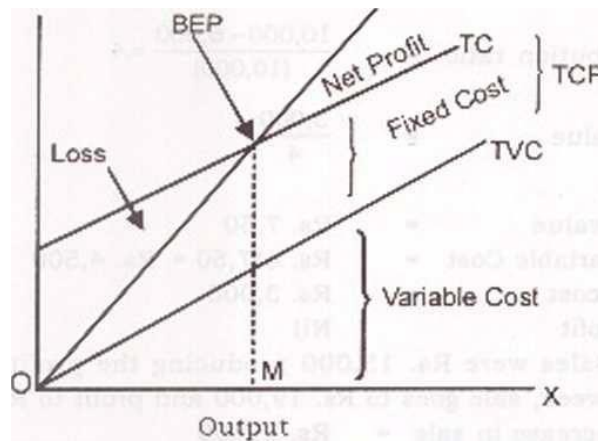
17.16 Self-Check Questions

17.16 (a) A firm make supernormal profits when _____.

17.16 (b) How do you Calculate Break-even Point in terms of physical units.

17.17 CONTRIBUTION

Contribution is the difference between the sale price per unit and the marginal cost per unit. Business manager does not usually think profit in Economic. Sense as the difference between total revenue and total cost. It is the difference between receipts and variable cost. Suppose a commodity is sold for Rs. 20/- and its variable cost is Rs. 15/- then contribution will be Rs. 5/- (20-15). Thus, contribution first meets fixed cost then think of profit. In the diagram on next page, Total Variable Cost (TVC) + total Net Profit (TNP) + Total Fixed Cost (TFC).

Therefore, if $TNP = 0$. then $TCM = TFC$ which occurs at BEP.

From the above equation, it becomes clear

$$TR = TCM + TVC$$

$$= (TNP + TFC) + TVC$$

Total C

$$\text{Contribution profit (TCP)} = TR - TVC$$

17.18 MARGIN OF SAFETY

It is the difference between the current actual sales and Break Even point output. The formula for margin of safety is

$$\text{Margin of safety} = \text{Total Sales} - \text{BEP Sale}$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}}$$

If the margin of safety is more, it is an indicator of the growth of a business. In case margin is narrow, the following steps may be taken to improve unsatisfactory position of the firm:

1. Increase the level of production
2. Increasing the selling price
3. Reduce the fixed or variable or both cost
4. Substitute the existing products by more profitable products.

17.19 PROFIT VOLUME RATIO

It is generally, known as P/V ratio. It is a relationship or percentage or contribution in terms of sales or turnover. It can be calculated as follows:

$$\text{P/V ratio} = \frac{\text{Contribution} \times 100}{\text{Sales}}$$

P/V ratio is very helpful in pricing policy, product analysis and Break-even point etc.

17.20 LIMITATIONS OF BREAK-EVEN ANALYSIS

The above discussion provides us a fair idea of the limitation of break-even analysis. The main limitations can be summarized under the following points:

1. Break-even analysis is based on static character which presume constant cost and revenue relationship, but practically constant relationship is not possible.
2. Often we find that input prices undergo a change over time. Such adjustments are generally, avoided in break-even analysis.
3. It is assumed in break-even analysis that the relative share of different products in total output remain same. But in practical situation, it is very difficult to presume this sort of relationship.
4. Break-even analysis implies a horizontal demand curve which is feasible only under perfect competition and not in other market conditions.
5. Factor like plant, size, technology and methodology of production have to be kept constant in order to draw an effective break-even chart, but it is not found in actual life.
6. Break-even analysis is based on accounting data and it suffers from many limitations like imputed costs, non-scientificallly determined depreciation.
7. The break-even analysis ignores the selling cost and only concentrate over production cost.
8. The break-even analysis is not an effective tool for long range use.
9. The area included in the break-even analysis should be limited because it is difficult to apply to too many departments or too many plants.
10. The valuation and allocation of costs in company are usually arbitrary. So it reduces the utility of this analysis.

In view of the above limitations, sometimes doubts are raised about the utility of break-even analysis. The break-even analysis in spite of these limitations is widely used as a method of profit forecasting.

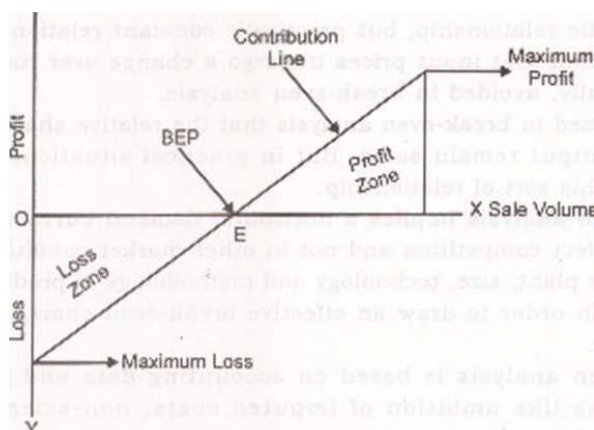
17.21 IMPORTANCE/SIGNIFICANCE OF BREAK-EVEN ANALYSIS

As a tool of planning, break-even analysis plays an immense role. To management, utility of break-even analysis lies in the fact that it presents a microscopic picture of the profit structure of a business economic, strength and weakness, but also sharpens the focus of certain leverages which can be operated

upon to enhance its profitability. The break-even analysis brings an everchanging contribution to the modern business. The break-even analysis to making can be given in paragraphs:

17.22 PROFIT ANALYSIS

It is used to analysis relationship. The profit below shows the relationship of a volume.



main importance of managerial decision the following

VOLUME

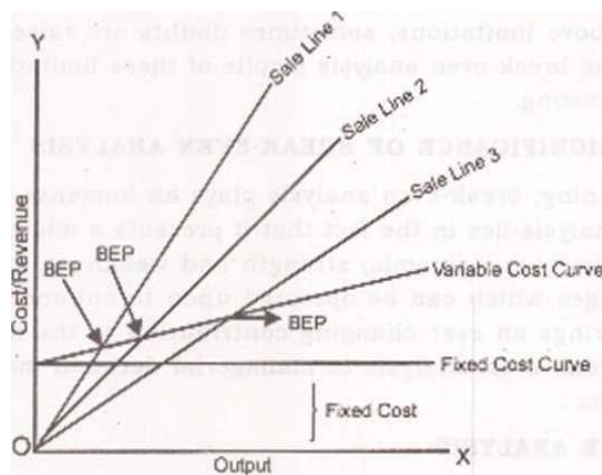
profit volume volume graph given

firm's profits to its

In the following diagram, X-axis shows the sale volume and Y-axis profit/loss. At point E, contribution line intersects X-axis determining break-even point. The maximum loss which occurs and zero sales volume is equal to the fixed cost. The maximum profit point is shown on the vertical axis or Y-axis. So, the line joining maximum loss point and maximum profit point is known as contribution line.

