BUSINESS ECONOMICS

A TEXT BOOK OF

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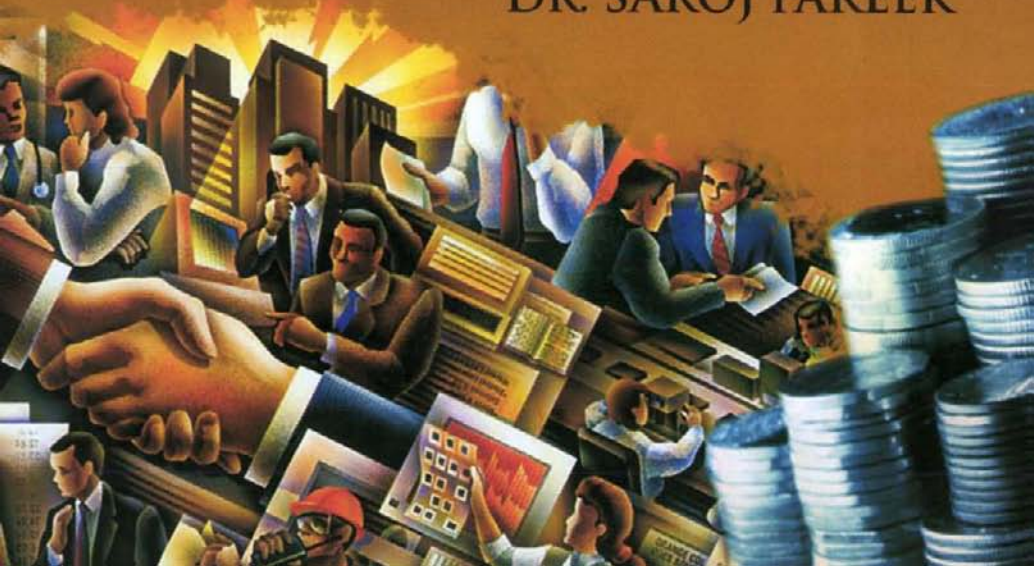
DR. SAROJ PAREEK



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# PREFACE

The economic techniques have gained a wide application in the process of modern management decision, possible, because recent business problems have become so complex that manager's personal experience is no longer adequate to give an appropriate solution. The purpose of this book is to provide, in one volume, the different economic theories which are deemed to constitute the subject matter of managerial economics. This book is written especially for B.Com., B.B.A., M.Com., M.B.A., and C.A. students of our country.

This book is intended to explain in non-technical language, the economic concepts, tools of analysis, their relevance in management decision-making and also the influence of economic environment on management decisions. To facilitate an easy understanding of the subject, the timely help of illustrations, examples, diagrams, tables and charts has been taken, Important terms relevant to the business economics are given in a separate chapter. To my publisher, I am grateful for publishing the book with due care and skill in a very short time. I shall be thankful to the readers for pointing out discrepancies and errors in the text, which I hope to rectify in the next edition of the book. Suggestions for further improvement of this book will be highly appreciated.

**Author**

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# CONTENTS

# 1

# INTRODUCTION

Managerial economics is economics applied to decision-making by the modern business managers. It is based on economic analysis for identifying problems, organising information, and evaluating alternatives. Managerial economics serves as a link between economic theories and managerial practice. Managerial economics can be defined as :

Managerial Economics is the integration of economic theory with business practice for the purpose for facilitating decision-making and forward planning by management of an organisation.

**Features of Managerial Economics :**

(i) It is concerned with decision-making of economic nature.

(ii) It deals with identification of economic choices and allocation of resources.

(iii) It deals, as to how decisions should be taken to achieve the organisational goals.

(iv) It provides a link between traditional economics and the decision sciences for managerial decision-making.

(v) It is concerned with these analytical tools which are helpful in improving the decision-making process.

**Nature of Managerial Economics :**

Managerial economics is concerned with the business unit and the economic problems of society. To understand the nature of managerial economics better, let us study the nature of economic theory relevant for managerial decision-making.

*(a) Macro-economic Conditions :* The decisions of the company are generally made within the broad framework of economic environment within which the company operates. These are known as macro-economic conditions. From this point of view these conditions are : working of the market, pace of economic change, economic policies of the government.

*(b) Micro-economic Analysis :* It deals with the problems of an individual company, industry etc. This helps in studying as to what is going on with in the company, how best to allocate scarce resources for various activities of the company. Some of the popular micro-economic concepts are the elasticity of demand, marginal cost, opportunity cost, market structure. Some of the common models used in micro-economic theory are mode) for monopoly price, mode for price determination and the behaviour and managerial models.

***Integration of Economic Theory and Business Practice :*** Economic theory helps to understand the actual business behaviour. Economic theory is based on certain assumptions, therefore, conclusions drawn from such economic theory may not generally conform to what actually happens. Managerial economist modify the theoretical result to conform to actual business behaviour. Economists have developed a theory of company, which centers on the assumption of profit maximisation and the assumption that firms act rationally in persuit of their objectives.

Managerial economics attempts to estimate and predict the economic quantities and relationships. The estimates of demand, production relations etc. are necessary for forecasting, prediction about demand, cost, pricing etc., helps for decision-making and forward planning.

Business managers must also understand the environment and adjust to the external factors like, government intervention, taxation, etc.

**Importance of Managerial Economics :**

Managerial economics helps the decision-making process in the following ways :

(i) It gives a number of tools and techniques. These techniques are in the form of models, which helps the manager to establish essential relationships that represent the actual situation.

(ii) It provides most of the concepts that are required for the analysis .of the problems, concepts of elasticity of demand, fixed and variable costs, short and long-run costs, etc., help in understanding and then solving the decision problems.

(iii) It helps in taking decisions about, product-mix, level of output and price of the product, investment, how much to advertise, etc.

(iv) Managerial economics helps in taking decision of following subjects :

(a) Objectives of a business company

(b) Production and cost

(c) Profit

(d) Pricing and output

(e) Demand forecasting

(f) Competition

(g) Investment

(h) Sales promotion and market strategy.

**Managerial Economics and Traditional Economics :**

Managerial economics is an applied field, whereas economics provide certain basic concepts and analytical tools. Both of them are concerned with problems of scarcity and resource allocation, generally labour and capital in order to find the best way to utilize them for achieving the set goals of the company.

Main contributions of economics to managerial economics are:

(a) To help in understanding the market conditions and the general economic environment in which the company is working.

(b) To provide philosophy for understanding and analysing resource allocation problems.

Success of any business organisation depends upon technical and economic efficiency. Technical efficiency means production with best technological specifications, while economic efficiency means maximisation of its goals, i.e. sales, profit etc. Managerial economics is concerned with both kinds of efficiencies, and takes the help of economic analysis for achieving both these efficiencies.

**Managerial Economics and Operation Research :**

Object of both operation research and managerial economics to take effective decisions, for adopting best way of achieving company's objectives. The difference in both of them is that, managerial economics is a fundamental academic subject to make one understand and analyse the business problems, while operation research is a functional activity carried out to help the manager to carry out his job of solving decision problems.

Operation research is concerned with model building. Economic theory is also concerned with model building. Economic models are general and confined to broad economic decisions only, while operation research models can solve problems of various disciplines. O.R.. models like linear programming and queuing etc. are widely used in managerial economics.