17.23 FORECASTING PROFIT POSITION OF DIFFERENT PRICE LEVELS

The break-even chart can be modified to show the price executive, but his profit position would be at different price levels under the Riven cost conditions. It can be shown with the help of a diagram given below. In the following diagram as sales line shift downward due to increase in price. It does not mean that profit decreases rather profit will increase. So, it is not necessary to take every conceivable price into consideration.



1. Break-even analysis helps in determining optimum level of output which is profitable for the firm.
2. It helps in deciding which product is to be produced and which not to be produced.
3. It is helpful in determining the target capacity for a firm.
4. With the help of break-even analysis. The firm can determine minimum cost for a given level of output.
5. The break-even analysis is helpful in decision making regarding dropping or adding a product.
6. It evaluates the percentage financial yield from the project.

7. The break-even analysis can be used in finding the selling price which would prove beneficial to the firms.
8. It is also helpful for the firm to decide from where to start paying dividend to the shareholders.

The above study is useful in different fields and its usefulness varies from industry to industry. It is most helpful to the industries which are suffering from frequent changes in input prices, technological changes and constant shifts in product mix. Hence, break-even analysis should be viewed as a guide to decision making and not a substitute for judgement, logical thinking or common sense. Thus, Break-Even Analysis is in principle concerned with the Cost Volume Profit Analysis.

17.24 Self- Check Question

17.24 (a) What is Contribution.

17.24 (b) How do you Calculate P/V ratio.

17.25 Answer to Self-Check Questions

17.8 (a) Avg. Revenue = Total Revenue/No of units sold

17.8 (b) Marginal Revenue is the addition to the total revenue which results from the sale of one more unit of output.

17.16 (a) $AR > AC$

17.16 (b) $BEP = \text{Fixed Cost} / \text{Contribution margin per unit}$

17.24 (a) Contribution is the difference between the sale price per unit and the marginal cost per unit.

17.24 (b) $P/V \text{ ratio} = \frac{\text{Contribution} \times 100}{\text{Sales}}$

Sales

17.26 Short Question

- (a) Write down assumptions of Break-even analysis.
- (b) How do you calculate Break-even point in terms of sale value.

17.27 Long Questions

Explain Break-Even Point. Give its advantages and limitations.

- 1.
2. Explain the nature and importance of Cost Volume Profit Analysis.
3. How Break-Even Analysis helps in forecasting profit position of different price levels?
4. Define :
 - (a) Margin of Safety
 - (b) Break-Even-Points

17.28 References

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CAPITAL BUDGETING

STRUCTURE

- 18.1 Meaning
- 18.2 Importance of Capital Budgeting
- 18.3 Methods of Capital Budgeting
- 18.4 Non-Discounted Cash Flow Method (Traditional Methods)
 - (a) Pay Back Period Method
 - (b) Accounting Rate of Return Method
- 18.5 Discounted Cash Flow Methods of Capital Budgeting
 - (a) Discount Rate
 - (b) Net Present Value (NPV)
 - (c) Internal Rate of Return Method
 - (d) Profitability Index
- 18.6 Self-Check Questions
- 18.7 Answer to Self-Check Questions
- 18.8 Short Questions
- 18.9 Long Questions
- 18.10 References
- 18.1 MEANING

Efficient allocation of capital is one of the most important function of financial management in modern times. This function involves the firm's decision to commit its long term assets and other profitable activities. The firm's decision to invest funds in long term assets are of considerable significance since they tend to influence the firm's value and size by influencing its growth, profitability and risk. The purpose of Capital Budgeting is to provide an insight of the frame Work which can be adopted to make optimum investment decision.

A capital budgeting decision may be defined as the firm's decision to invest its current funds most efficiently in the long-term assets in anticipation of an expected flow of benefits over a series of years. The long-term assets are those which effect the firm's operation beyond the one-year period. This decision would generally include expansion, acquisition, modernization and replacement of the long-term assets. The following are the main features of capital budgeting decision:

- (i) The exchange of current funds for future benefits.
- (ii) The funds are invested in long term assets.
- (iii) The future benefit will occur to the firm over a series of years.

18.2 IMPORTANCE OF CAPITAL BUDGETING

The importance of Capital Budgeting can be well understood from the fact that an unsound investment decision may prove to be fatal to the very existence of the concern. The need, significance or importance of capital budgeting arises mainly due to the following:

- (1) Large Investment

Capital Budgeting generally require large amount of funds but the funds available with the firm are always limited. Hence, it is very imperative for the firm to plan its investment programs very carefully.

(ii) **Long-term Commitment of Funds**

Capital Budgeting decision require funds for long term and on permanent basis. The longterm commitment of fund increases the financial risk involved in the investment decision. Greater the risk involved, greater is the need for careful planning of capital expenditure.

(iii) **Irreversible Nature**

Most investment decision arc irreversible in nature. Once the decision is taken, they cannot be taken back without a great loss.

(iv) **Long-term Effect on Profitability**

Capital budgeting decision have an long term effect on profitability of concern, not only present profitability is affected but future profitability's also.

(v) **National Importance**

Capital budgeting decision though are taken by individual but still they affect the employment and economic growth of country.

18.3METHODS OF CAPITAL BUDGETING

At each point of time a business firm has a number of proposals in which il can invest funds. However, there is always a limit on the availability of funds and it may not possible to invest funds in all the proposals at a time. Hence, it is very essential to select the proposals which give the maximum benefit and it is the capital budgeting techniques which help in selecting these proposals. A number of capital budgeting techniques are in use in practice. They may be grouped in the following two categories:

(i) **Non-discounted Cash Flow Method**

(a) **Payback Period**

(b) **Accounting Rate of Return (ii) Discounted Cash flow Methods**

(a) **Net Present Value**

(b) **Internal Rate of Return**

(c) **Profitability Index**

(i) NON-DISCOUNTED CASH FLOW METHOD (TRADITIONAL METHODS)

It is simplest and most popular method of evaluating capital budgeting, decision. The payback period is the length of time required to recover the initial cash outlay on the project. If the proper generates constant annual cash inflows, the pay-back period can be computed by dividing initial cash outlay by the annual cash inflow. That is

$$\text{Payback period} = \text{Initial cash outlay of the project} / \text{Annual cash flow}$$

A project require outlay of Rs. 50,000 and yield an annual cash inflow of Rs. 12,500 for 7 years. The payback period for the project is

$$\text{Payback period} = \text{Rs. } 50000 / \text{Rs. } 12500 = 4\text{years}$$

In case of unequal cash inflows, the pay-back period can be found by adding up the cash inflows until the total is equal to the initial cash outlay.

Example 1: Project involve initial cash outlay 600000 and generate cash inflows Rs. 10,000, Rs. 1,50,000 and Rs. 2,00,000 and Rs. 1,50,000 in 1,50,000 in I, II, III and IV year respectively. It payback period is 4 year, because sum, of the cash inflow of 4 years is equal of sum of the initial cash outlays.

Example 2: Suppose that a project a cash outlay of Rs.20,000 and generates cash inflows Rs. 8,000 Rs. 7,000, Rs. 4,000 and Rs. 3,000 during the next four years. We will find that original cash outlay

is not recovered in full three years. Only Rs. 1000 of the original outlay remains to be recovered. In the fourth-year cash in flow generated Rs. 3000. Assuming that the cash inflow occur evenly during the year, the time required to recover Rs. will be $(Rs. 1000/R Rs. 3000) 12 = 4$ months. Thus, the payback period is 3 years and 4 months. Acceptance - Rejection Criteria:

The payback period can be used as a criterion to accept or reject investment projects. If the payback period calculated for the project is less than the maximum pay-back period set by management, it would be accepted, if not it would be rejected, as a ranking method, it gives highest ranking to the project which has shortest payback period and lowest ranking to the project which has highest payback period.

Evaluation :

Advantages

A widely used investment criterion, the payback seems to offer the following advantages

- (i) It is easy to understand, complete and communicate to other.
- (ii) Since it emphasizes earlier cash inflow it may be sensible criterion when firm is pressed with problem of liquidity.
- (iii) It is a rough and ready method of dealing with risk because this favor generation of more cash inflows in earlier years and we know longer the period more the risk.
- (iv) When the payback period is set at a large number of years, the income streams are uniform for each year, the payback criterion is a good approximation to the reciprocal of the internal rate of return.

Disadvantages

- (i) It fails to consider the earning from an investment after the payback period. For example, two projects are being considered by firm. Each requires an investment of Rs. 10,00,000. The firm marginal cost of capital is 15%. The Net cash flows from investment X and Y are own in Table-I

TABLE-I Net Cashflow

Year	X	Y
	Rs.	Rs.
1	4,00,000	3,00,000
2	3,00,000	2,50,000
3	2,00,000	2,00,000
4	1,00,000	1,50,000
5	-	1,00,000
6	-	50,000

Since the cost in Rs. 10,00,000 the payback is 4 years for project X and 5 years for project Y. If the firm is employing a four-year payback period, project X would be accepted and project Y would be rejected. Thus, the payback ignores the income beyond the payback period.

- (ii) It is not an appropriate method of measuring the profitability of an investment project as it does not consider all cash inflow yielded by the project.
- (iii) It fails to consider time value of money. For example, consider the projects A and B each costing Rs. 9,00,000 and having the following cash inflows

Year	A	B
1	3,00,000	6,00,000
2	6,00,000	3,00,000
3		3,00,00

- (iv) Administrative difficulties may be faced in determining the maximum acceptable

payback period. There is no rational basis for setting a maximum period.

(v) The payback period is not consistent with the objectives of maximizing the market value of the firm's shares. Share value does not depend on the payback period of investment project.

(ii) Accounting Rate of Return Method

The Accounting Rate of Return is also called the average rate of Return. The accounting rate of return is found out by dividing the average after tax profit by the average investment. Average investment can be found out by dividing the total of the investment's book value after depreciation by the life of the project. Average income should be defined in terms of earnings after tax without an adjustment of interest viz EBIT (1-t). The accounting rate of Return, thus an average rate and can be determined by the following equation:

$$\text{ARR} = \text{Avg. Income} / \text{Avg. Investment}$$

Selection Criteria

As an accept or reject criteria, this method will accept all those projects whose ARR is higher than the minimum rate established by management and reject those projects which have ARR less than minimum rate. This method would rank a project as number one if it has highest ARR and lowest rank would be assigned to the project with lowest ARR.

Evaluation Of ARR Method

Advantages:

(i) It is simple to calculate and understand.

(ii) It is based on accounting, information which is readily available and familiar to businessman, no adjustment is required to arrive at cash flow of the project.

(iii) It considers benefits over the entire life of the project.

Disadvantages:

(i) It is based on accounting profits not cash flow.

(ii) It does not take into account the time value of money as profits occurring in different periods are valued equally. This is unscientific as money regularly changes its value. (iii) This method of ARR does not consider that the profits earned can be converted into a return.

18.5 DISCOUNTED CASH FLOW METHODS OF CAPITAL BUDGETING

We have considered non-discounted cash flow methods in the third chapters for measuring the value of an investment. Worth considered may give obviously incorrect results because they fail to consider the entire life of the investment or to give adequate attention to the timing of future cash proceeds. The discounted cash flow concept provides methods to account for the timing of cash proceeds and outlays over the entire life of the investment.