***Role of Managerial Economics in Decision-Making*** **:** Main tasks of a business manager are making decisions and processing informations. For making intelligent decisions, managers must be able to obtain, process and use information. The knowledge of economic theories to a manager, helps to perform these functions. Manager is required to take two type of decisions : specific decisions or general task decisions based on the informations obtained and processed by him.

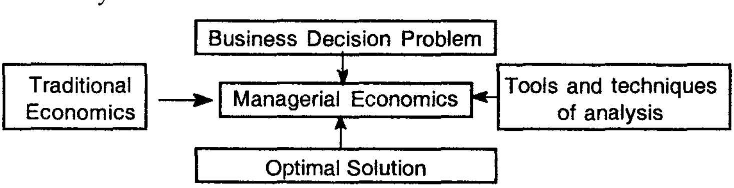


*Fig. 1. Managerial Economics and Decision-making.*

*(1) Specific Decisions :* These are not likely to be frequently repeated, and are very important decisions and require the use of basic economics. Some of such decisions are whether install in house computer or get the work done from outside, whether or not to close down a branch of the company that has recently been profitable. These are includes decisions related to pricing, demand forecasting, economic analysis of the industry etc.

*(2) General Tasks Decisions :* Decisions are influenced by external factors as well as internal factors. Internal factors are within control, while external factors are beyond control, but timely adjustments can be done to these external factors. The managerial economics help in understanding these external factors. Important external factors are as follows :

(i) General economic conditions like level and rate of growth of national economy, influence of international factors.

(ii) Prospects of demand for the product. For example change occurring in the purchasing power of public in general, changes undergoing in fashions, tastes and preferences.

(iii) Factors influencing input cost.

(iv) Market conditions for raw material and for finished product.

(v) Company's share in the market,

(vi) Government's economic policies.

Internal factors are :

(i) Production, sales, inventory schedules, their present position and forecasts for future.

(ii) Pricing and profit policies.

(iii) Most profitable product-mix, and the best prices for its various outputs considering the market conditions.

(iv) Investment decisions: forecast about the return on investment.

Manager is required to understand both type of factors which may influence his decisions.

**Models :**

Models aim at creating a set of relationship which approximate the real world situation. These are simple from the point of view of computation and gives satisfactory results. Models are very helpful in decision-making "Models are structures involving relationships among concept".

Economic theory deals with the scientific approach for selecting a best alternative, and constructs a simplified models of reality on the basis of which laws describing regularities in economic behaviour are derived. A model deals with the relationship of a given dependent variables with one or more independent variables.

Example of models are : Quantitative models, allocation model, queuing or waiting line models, Simulation models, Inventory models, Network or scheduling models.

Complex problems of the practical world thus can be solved by concentrating only on some key features instead of every detail. This approximation of reality, which we may construct in various forms are called as 'model'. Models exist in many forms, and the particular form selected depends upon the purpose. The decision making through models is (a) economical to construct as compared to actual situation and its modification, if required (b) convenient to analyse and experiment as compared to those with complex situations, (c) decision-making with these models is quick.

**Types of Models :**

Models are of different types, some of them are as follows :

(i) Predictive

(ii) Descriptive

(iii) Nominative.

(iv) Iconic

(v) Analog

(vi) Symbolic

(vii) Deterministic

(viii) Probabilistic.

***(i) Predictive Models :*** This model indicate that "if this occurs, then that will follow".

*(ii) Descriptive Models* : These provide descriptive picture of a situation and do not predict or recommend e g. organisation chart.

*(iii) Nominative Models* : These provide the best answer to a problem, e.g. economic let size model.

*(iv) Iconic Models* : These retain some of the physical characteristics of the things they represent e.g. three dimension scale models.

*(v) Analog Model* : These employ one set of properties to represent some other set of properties which the system being studied possess e.g. frequency distribution charts, flow charts etc.

*(vi) Symbolic Model* : These use symbols to describe the real world, e.g. quantitative models, allocation models, queuing models inventory models., simulation models, and network or scheduling models.

*(vii) Deterministic Models* : These determines the output (representing the solution) from a set of input values, e.g. Profit = Revenue — Costs.

*(viii) Probabilistic Models* : These involve probability distributions for inputs and provide a range of values of at least one output variables with a probability associated with each value. These models assist with decisions made under conditions of risk.

□□□

# 2

# MANAGERIAL ECONOMIST ROLE AND RESPONSIBILITIES

The managerial or business economist can play a very important role by assisting business management in using the increasingly specialized skills and sophisticated techniques which are required to solve the difficult problems of successful decision-making and forward planning. That is why, in business organisations, his importance is being growingly recognized. In advanced countries like the U.S.A., large companies employ one or more economists. In our country, too, big industrial houses like Tatas and Hindustan Lever have come to recognize the need for managerial economists.

Let us examine in specific terms how a managerial economist can contribute to decision-making in business. In this connection, following two important questions need be considered:

(1) What role does he play in business, that is, what particular management problems lend themselves to solution through economic analysis?

(2) How can the managerial economist best serve management, that is, what are the responsibilities of a successful managerial economist?

### Role of a Managerial Economist

One of the principal objectives of any modern management in its decision-making process is to determine the key factors which will influence the business organisation over the period ahead. In general, these factors can be divided into two categories: (i) external, and (n) internal. The external factors lie outside the control of management because they are external to the firm and are said to constitute business environment. The internal factors lie within the internal scope and operations of a firm and hence within the control of management, they are known as business operations.

To example, a business organisation is free to take decisions about what to invest, where to invest, how much labour to employ and what to pay for it, how to price its products, and so on. But all these decisions are taken within the framework of a particular business environment, and the firm's degree of freedom depends on such factors as the government's economic policy, the actions of its competitors and the like.

**Environmental Studies :**

An analysis and forecast of external factors constituting general business conditions, e.g., prices, national income and output, volume of trade, etc., are of great significance since every business organisation is affected by them. Some important questions in this connection are as follows:

(1) What is the outlook for the national economy? What are the, most important local, regional or world-wide economic trends? What phase of the business cycle lies immediately ahead?

(2) What about population shifts and the resultant ups and downs in regional purchasing power of consumers?

(3) What are the demand prospects in new as well as established markets? Will changes in social behaviour and fashions tend to expand or limit the sales of a company's products, or possibly make the products obsolete?

(4) Where are the market and customer opportunities likely to expand or contract most rapidly?

(5) Will export markets expand or contract, and how will new foreign government legislations affect operation of the overseas plants?

(6) Will the availability and cost of credit tend to increase or decrease buying? Are money or credit conditions ahead likely to be easy or tight?

(7) What the prices of raw materials and finished products are likely to be?

(8) Is competition likely to increase or decrease in future?

(9) What is the outlook regarding government's economic policies and regulations? What about changes in defence expenditures, tax rates, tariffs and import restrictions in our country?

(10) Will Reserve Bank's decisions stimulate or depress industrial production and consumer spending? How will these decisions affect the company's costs, credit, sales and profits?

Reasonably accurate answers to above and similar questions can enable modern managements to chalk out more wisely the scope and direction of their own business plans and to determine the timing of their specific actions. And it is these questions which present some of the areas where a managerial economist can make effective contribution.

**Business Operations :**

A managerial economist can also be helpful to the management in making decisions relating to the internal operation of a company in respect of such problems as price, rate of operation, investment, expansion or contraction. Some relevant questions in this context would be as follows:

(1) What will be a reasonable sales and profit budget of our company for the next year?

(2) What will be the most appropriate production schedules and inventory policies for the next six months?