In discounted cash flow techniques of capital budgeting, the concept of cash flow and discount rate is very important for cash flow estimation.

Cash flow refers to cash revenues minus cash expenses. A distinction should be made between cash flow & profits. A change in profit does not mean a corresponding change in cash flow. It is possible for a firm to experience a shortage of cash when profits are increasing or vice versa. For calculating cash inflows, separate estimates of cash inflows and cash outflows should be made. The initial cash outflows will include original cost and the installation cash. Any cash proceeds realized from the sale of an alternate project should be set off against the initial cash outlay of the project under consideration. Besides the initial cash outlay, cash inflows also occur in respect of expenditure on material, labor and other items.

Like cash outflow, cash inflow is also estimated. A cash inflow can occur by two means:

(i) Increase in cash revenue

(ii) Cash saving through reduction in operating cost.

The net cash inflow must be estimated on an after-tax basis. However, special attention should be given to non-cash expenditure like depreciation. Depreciation is a deductible expense for income tax

purpose. So, for calculating cash inflow once tax should be changed after charging depreciation and after payment tax, depreciation should be added back to profit to find flows. One can say that cash inflows are calculated after charging tax but before charging depreciating.

(a) Discount Rate

The discount is the project opportunity cost of capital (or simply the cost of capital for discounting its cash flows) The project's cost of capital is the minimum acceptable rate or the required rate of return on funds committed to the project. The minimum acceptable rate or required rate of return is a compensation for time and risk in the use of capital by the project.

After discussing the estimation of cash flows and discount rate, now we will discuss various discounted cash flow techniques for evaluating capital budgeting decisions.

(b) Net- Present Value (NPV)

The net present value is the different between total present value of future cash inflows and present value of cash outflows. It correctly postulates that cash flow arising at different time periods differ in value and are comparable only when their equivalents present value are found out. In this methods, cash inflows fit cash outflow associated with each project are worked out. Present value is of cash flows, are calculated using opportunity cost of capital as the discount. After that, Net present value is found out by subtracting present value of cash outflows from present value of cash inflows.

The equation for the Net present value be written as follows

$$NPV = \frac{[C_1 + C_2 + C_3 + \dots + C_n]}{[(1+K) + (1+K)^2 + (1+K)^3 \dots + (1+K)^n]} - C_0$$

OR NPV

Where C_1, C_2, \dots represent Net Cash Inflow in years 1, 2

K = Opportunity Cost of Capital C_0 =

Initial cost of Investment n = Expected life of the

Investment Selection Criterion:

The acceptance rule using the NPV method is to accept the investment project if its net present value is positive ($NPV > 0$) and to reject it if the New present value is negative ($NPV < 0$). A project may be accepted if $NPV = 0$. As a ranking method, first rank will be given to the project with highest positive NPV and last rank will be given to the project with lowest negative NPV. Evaluation of NPV Method

Advantages:

- (1) It recognizes the time value of money.
- (2) It uses all cashflows occurring over the entire life of the project
- (3) Discounting process facilitates measuring cash flows in term of present value. (4) This method is always consistent with the objective of maximizing the shareholders wealth.

Limitations:

- (1) The NPV method is easy to use if forecasted cash flows and discount are known but in practices. It is quite difficult to obtain the estimates of cash flow due to uncertainty.
- (2) The ranking of investment project as per NPV rule is not independent of the discount rates.
- (3) A project with higher net present value with large economic life may be less desirable than a project with a shorter economic life as an alternative under such circumstances the NPV method gives misleading results.

Illustration 1. Excellent Trading Co. Ltd. proposes to increase the production of the company. There are willing to purchase a new machine. There are three types in the market. The following are the details regarding them.

	Type P Rs.	Type Q Rs.	Type R Rs.
Cost of Machine	17,500	12,500	9000
Wages per operative	400	750	250
Cost of indirect materials	250	- 300	400
Expected saving in indirect materials	100	550	250
Additional cost of maintenance	750	800	500
Additional cost of supervision	11	20	0
Operative not required (number)	10 years	6 years	5 years
Estimated life of machine			
Taxation ac 50% of the Profit			

You are required to advise the management which type of the machine should be purchased.

Solution:

Comparative Profitability Statement

	Type P Rs.	Type Q Rs.	Type R Rs.
Cost of Machine	17,500	12,500	9,000
Life of the machine	10 years	6 years	5 years
Annual Saving in cost			
Wages (Operative not required x Rate)	2,750	6,000	2,250
Scrap	400	750	250
Direct Material	100		250
Total (A)	3,250	6,750	2,750
Additional cost or expenditure			
Maintenance	750	550	500
Indirect materials	--	400	--
Supervision	--	800	--
Total (B)	750	1,750	500
Cost Savings or Marginal Profit, (A-B)	2,500	5,000	2,250
Cost Saving after tax of 50%	1,250	2,500	1,125
$\frac{\text{Cost Saving after tax of 50\%}}{\text{Cost of Machine}}$			
Payable Period	14 years	5 years	8 years
Cost Payback period			
(Life of machine-Payback period)	--	1 years	--
Payback Profitability	--	2,500	--

(c) Internal Rate of Return Method

Internal rate of return can be defined as that rate which equals the present value of inflows with the present value of cash outflow. In other words, it is the rate at which NPV of the investment is zero. It is called internal rate because it depends solely the outlay and proceeds associated with investment and not on any rate determined side the investment. It can be determined by solving the following equation:

$$C_0 = \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_n}{(1+r)^n}$$

The main point of difference between IRR and NPV method is that in the NPV method, the required rate of return K is assumed to be known and the New present value is calculated, while in IRR method the value of r has to be determined at which the net present value is zero.

The value of r can be found out by trial and error. The approach is to select any discount rate to compute the present value of cash inflows.

If the calculated present value of the expected cash inflow is lower than the present value of cash outflow, a lower rate should be tried. On the other hand, a higher value should be tried if the present value of cash inflows higher than present value of cash outflows. The process will be repeated unless the Net present value becomes zero. Selection Criterion:

The proposal, should be accepted if its internal rate of return is higher than the opportunity cost of capital ($r > k$). The proposal shall be rejected if its internal rate of return is lower than the opportunity cost of capital ($r < k$). The decision may indifferent if internal rate of return is equal to required rate of return ($r = k$). Evaluation:

Advantages

- (1) The IRR method, also recognizes the time value of money.
- (2) It considers all cashflow occurring over the entire life of the project.
- (3) It is consistent with the objectives of maximizing the shareholder's wealth.

Limitations:

- (1) It involves complicated calculations and so it is difficult to understand and use.
- (2) The method implies that intermediate cash inflows generated by the project are reinvested at the internal rate of project which may not be so its reinvestment at the rate of firms cost of capital seems to be more convincing and it is followed in net present value method.
- (3) The results obtained through IRR method may, not match NPV. Method results if the projects differ in their (i) expected lives, or (ii) cash outlays or (iii) timing of cash flows. Illustration

2:- A firm whose cost of capital is 10% is considering two mutually exclusive projects A and B the cash flows of which are as below:

Year	Project A Rs.	Project B Rs.
0	-50,000	-80,000
1	62,500	96,170

Suggest which project should be taken up using (i) Net Present Value Method, and (ii) the Internal Rate of Return Method.

Solution:

Year P.V. Factor	(1) Calculations of Net Present Value (NPV)			
	Project A		Project B	
	Cash Flow Present Value		Cash Flow Present Value	
	(Rs.)	(Rs.)	(Rs.)	(Ra.)

0	1	-50,000	-50,000	-80,000	-80,000
1	909	62500	56,812	96170	874.418
of Present Value (NPV)			+6812		+7418
(ii) Calculations of Internal Rate of Return (IRR)					
		Project A		Project B	
<u>Initial Outlay</u>					
V. Factor - ,		<u>50,000</u> = .80		<u>80,000</u> = .83	
	Annual Cash Flow	62,500		96,170	
	R (Using P.V. Tables)	25%		20%	

Suggestions: According to the Net Present Value Method, investment in Project B is better because of higher positive NPV; but according to the IRR method Project A is a better investment because of the high internal rate of return. Thus, there is a conflict in banking of the two mutually exclusive proposals according to the two methods. Under these circumstances, we would suggest to take up Project B which gives a higher present value because in doing so the firm will be able to maximize the wealth of the shareholders.

(d) Profitability Index

It is the ration of the present value of cash inflows at the required rate of return to the initial cash outflows of the investment. It is also known as cost benefit ratio.

$$PI = \frac{\text{Present Value of Cash flow}}{\text{Initial cash outflow}}$$

$$PI = \frac{PV(C_i)}{C_0}$$

Selection Criterion :

The project will have to selected of PI is greater than I an of it is less than I it shall be rejected the decision shall be indifferent. If PI is equal to I.Evaluation of PI Method:

- (1) PI is a conceptually sound method of appraising investment project. It give due consideration to time value of money.
- (2) Though it needs more time for calculations when compared with traditional methods, but as against internal rate of return method is requires less time.
- (3) It helps in ranking the projects, giving highest rank to the project with highest profitability index and lowest rank to the project with lowest profitability index.
- (4) As this method is capable of calculating incremental benefit-cost ratio, it can be used to choose between mutual exclusive projects.

18.6 Self-Check Questions

18.6 (a) In NPV method, an investment project is accepted when _____.

18.6 (b) As per IRR method, a proposal is rejected when _____.

18.7 Answer to Self-Check Questions:

18.6 (a) $NPV > 0$

18.6 (b) $r > k$

18.8 Short questions

1. Write down selection criteria of Profitability Index.
2. What are the methods of Capital Budgeting.
3. What is Discount Rate?

18.9 Long Questions:

1. Give meaning and definition of Capital Budgeting.
2. Explain various methods of Capital Budgeting.
3. Write Notes:
 - (i) Net Present Value
 - (ii) Profitability Index
 - (iii) Discount Rate

18.10 References

A. Marshall : Principles of Economics

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Prasanna Chandra : Financial Management

Lesson No. 19**COST OF CAPITAL****STURCTURE**

19.1 Introduction 19.2 Importance of Cost of Capital 19.3 Measurement of Cost of Capital
 19.4 Computation of Cost of Capital 19.5 Self-Check Questions 19.6 Cost of Debt 19.7
 Cost of Preference Share Capital 19.8 Cost of Non-Redeemable Preference shares 19.9 Cost
 of Redeemable Preferences Shares 19.10 Cost of Equity Share Capital 19.11 Weighted
 Average Cost of Capital 19.12 Self-Check Question 19.13 Answer to Self-Check Questions
 19.14 Short Questions 19.15 Long Questions 19.16 References

19.1INTRODUCTION

The term 'cost of capital' refers to the minimum rate of return that a company must earn on its investment in order to leave unchanged the market price of its stock/shares. It is directly related with overall firm's objective of wealth maximization. This will be possible only if the firm earns a return on its projects financed by the equity shareholder's funds at a rate which is at least equal to rate of return expected by them. If a firm falls to earn return at expected rate, the market value of the shares would fall and thus result in reduction in overall wealth of shareholders.

In essence a firm's cost of capital is the rate of return which is required on its investments to increase the value of the firm in market place. There are four major characteristics of cost of capital.

- (i) It's not a cost as such. It is really a rate of return that is required on the project where investment is being made.
- (ii) Cost of capital is minimum rate of return, just to maintain value of firm.
- (iii) Cost of capital has three components:
 Return at zero risk level;Premium for
 business risk;Premium for financial
 risk.

In order to understand these three components of cost of capital we must have clarification regarding the various types of risks.

Business risk is regarding the possibility that the firm will not be able to operate successfully in the market. Financial risk refers to the risk on account of pattern of capital structure i.e., debt equity mix. In this context we can say that a firm with higher debt content in its capital structure have more financial risk as compared to the firm having lower debt content. The reason is that in former case the firm requires higher operating profits to meet periodic interest requirements and repayments of principal at the time of maturity as compared to latter. Thus financial risk relates to the risk that firm will not earn sufficient profits to make payment of interest on loans or payments of dividends.