(3) What changes in wage and price policies should be made now?

(4) How much cash will be available next month and how should it be invested?

**Specific Functions :**

A further idea of the role of managerial economists can be had from the following specific functions performed by them as revealed by a survey pertaining to Britain conducted by K.J.W. Alexander and Alexander G. Kemp :

(1) Sales forecasting.

(2) Industrial market research.

(3) Economic analysis of competing companies.

(4) Pricing problems of industry.

(5) Capital projects.

(6) Production programmes.

(7) Security/investment analysis and forecasts.

(8) Advice on trade and public relations.

(9) Advice on primary commodities.

(10) Advice on foreign exchange.

(11) Economic analysis of agriculture.

(12) Analysis of underdeveloped economies.

(13) Environmental forecasting.

It is thus clear that in present practice managerial economists perform many and varied functions. However, of these, marketing function, i.e., sales forecasting and industrial market research, has been the most important. For the purpose, they may compile statistical records of the sales performance of their own business and those relating to their rivals, carry out analysis of these records and report on trends in demand, their market shares, and the relative efficiency of their retail outlets. Thus, while carrying out their functions, they may have to undertake detailed statistical analysis. There are, of course, differences in the relative importance of the various functions performed from company to company and in the degree of sophistication of the methods used in carrying them out.

**Economic Intelligence :**

Besides above functions involving sophisticated analysis, managerial economist may also provide general intelligence service supplying management with economic information of general interest such as competitors' prices and products, tax rates, tariff rates, etc. In fact, a good deal of published material is already available and it would be useful for a company to have some one who understands it. The managerial economist can do the job with competence.

## Responsibilities of a Managerial Economist

Having examined the significant opportunities before a managerial economist to contribute to managerial decision-making, let us next examine how can he best serve the management of a company. For this, he must thoroughly recognize his responsibilities and obligations.

A managerial economist can serve management best only if he always keeps in mind the main objective of his business, viz., to make a profit on its invested capital. His academic training and the critical comments from people outside the business may lead a managerial economist to adopt an apologetic or defensive attitude towards profits. Once management notices this, his effectiveness is almost sure to be lost. In fact, he cannot expect to succeed in serving management unless he has a strong personal conviction that profits are essential and that his chief obligation is to help enhance the ability of the company to make profits.

Most management decisions necessarily concern the future which is rather uncertain. It is, therefore, absolutely essential that a managerial economist recognizes his responsibility to make successful forecasts. By making best possible forecasts and through constant efforts to improve upon them, he should aim at minimizing, if not completely eliminating, the risks involved in uncertainties, so that the management can follow a more orderly course of business planning. At times, he will have to reassure the management that an important trend will continue; in other cases, he may have to point out the probabilities of a turning point in some activity of importance to management. In any case, he must be willing to make considered but fairly positive statements about impending economic developments, based upon the best possible information and analysis and stake his reputation upon his judgment. Nothing will build management confidence in a managerial economist more quickly and thoroughly than a record of successful forecasts, well documented in advance and modestly evaluated when the actual results become available.

A few corollaries to the above proposition need also be emphasised here. First, he has a major responsibility to alert management at the earliest possible moment in case he discovers an error in his forecast. By promptly drawing attention to changes in forecasting conditions, he will not only assist management in making appropriate adjustment in policies and programmes but will also be able to strengthen his own position as a member of the management team by keeping his fingers on the economic pulse of the business.

Secondly, he must establish and maintain many contacts with individuals and data sources which would not be immediately available to the other members of management. Extensive familiarity with reference sources and material is essential, but it is still more important that he knows individuals who are specialists in particular fields bearing on his work. For this purpose, he should join professional associations and take active part in them. In fact, one of the best means of determining the calibre of a managerial economist is to check up his ability to obtain information quickly by personal contacts rather than by lengthy research from either readily available or obscure reference sources. Within any business, there may be a wealth of knowledge and experience but the managerial economist would be really useful if he can supplement the existing know-how with additional information and in the quickest possible manner.

Again, if managerial economist is to be really helpful to the management in successful decision-making and forward planning, he must be able to earn full status on the business team. He should be ready and even offer himself to take up special assignments, be that in study teams, committees or special projects. For, a managerial economist can only function effectively in an atmosphere where his resources are, widely sought and used. In virtually all instances, his success or failure can be traced not only to his basic ability, training and experience, but also to his personality and capacity to win continuing support for himself and his professional ideas. Of course, he must always try to minimize the use of technical terminology in communicating with his management executives. For, it is well known that what management does not understand, it will almost automatically reject.

To conclude, a managerial economist has a very important role to play by helping management in successful decision-making and forward planning. But to discharge of a company his role successfully, he must recognize his responsibilities and obligations. To some business executives, however, a managerial economist is still a luxury or perhaps even a necessary evil. It is not surprising, therefore, to find that while their status is improving and importance is gradually rising, managerial economists in certain companies still feel quite insecure. Nevertheless, there is a definite and growing realization that they can contribute significantly to the profitable growth of companies and effective solution of their problems; and this augurs well for their future.

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# 3

# CONCEPTS OF MANAGERIAL ECONOMICS

About seven decades back, when Joel Dean's classic work on managerial economics was published, the impression was that managerial economics is "conceptual rather than metrical". Today we find that Managerial Economics is "both conceptual and metrical". Concepts and measurements help a business manager making scientific decisions. A modern business manager wants to take prompt and precise decisions and suggest a clear-cut set of follow-up actions to his sub-ordinates. In analysing his decision environment, theoretical concepts and mathematical measurements are useful and supplementary to each other. Concepts remain abstract, if they cannot be measured; and measurements remain mathematical puzzle, if the underlying concepts are not clear. Accordingly, in this chapter, our propose to study a few fundamental concepts and measurement techniques which are being increasingly employed in Managerial Economics. Finally, we intend to consider case-methodology as a tool of analysis.

**Fundamental Concepts :**

Concepts which are applied in analysing business decisions are supplied mostly by Economics. Some of these concepts do undergo a number of refinements in the process of their application. Most of these concepts are related to each other Each of these concepts has an underlying principle to suggest, principles which become basis of decision making. Following are some of the propositions which we would like to assert while defining and discussing the fundamental concepts.

*(i) Marginalism and Incrementalism :* The concept of 'margin' is very popular in economics. Economists speak of equilibrium solutions in terms of marginal adjustment. For example, in formal economic theory, we learn that a company makes a decision to produce by equating marginal revenues with marginal costs. There are various other marginal concepts like marginal utilities and marginal productivities Any such concept of margin has reference to impact of an one-unit-change in the independent variable on the dependent variable. Revenues earned or the cost incurred by a company depends on the volume of output produced and sold. Accordingly, marginal revenue is the change in total revenue resulting from an one-unit change in the volume of output produced; it is the additional amount of revenue earned if the company decides to produce (n + 1) rather than n units of output. Similarly, marginal cost refers to the cost of producing the additional unit of output. Marginal utility is the addition made to total satisfaction as a result of an additional unit of consumption of an item. Marginal product is the addition made to total product (subtraction from the product) as a result of employing an additional (withdrawing the last) factor of production.