Now come over to the aforesaid three components of cost of capital. These can be better illustrated with the help of following figure.

Financial Risk
Business Risk

Firm's Cost of Capital

No Risk

The figure shows that cost of capital financial risk > cost of capital at business risk > cost of capital financial risk > cost of capital at business risk > cost of capital with no risk.

The above three components of cost of capital may be put in the form of the following equation.

$K = r_0 + b + f$ Where:

K = Cost of Capital

r_0 = Return at zero risk levels; b =

Premium for business risk; f =

Premium for financial risk.

19.2 IMPORTANCE OF COST OF CAPITAL

The determination of cost of capital is a very important step in the financial decision-making. The concept of cost of capital is very important in financial management. Cost of capital plays a very important role in capital budgeting decisions, capital structure planning and also in measuring financial performance.

(a) As an acceptance criterion in Capital Budgeting

In the words of James Porterfield, the concept of cost of capital had assumed growing importance largely because of the need to devise a rational mechanism for making the investment decision of the firm; optimal investment decisions can be made by considering the cost of capital. Out of several investment proposals, the desirable and profitable ones can be identified with help of cost of capital. If expected return from an investment project is greater than equal to cost of funds required for the project, the project may be accepted otherwise rejected.

(b) As a determinant of Capital mix in Capital Structure Decisions:

Cost of capital plays a very significant role in determining the capital mix in capital structure decision. A proper balance between debt and equity capital as components of total capitalization of a firm is a significant matter of corporate financial policy. An important reason for using debt is that its use increases the rate of return on equity capital, other things remaining the same. However, the use of debt increases the financial risk, because a slight fall in the earning capacity of the company may bring the firm near to cash insolvency. This greater degree of the financial risk reduces the value of the firm for the investors and lesser they are attracted to invest more or to continue the present investment in the firm. So, it becomes difficult for the firm, in that case to raise funds and they have to offer higher rate of interest which increases cost of capital. It is, therefore, absolutely necessary that cost of each source of funds is carefully considered and compared with risk involved with it.

(c) As a basis for Evaluating the Financial Performance

We know that ultimately, it is top management which is responsible for the overall profitability of the firm. By the large it is the top management which selects the investment proposals on the basis of the analysis of relevant data. To evaluate the financial performance of the top management, actual profitability of the project is compared with the projected overall cost of capital and actual cost of capital of funds raised to finance the project. If the actual profitability is more than the projects and actual cash of capital, the performance may be said to be satisfactory.

19.3 MEASUREMENT OF COST OF CAPITAL

Cost of capital is determined first for individual sources of funds. Then overall cost of capital is computed combining the individual or specific sources of funds. This overall cost of capital is also known as composite cost of capital or weighted average cost of capital.

ASSUMPTIONS

Before discussing the computation of average cost of capital, let us note the assumptions which must be satisfied in order to use average cost of capital for appraising new investments:

1. Cost can be either Explicit or Implicit

An understanding of explicit and implicit cost of capital is necessary for computation of overall cost of capital. The explicit cost of any sources of finance may be defined as the discount rate that equates the present value of funds received by the firm with the present value of expected cash outflows. These outflows may be interest payments, repayments of principal or dividend. In other words, it is the internal rate of return the firm pays for financing.

For example, if a company raises a sum of Rs. 1 lakh by way of debentures carrying interest at 9% and payable after 20 years, the cash inflows will be a sum of Rs. 1 lakh. However annual cash outflow will be Rs. 9000 for 20 years. The explicit cost of capital will, therefore be that rate of internal return which equates Rs. 1 lakh the initial cash inflows with Rs. 9000 payable every year for 20 years and Rs. 1 lakh at end of 20 years.

Now come over to the implicit cost of capital. There are some sources of funds which do not involve any future cash outflows e.g., retained earnings. Obviously (explicitly), retained earnings have no cost. But impliedly, retained earnings do have cost. If the firm does not retain the earnings and distribute to the shareholders in the form of dividend, the shareholders would have invested this dividend in some profitable venture and would get return on investment of retained earnings so received. But they don't get this opportunity when earnings are retained by the firm. So, they lose the opportunity to earn on amount of earnings retained. If this is assumed then there is opportunity cost of retained earnings for shareholders. The firm's retained earnings should compensate the shareholders for the loss. Therefore, there is opportunity cost of retained earnings which is not expressed but is implied. This opportunity cost is implicit cost of capital.

2. The risk characterizing new investment proposals being considered is the same as the risk characterizing the existing investments of the firm. In other words, the adoption of new investment proposals will not change risk complexion of the firm.

The capital structure of the firm will not be affected by new investments. This simplifies the computation of cost of capital. This assumption implies that any quantity of funds to be raised for new projects will have the same mix for sources as the firm had before raising additional funds.

3. Cost of previously obtained capital are not relevant for computing the cost of capital to be raised from a specific source. It means that only marginal cost of capital to be raised from different sources is computed.

4. Cost of each source of capital is computed on after tax basis.

These assumptions may also be termed as problems in determining the cost of capital).

19.4 COMPUTATION OF COST OF CAPITAL

For calculating the overall cost of capital, we compute first of all the cost of individual sources of capital. A typical firm uses following sources of capital.

1. Debt/Debentures
2. Preference share capital
3. Equity share capital
4. Retained Earnings

Cost of each source of capital can be determined as follows:

19.5 Self-Check Question

19.5 (a) What is cost of capital?

19.5 (b) Write different sources of capital.

19.6 COST OF DEBT

There can be various forms of debt. It may take the form of a loan or it may be in the form of debentures, etc. Moreover, it may be issued at par, at premium or at discount. It may be perpetual or redeemable. The technique of computation of cost in each case has been explained in the succeeding discussion:

(a) Debt issued at par

The computation of cost of debt issued at par is comparatively an easy task. It is the explicit interest rate adjusted further for the tax liability of the company. The formula for its computation is

$$K_d = \frac{R(1-t)}{P}$$

Where, K_d = cost of debt

R = Debenture Interest/Rate

T = Marginal tax rate

P = Rate value of debenture

It may be noted that the interest rate is multiplied by the factor $(1-T)$. This multiplication is necessary to reflect the fact that interest on debt is a tax-deductible expense.