In economic theory, the concept of 'margin' is very useful; it renders the determination/derivation of an equilibrium solution quite simple and easy. However, in the real world of business management, marginalism should better be replaced by incrementalism. In making economic decisions, management is interested in knowing the impact of a chuck-change rather than a unit-change. Incremental reasoning involves a measurement of the impact of decision alternatives on economic variables like revenue and costs. Incremental revenues (or costs), for example, refer to the total magnitude of changes in total revenues (or costs) that result from a set of factors like change in prices, products, processes and patterns.

The distinction between marginalism and incrementalism may be explained with the help of an example. Suppose 200 employees working on a plot of one acre land can produce 250 tons of some output, Q. If one more worker is added to the crew, then total production shoots upto 251.3 tons. In this case, the marginal product due to the 201th worker is 1.3 tons. In real world, factor proportion may not be nicely divisible. We may know that 210 employees can produce 260 tons of Q. In this case, the order of incremental volume of output, if we decide to add 10 workers to a crew of 200, turns out to be 10 tons of Q. Here the average incremental output turns out to be 1 ton per one worker. The reader may verify at this stage that :

1. Marginal concepts are always denned in terms of unit changes, but incremental concepts are defined in terms of chunk changes.
2. Incremental concepts are more flexible than marginal concepts. In marginalism, the reference is to one independent variable, but in incrementalism, more than one independent variable can be considered at a time. Marginal revenue is the increase in revenue due to one-unit increase in level of output. But revenue may increase due to a change in not only output, but also price and production process.
3. Under special circumstances, incremental and marginal revenue (cost) may be the same.

Incremental revenue and incremental cost are two basic concepts for making optimum economic decisions. A decision is optimum if it increases revenue more than cost or if it reduces costs more than revenue, i.e., if the net incremental revenue is positive. This may be termed as the "incremental principle" to be followed by management in making decisions.

*(ii) The Equi-marginal Concept :* Since resources are limited, a very fundamental question arises: How to decide on an optimum allocation of resources? When we use resources, we get returns as either physical returns or its value, money-revenue. If there is only one resource, then we may go on utilising it till we get the maximum return from it; and we get the maximum return, when the marginal return is zero. Alternatively, if there are more than, one resources, then total, returns are maximised when marginal returns are same in all resource-uses. The following Tables explain these principles.

*Table 1*

| *No. of Workers* | *Total Output* | *Average Output* | *Marginal Output* |
|---|---|---|---|
| 1 | 12 | 12.0 | - |
| 2 | 22 | 11.0 | 10 |
| 3 | 33 | 11.0 | 11 |
| 4 | 47 | 11.8 | 14 |
| 5 | 59 | 11.8 | 12 |
| 6 | 68 | 11.3 | 9 |
| 7 | 72 | 10.3 | 4 |
| 8 | 72 | 9.0 | 0 |
| 9 | 70 | 7.7 | –2 |

*Table 2*

| *No. of Workers* | *Marginal Output from* | | |
|---|---|---|---|
| | *Project A* | *Project B* | *Project C* |
| 1st | 10 | 9 | 8 |
| 2nd | 9 | 8 | 7 |
| 3rd | 8 | 7 | 6 |
| 4th | 7 | 6 | 5 |
| 5th | 6 | 5 | 4 |
| 6th | 5 | 4 | 3 |

Note that in Table 1 management should decide to stop employment of workers at 8 because at that the marginal output is 0 and the total output is at a maximum 72. In this typical case, the optimizing principle reads, therefore : Do not go beyond zero marginal return, if a resource has only one use. This is known as "optimum activity level" principle of resource allocation (Baumol).

However, the resource may not have one but many uses. Same workers can be used in a number of alternative productive projects. Now the question is : Where and how many workers should be used? Consider Table 2. In this case when a total of six workers is at disposal, the optimum allocation of labour resources will be : three workers for Project A, two workers for Project B and one worker for Project C such that Project A will yield a total output of 27. Project B will yield a total output of 17, and Project C, a total output of 8. This is the test result under given circumstances. Note that total returns are maximum at 52, when marginal return from Project A = marginal return from Project, B =marginal return from Project, C=8. In economic terms, it means that a resource should allocated so that the value added by the last unit is the same in all uses. This is the principle of equi-marginal return or "relative activity level". Total product in money terms is maximised when the value of the marginal production of a factor is equalised in all directions.

The equi-marginal principle underlies sound decision every where. A consumer can maximize total satisfaction by deciding to equate marginal utilities from different goods he purchases. A producer can maximize his production by deciding to equate marginal productivities of the factors he uses. An investor can maximize the total return from investment by deciding to allocate resources such that the last unit of investment in different assets yields the same return.

There are some important assumptions underlying all such equi-marginal principles :

1. Resources are given.
2. Resources have alternative uses.
3. The law of diminishing utilities/returns operates. This law reads :

As more and more resources are used in the same production line, the total returns increase at a diminishing rate, the marginal and average returns (due to resource use) diminish at a uniform rate. We can retain equi-marginal principle as long as diminishing returns are relevant. But when the marginal returns are constant, we need an alternative form of principle, making use of inequalities rather than equalities. The alternative principle would read as follows : Apply resources first to activities with higher marginal return values before moving to lower values. In many linear programming models, this principle is followed, because there we assume (a) marginal return from resources-use are constant, and (b) a combination of different resources is needed for production. To the extent these are not very realistic assumptions for our business world, it follows that the economists' simple principle of equi-marginal return has limitation. Management cannot always rely on such a principle for making sound decisions. This is particularly true when Management finds that incrementalism is more real and operational than marginalism. In that case, we may perhaps prescribe 'equi-in-crementation' rather than 'equi-margindison'.

*(iii) The Concept of Time Perspective :* Since the writings of Marshall, the doyen of economists, it has been customary to consider the time element in any discussion of economic issues. Economists normally make a distinction between "short-run" and "long-run". By "short-run", the reference is to the time period when the structure of industry, the size of company and the scale of plant are not alterable; the time is so short that any change in the scale of output has to be brought about by changing the intensity of exploiting the fixed factors like land and machineries. In the "long-run", all factors become variable; then enough time is available to adjust the scale of plant, the size of company and the structure of industry so as to change the volume of output. It is understandable that this disniction between short-run and long-run is useful in studying the effect of any policy decision on variables like price, revenue, cost and profit. However, Management, the decision-making unit may often wonder—How short is the short-run? How long is the long-run? In the long long-run, are we not all "dead"? (Keynes). Normally, the managers take short-run and long-run to mean immediate and remote effect of their policy decisions. In this context, the principle they follow may be stated thus: A wise economic decision is the one which considers both the short-run (immediate) and the long-run (remote) effects of a move on revenues and costs. Short-run costs must be covered up in long-run benefits-

The concept of time perspective is interpreted by business managers in another way. After all, decision-making involves a co-ordination on the time scale—past data, present decisions and future course of action. As such, form operational standpoint, the relevant distinction should be between past, present and future. The distinction between present and future comes very close to the economists, distinction between short-run and long-run.

***(iv) Discounting Concept :*** The concept of discounting is an extension of the concept of time perspective. In making decisions, the co-ordination between present and future is a difficult task. This is so, because the future is unknown, indefinite, incalculable and immeasurable. There is a lot of risk and uncertainty about the future. So, future must be discounted. Even if future is certain, yet it must be discounted because to wait for future is to a sacrifice the present. For example, an investor may find scope for investment today, but the returns from that investment may flow from it tomorrow. Unless these returns are discounted and the present value of the returns are calculated, it is not possible to judge whether or not the cost of undertaking the investment today is worth. Even if the future returns are certain, this discounting is necessary. Suppose, Rs. 100 will flow as return next year from the investment undertaken this year, then this sum could have been kept in the bank and say, 5% rate of interest might have been earned on that such that its value next year would have been

$$100 + \left(100 + \frac{5}{100}\right) = 105$$

Principal + (Principal × rate of interest) = Annuity

$$P + (P \times i) = A$$

$$\therefore \qquad P = \frac{A}{(1+i)}$$

that is, the present value of a return is the future yield, discounted at an appropriate rate of return.

$$100 = \frac{105}{(1+.05)}$$

Similarly, the present value of Rs. 100 next year, under the assumption of an available 5% rate of interest will be :

$$\frac{Rs.100}{1+.05} = Rs.\ 95.24.$$

Thus a rupee tomorrow is worth less than a rupee today. A hundred rupees tomorrow is worth only Rs. 95.24 today.

At this stage, what is important is not the present value formula, but the fundamental concept of discounting underlying the formula. In most of the economic decisions, where monetary costs and returns are calculated, such discountining becomes necessary for management in undertaking the present set of decisions The discounting principle can now be stated as : If a decision affects costs and revenues at future dates, it is necessary to discount these costs and revenues to present values so that the net returns at present can be computed and on that basis a decision may be taken. An economic decision is wise if it yields a positive net return.

***(v) Opportunity Cost Concept :*** By the opportunity cost of decision is meant the sacrifice of alternatives required by that decision. Let us have some examples :

1. The opportunity cost of investing a sum in some business venture which yields no immediate return is the rate of interest which the sum could have earned, had it been invested as a safe fixed deposit in a bank.
2. The opportunity cost of a using a machine to produce one product X is the another product Y which the machine could have produced, had X not been produced.
3. The opportunity cost of not using a machine at all is the product which the machine could have produced as well as the depreciation of the machine.
4. The opportunity cost of using our own house as a business premise is the rent which we could have earned by letting others use it.
5. The opportunity cost of putting our own labour in our own business is the wages/salaries that we could have earned by accepting a job elsewhere.
6. The opportunity cost of doing MBA Course in the evening is the sacrifice of time and energy we could have spent with our family or friend.

There are three important points to be noted out of these examples. Firstly, the calculation of opportunity cost involves the measurement of sacrifices, Secondly, sacrifices can be monetary or real. Monetary sacrifices can be expressed as explicit costs, recognised in the book of accounts. Real sacrifices may be expressed only as implicit costs, not recognised in the book of accounts. Since opportunity costs have reference to both explicit and implicit costs, they are not merely accounting costs. Thirdly, the opportunity cost is the cost of sacrificed alternatives. If there are no sacrifices, there will be no opportunity cost. Since resources are limited, sacrifices are always involved and, therefore, the opportunity cost concept is always useful for making economic decisions.

It may be noted that the discounting technique is actually a method of measuring opportunity cost i.e., the cost of sacrificing present returns in favour of future returns. Discounting itself is an extension of the concepts of time perspective and incrementalism, Economists have been using this concept very widely. For example, when they talk of a trade-off along the production possibility curve, i.e., the rate of substitution between two products under the assumption of given resources, or when they talk of a trade-off along the iso-quant curve, i.e., the rate of substitution between two resources under the assumption of given product or when they talk of transfer price of factors like land, they are talking basically of opportunity cost concepts—cost of one which we have in terms of another which we could have had. The opportunity cost reasoning is also an integral part of linear programming

The opportunity cost principle to be followed by management may now be stated simply. Minimize the opportunity cost in taking economic decisions; that is the sure road to optimal decisions.

*(vi) Scarcity-and-Choice Concepts :* Lastly, but not the least, another concept, very fundamental to the process of decision making is the concept of scarcity-and-choice. We know that decision making essentially boils down to an act of choice. Here is a choice among available alternatives. This choice is necessary because the resources at our disposal are so limited that we cannot avail of all the available alternative courses of action at the same time. In fact,

economic decision making is an attempted solution of an economic problem; and an economic problem is a problem of choice and valuation, Scarcity of means (in relation to the ends that we have to satisfy) is the source of an economic problem. Making economic decisions is nothing else but making choices, and making choices is essential for making compromises with scarcity. Scarcity and choice are thus related concepts for managerial decision-making. Since investment resources are limited, investment decision involves a choice among alternative investment projects, each project having a given gestation period, a given rate of return, a given cost structure etc. Since productive resources are limited, production decision involves a choice of (production) technique and technology, a choice of product line (and mix), a choice of quality and quantity of product etc. Similarly, it is the scarcity of resources which, on the one hand, compells the buyer to choose a product-combination to be consumed and which, on the other hand, compells the seller to choose a given market.

In this discussion of choice arising out of scarcity of resources, by 'resources', we have reference to men, materials, machines, money, time and energy. None of above resources which are so essential for any productive activity/process has got abundant supply. The decision making principle in this context should, therefore be to minimize the use of these resources or to maximize the gain from the resource-use.

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# 4

# MEASUREMENT TECHNIQUES OF MARGINAL ECONOMICS

Managerial ecnomics is not only conceptnal but also metrical. Additionally, since managerial economics is more 'applied' and less 'theoretical' in nature, there is a need to transfer the treatment of the subject-matter from the conceptual level to the opsrational level; as a result, measuremeat assumes significance.

The attempt at precision, on the one hand, and the need for measurement, on the other hand, make the use of mathematics indispensable. The basic principles of managerial economics are easily stated in language of mathematics. This suggests that there is no dichotomy between managerial economics and mathematical economics.

Mathematics lies at the root of measurement, it furnishes the basic tools and techniques of measurement. The Theory of Decision Making, Operation Research, Statistics and Econometrics, which are so increasingly used these days in economic measurement, are fields of Applied Mathematics. Modern business managers must, therefore remember that mathematics has not been invented by accident merely to annoy them, mathematical methods are invented precisely because the human imagination can perceive and invent problems that the unaided imagination cannot solve. Mathematics is an aid to solution; and an attempt towards the solution of problem itself constitutes decision making.

Mathematical methods and related measurement techniques can be briefly discussed under three heads : (i) some formal definitions and derivations (ii) the use of calculus tools, and (iii) econometric estimation.

*(i) Some Formal Definitions and Derivations :* We will introduce a number of standard notations as a means to attempt precision :

p = total profits

R = total revenue

C = total costs

Q = output produced and sold.

We will use subscript notations to indicate the level of output or the size of plant or the time period with which the costs, revenues and profits are associated. Thus Q means the level of costs of producing 1 unit/of using plant 1/in period 1. Likewise we may have R1, R2...or p1, p2.... Generalising we may have :

$$\pi_n = R_n - C_n$$

where n = 1, 2, 3, .... some number denoting units of output/time period.

Similarly, we can write,

$$\pi_{(n+1)} = R_{(n+1)} - C_{(n+1)}$$

or $$\pi_{(n-1)} = R_{(n-1)} - C_{(n-1)}$$

Employing these notations, the average and marginal concepts can be defined as follows :

$$AC_n = \frac{C_n}{Q_n}$$

$$AR_n = \frac{R_n}{Q_n}$$

$$A\pi_n = \frac{\pi_n}{Q_n} = \frac{R_n - C_n}{Q_n}$$

The first expression says, for example, that average costs, when n units of output Q are produced are; equal to the total costs of producing n units ($C_n$) divided by the total number of units produced ($Q_n$). The second is, likewise an expression for average revenue and the third one, for average profit.