(b) Debt issued at Premium or Discount

In case the debentures are issued at premium or discount the cost of debt should be calculated on the basis of net proceeds realized on account of issued of such debentures or bonds. Each a cost may be further adjusted keeping in view of the tax rate applicable to the company. The formula for its computation is

$$K_d = \frac{R}{NP} (1-T)$$

Where K_d = Cost of debt

R = Annual interest payment

NP = Net proceeds of loans or debentures

T = Tax rate

Let us take an example to illustrate this let a company issues 10% irredeemable debentures of Rs. 1,00,000. The tax rate applicable to the company is 60%. Calculate the cost of debt if debentures are issued at

(i) Par (ii) 10% discount and (iii) 10% premium

Solution: The formula is

$$K_d = \frac{R}{NP} (1-T)$$

(i) Issued at par

$$K_d = \frac{10000}{100000} (1 - 0.60)$$

$$= 4\%$$

(ii) Issued at Discount

$$K_d = \frac{10000}{90000} (1 - 0.60)$$

$$= 4.4\%$$

(iii) Issued at Premium

$$K_d = \frac{10000}{110000} (1 - 0.60)$$

$$= 3.6\%$$

(c) Cost of Redeemable Debt

In the proceeding discussion we presumed that debentures or bonds are not redeemable during the life time of the company. However, if the debentures are redeemable after the expiry of fixed period, the effective cost of debt before tax can be calculated using the following formula:

$$K_d (\text{before tax}) = \frac{R + \frac{1}{n} (MP - NP)}{MP + NP}$$

Where,

M = Maturity Price of debt

NP = Net proceeds of debentures R

= Annual interest payments n =

No. of years to maturity

For computing the after-tax cost of debt, the following formula is used. After tax cost of debt = Before tax cost of debt (1-t) Where t is tax rate.

19.7 COST OF PREFERENCE SHARE CAPITAL

Cost of preference can be defined as the minimum rate of return which a firm must earn on preference share capital financial position of its investment, so as to justify such investment. Preference share is a hybrid security. It possess certain characteristics of a debentures and certain characteristics of an equity share. There is a specific dividend on preference shares just like expressed interest on debentures. But some provisions relating to preference shares such as additional dividend if profits exceed a limit, non-redeemable capital, payment of preference dividend out of the profits after tax make the preference share similar to equity shares. Preference shares, which are non-cumulative do not pose the threat of legal action including that of bankruptcy against the firm by the investors, if the firm does not earn sufficient profits to pay preference dividend. It can omit the payments of dividend. This flexibility is not available in case of interest on debentures. However, companies intend to pay the stipulated preference dividends and preference share holders expect to receive preference dividend regularly.

19.8 COST OF CAPITAL FOR NON-REDEEMABLE PREFERENCE SHARES

Non-redeemable preference shares capital is perpetual and they don't have maturity date. The firm is not required to repay the capital raised through non-redeemable preference shares till it is a going concern.

The cost of preference capital is found out by solving following equation.

$$D = \frac{D}{MP}$$

OR

$$D = \frac{D}{NP}$$

19.9 COST OF REDEEMABLE PREFERENCE SHARES

In case of redeemable preference shares, the cost of capital is the discount rate that equals the net proceeds of the rate of preference shares with the present value of future dividends and principal repayments.

The cost of preference capital may be obtained quickly by using the following approximation.

$$K_p = \frac{D + (P - NP)/N}{(P + NP)/2}$$

Where, K_p = cost of preference capital

D = preference dividend per share payable annually

P = redemption price

NP = net amount realized per preference share

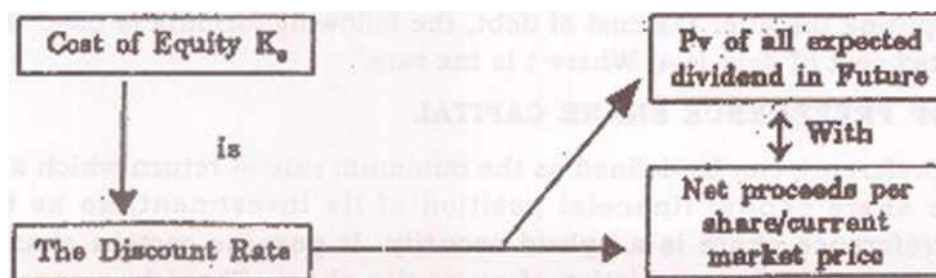
n = maturity period

It should be noted that the cost of preference capital is not adjusted for taxes since dividends on preference shares is taken as an appropriation of profits and not a charge against profits. Thus, the cost of preference capital is substantially greater than the cost of debt.

19.10 COST OF EQUITY SHARE CAPITAL

In the words of I.C. Van horn, cost of equity capital is the minimum rate of return that the company must earn equity financed portion of its investments in order to leave unchanged the market price of its stock.

For operational purposes the above-mentioned definition can be exhibited in the following way:



The cost of equity capital is the most difficult to measure. Some people argue that equity does not involve any cost. If there is profit, dividends are distributed to equity shareholders. Otherwise, no dividends are paid. Another major problem is that cost of equity is based upon the stream of future dividend as expected by shareholders. However, it is very difficult to estimate the amounts of expected future dividends and what should be the basis for this estimate.

Despite all these difficulties, different authorities have conveyed different explanation and approaches the following are some of the approaches according to which cost of equity capital can be worked out:

(1) Dividend Price Approach (D/P Approach)

According to this approach, Cost of equity capital is the discount rate that equates the present value of all expected future dividends per share with the net proceeds or the current market price of a share. Symbolically,

$$K_e = D / NP \text{ or } D / MP$$

Where K_e = Cost of Equity capital

D = Expected dividends per share

NP = Net proceeds per share MP =

Market price per share

The basis assumptions underlying this method are that the investors give prime importance to dividends and the risk in the firm remains unchanged. This dividends price method of computing cost of capital does not seem to be logical because

- (i) It does not consider the growth in dividends.
- (ii) Does not consider future earnings on retained earnings.
- (iii) It does not take into account capital gains.