Marginal concepts are defined as follows :

$$MC_n = C_n - C_{(n+1)} = \Delta C_n$$

$$MR_n = R_n - R_{(n+1)} = \Delta C_n$$

$$M\pi_n = \pi_n - \pi_{(n+1)} = \Delta \pi_n$$

The first impression here defines the marginal costs of the nth unit. The Greek letter delta ($\Delta$) is used to indicate a change; the marginal concept has reference to one unit change. The second expression defines marginal revenue from the nth unit and the last expression stands from marginal profits. Likewise, the incremental concepts can be defined.

For example :

$$C_{100} - C_{80} = C_{20}$$

$$R_{100} - R_{80} = R_{20}$$

$$\pi_{100} - \pi_{80} = \pi_{20}$$

These expressions tell us the incremental costs, incremental revenue and incremental profits, when the decision is taken to produce, an additional chunk of 20 units of output.

The equi-marginal principle can now be given a notational expression. For example, if a producer is selling his output in different markets (1, 2....... ....... ..n) then he must satisfy optimum decision —

$$MR_1 = MR_2 = \ldots\ldots\ldots = MR_{(n-1)} = MR_n.$$

or if a producer is using different plants (1, 2,. ....... .., n) to produce his output, then his optimising condition is

Such definitions, when used and manipulated by the elementary rules of Algebra may help us to derive and prove some fundamental propositions of Economics.

The profit-maximising principle is a fundamental proposition of Economics. The principle reads :

Profits are maximised at a point where marginal revenue equals marginal costs. To prove this, we start with an expression for a change in profits when production is increased by one unit :

$$\Delta\pi_n = \pi_n - \pi_{n-1} = \{R_n - C_n\} - [R_{n-1} - C_{n-1}]$$

or $\Delta\pi_n = R_n - C_n - R_{n-1} + C_{n-1}$

or $\Delta\pi_n = [R_n - R_n - 1] - [C_n - C_{n-1}]$

or $\Delta\pi_n = MR_n - MC_n$

Now take the current level of output as n–1 units and examine if it is worth while raising or lowering output. If $\Delta\pi_n > 0$, then profits can be increased by raising output; if $\Delta\pi_n < 0$, then profits are lowered by raising output, finally if $\Delta\pi_n = 0$, profits are as high as they can possibly be at the present level of output, this is where profit maximisation condition is satisfied. Using n, for additional unit of output we write,

when $\Delta\pi_n > 0$, $[MR_n - MC_n] > 0$ or $MR_n > MC_n$

when $\Delta\pi_n > 0$, $[MR_n - MC_n] < 0$ or $MR_n < MC_n$

when $\Delta\pi_n > 0$, $[MR_n - MC_n] = 0$ or $MR_n = MC_n$

Thus MR=MC turns out to be profit maximising condition.

Let us now study another fundamental proposition of economics : Fixed costs do not affect the profit maximising level of output in the short-run. We have already demonstrated that at profit maximising level of output, MR = MC. We need, therefore, to demonstrate only that fixed cost do not affect MC. In the short run, total costs have two components—total variable costs which change with the level of output produced and total fixed costs which do not change. Thus

$$C_n = TVC_n + \overline{TFC}$$

We put a bar to mean than $\overline{TFC}$ remain fixed whatever may be the level of output produced.

NOW $MC_n - C_n - C_{n-1}$

or $MC_n = [TVC_n + \overline{TFC}] - [TVC_{n-1} + \overline{TFC}]$

or $MC_n = TVC_n - TVC_{n-1} = \Delta TVC_n$

Note, marginal cost turns out to be a change in variable costs only. Marginal cost in the short run is not affected by fixed costs.

Such proofs are either too simple and obvious or too crude and clumsy. These proofs can be straight forward and easily derived once we have calculus tools at our command.

***(ii) Use of Calculus Tools :*** In elementary economics, functions and graphs are used as tools of explaining economic relations. For example, the demand for x is a function of the price of x.

$$D_x = d(P_x) \qquad ...(i)$$

Or, the supply of x is function of the price of x

$$S_x = s(P_x) \qquad ...(ii)$$

Or, the production of output (Q) is a function of factors like land (L), labour (N), capital (K) and enterprise (E).

$$Q = q(L, N, K, E) \qquad ...(iii)$$

Thus we come across functions of one variable as well as more than one variable. The relation involving two or three variables can be easily represented in two-dimensional or three-dimensional figures. Co-ordinate Geometry cannot answer our need when we move to more than three/four variables. Similarly, when economic relations do no longer remain linear but become non-linear, simple tools of Algebra like simultaneous equation methods do not suffice. The use of Calculus and Matrix Algebra then become necessary. Matrix Algebra is a must for understanding and applying linear programming techniques of decision making. On the other hand, Calculus is necessary for applying the operation research technique of optimum decision making. Calculus is in fact, basic in formulating precisely some of the basic concepts and theorems of Marginal Economics.

The use of Calculus be illustrated. For example, the marginal concepts can be defined. Considering (iii)

$$\frac{\partial Q}{\partial L}, \frac{\partial Q}{\partial K}, \frac{\partial Q}{\partial N} \text{and} \frac{\partial Q}{\partial E}$$

will be the respective expressions for marginal product of land, marginal product of labour and marginal product of enterpreneur. These partial derivatives will tell us the impact of a one-unit change in one independent variable, on the dependent variable keeping the other independent variables constant. In case of a single variable function like (i), we can de-note the effect of one unit change in price of x on the demand for

x as $\frac{\partial D_x}{\partial P_x}$ and the elasticity of demand for x as $\frac{\partial D_x}{\partial P_x}.\frac{P_x}{D_x}$.
Eventually we will derive such results.

It is very commonly assumed in managerial economics that decision-making- units, like firms, households or governments seek to maximize something or other, 'profit' or 'utility' or 'social welfare'. The Calculus rules of maxima and minima are very handy-tools in deriving optimum decision by these units. For example, if profit is to be maximized, then

$$\pi = R - C \qquad \text{...(iv)}$$

$$R = R(Q) \qquad \text{...(v)}$$

$$C = C(Q) \qquad \text{...(vi)}$$

$$\pi = R(Q) - C(Q) \qquad \text{...(vii)}$$

Two conditions must be satisfied for finding the profit—maximizing level of output :

(a) $$\frac{d\pi}{dQ} = \left[\frac{dR}{dQ} - \frac{dC}{dQ}\right] = 0 \qquad \text{...(viii)}$$

(b) $$\frac{d^2\pi}{dQ^2} = \left[\frac{d^2R}{dQ^2} - \frac{d^2C}{dQ^2}\right] < 0 \qquad \text{...(ix)}$$

From (viii) it follows, for profit maximizing level of output, $\frac{dR}{dQ} = \frac{dC}{dQ}$. Note this is nothing else but our earlier proposition MR=MC.

For a minima like cost-minimization, the first order (equilibrium) condition remains the same but the second order (stability condition) reverse, compared to (ix).

In case of constrained maxima or minima, the use of Lagrange Multiplier ($\lambda$) is a popular technique. The idea of maximizing subject to a constraint is probably the most important single idea in Economics which is science of choice. When the means of achieving ends are scarce and capable of alternative application, but ends are unlimited and capable of being distinguished in order of significance, then behaviour necessarily assumes the form of choice. This choice aims at either maximizing satisfaction of ends subject to the constraint of a given limited resources or minimizing the use of resources subject to the costraiat of a given end to be satisfied. Sometimes there may be more than one constraint. The number of Lagrange Multipliers must be the same as the number of constraints. Sometimes, such a problem can be more easily tackled through linear programming. If the decision-maker aims at "satisfying" multiple goals rather than maximizing/minimizing one goal variable, then goal-programming techniques may be applied. The point remains that there are many sophisticated techniques of measuring economic relations and optimizing economic decisions. The use of Calculus furnishes only the basic tool. The students of Managerial Economics are, therefore, strongly advised to acquire a basic knowledge in Calculus.

***(iii) Econometric Estimations :*** Managerial economics is concerned with exploring real world business applications of the logical structure of micro-economics. The development of the discipline of Economatrics over last two decades has important implications for the pursuit of such real world applications of micro-economic concepts and precepts. We are now capable of estimating demand equations, cost functions, production functions and other relations of micro-economic theory into quantifiable from such that we can provide useful information to business management for scientific decision-making. The major problems in applying economic analysis to specific business decision-making are quantitative measurement of economic relations and empirical verification of economic hypotheses. Do returns to labour diminish over a particular operating region of the production? Are there economies of scale in enlarging the size of the plant? Is demand price-elastic or income-elastic? Will the introduction of a new product (substitutes or complementries to the existing products) affect the market of the existing product? These are questions involving measurement. To obtain concrete answers to these questions, we must have explict measurement of theoretical functions involved. It is excatly here that the econometric methods of measurement and estimation are relevent. If we can blend together the econometric methods and micro-economic theories, we will be able to develop sufficient and scientific information useful in management decision making." In attempting such juxtaposition, we will move a step beyond the qualitative level of analysis which characterises the previous treatment of Managerial Economics.

The initial step in econometric estimation is the construction of a model. A model is a system of economic relations which may be either definitions and/or behaviourial equations. Using the structural form of the model, we derive a reduced-form solution for our decision variable. If this solution is fixed under a given set of initial conditions and previous condition, then the model is deterministic, but if the solution varies depending upon stochastic variation in the way in which the variables of the model relate to each other, then the model is probabilistic. If the solution of the model has a policy implication such that an optimal action path is suggested, the model is called normative, but if the solution is only useful in predicting the actual outcome of the system regardless of whether or not the outcome is optimal, then the model is called positive. Finally, if the solution considers the economic relations introducing time lags or over different periods, the model is dynamic; but if it does not, then the model is static. In what follows in this text, we shall only confine ourselves to models which are deterministic, positive and static. Additionally, perhaps more important, we shall only consider single-equation rather than simultaneous-equation models; because the purpose here is to illustrate how we can meaningfully quantify the content of Managerial Economics. For purposes of illustration, we will present empirical least-square estimates of co-efficients in a linear regression model of the type :

$$Y = \alpha + \beta \ X + u$$

where Y is dependent variable (say, demand), X is a predetermined variable (say, price), a is the intercept term, P is the slope coefficient and u is an unexplained portion of Y assumed to have no systematic relationship with X. Estimating the co-efficients a and p is a matter of fitting the best line through the statistical measure of least square. In a single equation, we can consider more than one independent variable and hence more than one regression co-efficients. It must be made very clear at this stage that we are interested in the interpretation of results (i.e., estimated coefficients) rather than a formal derivation and verification of the results which, we understand, is the job of Statistics, Economatrics and Economics and not of Managerial economics. For example, the estimated regression co- efficients may be intrepreted as the economic concepts of "elasticity" and such interpretation may help scientific decision making. This is what is relevant in Managerial Economics.

**Case Methodology :**

The case-method has become very popular in all most all fields of management studies. The use of case-method assumes some familiarity with concepts, precepts and measurement techniques. The treatment of the subject in this text has been designed as a foundation- course where attempt is made primarily to develop the concepts and precepts, and to suggest their operational significance. At this stage, the case method is secondary. We consider the case method to be an appropriate tool of analysis for a more advanced course on Managerial Economics. Hence we have not introduced any long case in this volume. Nevertheless we think that the students must get familiar with case method. We have, therefore, constructed our examples- and-problems in the form of short cases, each case is meant to develop conceptual clarity about economic applications. A real case would be a combination of many such short cases. For illustration, we have introduced a few such short cases at the end of this volume.

Managerial Economics intends to bridge the gap between abstract economic theories and real world business practices. Cases are either actual realities or real world approximations; their analysis revels how abstract economic concepts and theories are applicable in making actual decisions. Concepts and theories from Economics are to be used as tools of analysing decision problems which may vary from case to case, from manager to manager. There is no definite procedure in analysing a case. Normally the case-analyst follows the following methods :

(i) Key issues are seporated from the trival issues so that the total situation is clarified.

(ii) Availiable facts are organised around the key issues so that the content of the central problem before the Management is defined clearly.

(iii) Alternative courses of action, appropriate as solutions to the central problem, are determined. The analyst may either locate these alternatives within the description of the case or invent these alternatives or do both.

(iv) The alternatives are evaluated; the strength and weakness of each alternative solution are critically appraised.

(v) One of the alternative is recommended, here lies the decision. The manager must be decisive, but he must be fully aware of the limitations of his decision.

He need not overstate his case and glorify his decision. He is expected to assert how his choice of a given decision is "better" than other choice from available courses of action. He cannot claim his decision to be the "best" one because he might not have received "all the fact's about the case.

After all, the case method involves an analysis of a given situation through evaluation of facts, organisation of facts into meaningful patterns, the weighing of important facts against unimportant ones, formulation of alternative courses of actioa, the evaluation of those alternatives against the fact and objectives of the under taking and the final choice of solution i.e., the act of making decision.

**Overview :**

Managerial economics is both conceptual and metrical. As such the knowledge of a few fundamental concepts and a few measurement techniques, relevant in the process of applying economic analysis in examining business decisions, is basic to the subject of managerial economics. We have discussed following six fundamental concepts. These are :

(i) Marginalism has reference to changes in the magnitude of dependant variable due to one unit change in independent variable Marginalism may be replaced by the concept of incrementalism for practical purposes.

(ii) The equimarginal concept suggests the optimizing principal that marginal utilities/productivities/returns/ costs must be equalised so that the totals can be maximized.

(iii) The time perspective which the economists have in mind is normally classified into short-run and long-run, depending on the variability of productive factors to vary the level of output.

(iv) Discounting is essential for computing the present value of future returns or costs, when future is uncertain.

(v) The opportunity cost is the cost of sacrificed alternative discounting is a method of calculating opportunity costs involved in time preference.

(vi) Scarcity is basic to any economic problem, the problem of choice and valuation. It is because of scarcity, economic decision making makers sense.

In explaining above and other concepts and precepts of economic the measurement of economic relationship is essential, and therefore, some discussion is attempted on (i) some formal definitions and derivations, (ii) the use of calculus tools and (iii) econometric methods

A famibiarity with these concepts and technique is essential for approaching managerial economics through Case Study Method.

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# 5

# IMPORTANT TERMS USED IN MANAGERIAL ECONOMICS

For understanding managerial economics, it is necessary to know following terms used in managerial economics :

*(1) Economics :*

Economics is the science which studies human behaviour which aims at meeting maximum objectives with the help of limited resources.

Economics is the art and science which deals with the economic problems of the people living in a society.