(2) Dividend Price Plus Growth (D/P + G) Approach

According to this approach, the cost of equity capital is determined on the basis of expected dividends rate plus rate of growth in dividend. The rate of growth in dividend is determined on the basis of the number of dividends paid by the company for last few years.

The computation of cost of capital, according to this approach can be done by using the following formula:

$$K_e = D / NP + g \text{ or } D/MP + g$$

Where g - Growth is expected dividend.

It may be noted that in case of existing equity shares, the cost of equity capital can be determined by using MP (market price) of equity share in place of NP (net proceeds) of the share as given above.

The dividend price growth approach is, to a great extent, helpful in determining satisfactory the expectation of the investors. However, the quantification of expectation of growth of dividends is a difficult matter. Usually, it is presumed that growth in dividends will be equal to growth in earning per shares.

(3) Earning Price Approach

This approach is based on assumptions that it is the earning per share which determined the market price of the shares. That is the shareholders capitalize a stream of future earning (as distinguished for dividends in order to evaluate their shareholders. Hence the cost of capital should be related to that earning percentage which could keep the market price of equity shares constant.

This approach therefore takes into account both dividends as well as retained earnings.

The formula for calculating the cost of capital according to this approach is as follows :

$$K_e = E/NP$$

Where K_e - Cost of Equity Capital

E = Earnings per share

NP = Net proceeds of an equity share

However, in case of existing equity share, it will be more appropriate to use market price (MP) instead of net proceeds (NP) for determining the cost of capital.

19.11 COST OF RETAINED EARNINGS

The usual practice of the companies is that they do not distribute all the profits earned by them by way of dividend among their shareholders. They retain some profits for future expansion of the business. Many people feel that such retained earnings are absolutely cost free. But this is not an appropriate approach. Because if it had been distributed among the shareholders by way of dividend, it would have given some earning to them. The company has deprived the shareholders of this earning by retaining a part of profit with it. Thus, the cost of retained earning is the earnings foregone by the shareholders. In other words, the opportunity cost of retained earnings may be taken as cost of retained earnings. It is equal to the income that the shareholders could have otherwise earned by placing these investments in alternative investments.

The situation could be put in some other way. Let the earnings are not retained by the company and passed on the shareholders. And the shareholders invest them in new equity shares of the same company. In other words, if earnings were paid as dividends and simultaneously an offer for right shares was made, the shareholders would have subscribed to the right shares on the expectation of certain return. This expected return can be taken as cost of retained earnings of the company.

However is actual, it doesn't happen. The shareholders have to pay income tax on the dividends received, they have to incur brokerage cost for making investments, etc. Thus the funds available to the shareholders would be less than what would have been with the company, had they retained it. So while calculating the cost of retained earnings, some adjustments are required.

Symbolically

$$K_r = K_e (1-T) (1-B)$$

Where K_r = Cost of retained earnings

K_e = Cost of equity shares T =

shareholder's marginal tax rate B =

Brokerage cost.

The computation of cost of retained earnings after making adjustments for tax liability is a difficult process because it is almost impossible to find out personal income tax rate of different shareholders of the company. Because the income tax rate will differ from shareholders to shareholders.

Due to this major limitation of this approach, some authorities recommended the use of another approach termed by them as “External yield criterion”. According to this approach, the opportunity cost of retained earnings is the rate of return that can be earned by investing the funds in another enterprise by the firm. Thus according to this approach, cost of retained earnings is simply the return on direct foreign investment of funds by the firm. and not what the shareholders are able to obtain on their investments. The approach represents an economically justifiable opportunity cost that can be applied consistently.

19.12 WEIGHTED AVERAGE COST OF CAPITAL

Weighted average cost of capital is also called as composite cost of capital average cost of capital, weighted marginal cost of capital or overall cost of capital.

Weighted average cost of capital comprises the cost of various components of financing cost of individual components (sources) of capital structure are weighted according to their relative proportions in the total capital. The relative proportion of each source of funds is ascertained by using either.

- (i) The book value of the source
- (ii) Market value of the source.

The weighted average cost of capital denoted by K_o , by using the market value is higher than the K_o derived by using the book value. The reason is that with market value weight, equity capital gets greater emphasis.

Symbolically,

$$K_o = K_d W_d + K_p W_p + K_e W_e + K_r W_r$$

Where, K_o = weighted average cost of capital

- K_d = Cost of debt capital
- W_d = Proportion of debt capital
- K_p = Cost of preference share capital
- W_p = Proportion of preference share capital
- K_e = Cost of equity capital
- W_e = Proportion of equity share capital
- K_r = Cost of retained earnings
- W_r = Proportion of retained earnings

It may be noted here that the market value weights are sometimes preferred to the book value weights because the market value represents the true value of investors. However, market value weights suffer from the following limitations.

- (i) It is very difficult to determine the market values because of frequent fluctuations.
- (ii) With use of market value weights, equity capital get greater importance.

19.13 Self-Check Questions

19.13 (a) How do you calculate weighted average cost of capital?

19.13 (b) Write down the formula of Cost of debt.

19.14 Answer to Self-Check Questions:

19.5 (a) It is the minimum rate of return that a company must earn on its investment in order to leave unchanged the market price of its stock/shares.

19.5 (b) Debentures, Preference shares, Equity shares

19.13 (a) $K_o = K_d W_d + K_p W_p + K_e W_e + K_r W_r$

19.13 (b) $K_d = R (1-t) \frac{R}{P} (1-t)$

P

19.15 Short Questions

1. How do you compute cost of capital?
2. Write down importance of cost of capital.

19.16 Long Questions

1. Define Cost of Capital? Explain its significance in financial decision making.
2. What are the various concepts of Cost of Capital? Why should they be distinguished from financial management.
3. Write notes:
 - (i) Weighted Average Cost of Capital
 - (ii) Marginal Cost of Capital

19.17 References

- A. Marshall : Principles of Economics
J.R. Hicks : Value and Capital
Prasanna Chandra : Financial Management