Economics as applied to industrial organisation has following two main divisions :

1. Micro Economics
2. Macro Economics.

Micro economics can be defined as the branch of economics where the unit of study is a company or an individual It is the main concept and a numerical tool for economics concerning with industries The Micro-Economics deals with smaller units of the economy like behaviour of individual customers, plants or industrial undertaking.

Macro-Economics study with whole economy, and studies the growth of national income and economical environment as whole.

It plays an important role in forecasting and other factors related to marketing.

Economics is a subject of interest to the engineers, as they are to deal with the economic problems related to increasing the production, reducing the efforts, increasing the wealth, improving the living standard, reduction in cost of the products, etc.

***(2) Income :***

Income (personal) is defined as those incomings which are in the form of money and payment in kind. Whereas income from business is found by deducting the outgoings expenditure on, material, labour and other overheads etc. from gross income. Income can be derived either from personal services or from property.

***(3) Investment :***

In a modern business, investments are made on :

(i) Land and buildings,

(ii) Procurement of raw materials, tools, instruments,

(iii) Purchase and installations of machinery,

(iv) Internal services like material handling devices, transporting vehicles, light, water gas, power etc.

(v) Administrative and selling services,

(vi) Works related to productivity improvement, cost-reduction etc.

(vii) Payment of wages to the employees,

(viii) Other works related to running the business and its development.

Reserves for working capital are very necessary for sound financial management. It ensures stability and financial soundness of the company. This helps, to cover credit losses, to liquidate debts, to expand, for replacement of machinery, for taxes, to meet contingencies like fire, theft, strikes etc.

Reserves are of two types, namely revenue reserves, and capital reserves. Revenue reserves are required to meet future commitments such as, distribution of dividends, research and developments etc. Whereas capital reserves are made for increasing the capital.

***(4) Assets and Liabilities :***

***Assets :*** These are the resources of the company. Examples of assets are : cash, properties, machinery, stocks etc.

***Liabilities :*** Liabilities are the claims of the creditors against the business enterprise. The important examples of the liabilities are :

(a) *Current Liabilities :* Bank overdraft, snort term loans, trade credit, wages etc.

(b) *Fixed Liabilities :* Among owed, long term debts etc.

(c) *Contingent Liabilities :* Guarantees and when principal debtors fails to pay etc.

***(5) Production :***

Production in Economics, means producing things that can satisfy some human wants or have economic utilities or such utilities which have exchange value. For example, when a carpenter makes a table out of a log of wood he only changes the shape of wood but in the form of table, the wood is more serviceable. Books satisfy man's thirst for knowledge. Food and drinks satisfy hunger and thirst. It is thus that thing which satisfy human wants and this capacity of a thing is termed as utility.

***(6) Utility :***

Utility may be defined as the power of things and services to satisfy some human wants, it can also be defined as the satisfaction which we actually obtain from the things or services we consume.

Economic Utilities are of Five Types :

1. ***Form Utility :*** A person is said to create form utility when he exchanges the form of matter in order to make it more serviceable. For example, table out of a log of wood.

2. ***Place Utility :*** When a person transports a commodity from a place where it is wanted less to a place where it is wanted more, he creates place utility *e.g.* bringing timber from mountains to plains.

3. *Time Utility* : When an article is stored till the time it will be needed and valued more, time utility is added to it *e.g.* storing of articles by shopkeepers, storing of vegetables and fruits in cold storage for sale when they are not available in season.

4. ***Possession Utility*** : Possession or ownership utility is created by transfer or change of ownership of an article from a person who has little use for it to a person who has greater use for the same *e.g.* selling of a table by carpenter to an office.

5. *Service Utility* : Those who render direct or personal service to the consumers create service utility *e.g.* doctors, lawyers, teachers domestic servants etc.

(7) *Market* :

In ordinary sense, a market is a place where things are bought and sold. But in economic sense, a market is a place or region, where buyers and sellers have free competition with one another. The buyers and sellers may not beat one place. They may have free intercourses by means of post, telegraph, telephones etc. Therefore, in the economic sense, the term market is applied to commodities and buyers and sellers or the same who are in direct competition with one market to another.

***Essentials of Market*** : The following are the essentials of a modern market :

1. A commodity.
2. A large number of buyers and sellers.
3. An area or region which may be a village, a city, a country or the whole world,
4. Competition between buyers and sellers.

When there is perfect competition between buyers and sellers, there can be only one price for the commodity at any given time. Some allowance may be made for cost of transportation from one part of the market to another.

***Classification of Markets*** : Markets may be classified in respect of *(a)* Space and *(b)* Time.

Under space, we may have,

1. Local Markets.
2. National Markets.
3. International Markets.

Under time, we may have,

1. Short period markets. 2. Moderately long period markets. 3. Long period markets. 4. Secular markets or very long period markets.

*(a) Space Market :* When commodity is brought and sold only within or near its place of production, it has local market *e.g.* fresh vegetables, milk etc.

When the area of the market covers a whole country the commodity is said to have national market.

When competition in the case of a commodity is world-wide, the market is said to be international.

*(b) Time Market :* This division of market refers to the period for which the market for any commodity exists.

*Market Price :* Market price of a commodity or service is the price that prevails in the market at any time. It can change at any time. The market price of a commodity at a certain time is determined by the interaction of the forces of demand and supply. No buyer will be prepared to pay anything more than the marginal utility of the commodity to him. He would rather pay less. On the other hand, no seller is prepared to accept anything less than the cost of production of the commodity to him. He would like to charge as high a price as possible. Marginal utility and marginal cost of production are the two limits. The price fluctuates between them. It is fixed at a point where it is equal to supply. Competition between buyers raises the price and between sellers lowers the price.

*Normal Price :* Normal price is the price which is likely to prevail in the long run if sufficient time is allowed for adjustment between demand and supply. Normal Price is neither abnormally high nor abnormally low. It is more or less a constant price, and the market price fluctuates above and below. The governing factor for the normal price is the cost of production or supply of a commodity. It, therefore, tends to be equal to its marginal cost of production.

*Monopoly Market :*

Under conditions of perfect competition value is determined as a result of interaction of the forces of demand and supply. Under monopoly, the supply is under the control of the monopolist. Therefore, the law of demand and supply does not work freely. The aim of the monopolist is to get maximum net profit from the monopoly. In order to achieve this aim, he has to study the conditions of demand and supply.

In determining the price policy, the monopolist has two possibilities before them.

(1) He may fix a particular price for his product when he puts the quantity on the market according to the demand.

(2) Or he may fix quantity of product in the market and sell it for whatever price he gets. The monopolist will go on producing so long as the marginal revenue is greater than the marginal cost. He will stop producing the commodity where marginal revenue is equal to margin at cost.

At this point, his net profit is maximum. In order to reach this point, he follows the method of trial and error in fixing the price.

*(8) Money :*

Money is all that serves as a medium of exchange. It includes metallic coins, currency notes, cheques, bills Of exchange, hundies and drafts.

*Functions of Money :*

1. It serves as a medium of exchange. All buying and selling is done through the medium of money.
2. Money is used as a common measure of value. The values of all commodities are measured in terms of money.
3. It serves as a standard of deferred payment. All borrowing and lending is done in money.
4. It serves as a store of value. We store value in the form of money, not in the form of any other commodity.

*Kinds of Money :*

1. ***Standard Money :*** It is that form of money in terms of which all values are measured and the face values of which is equal to its intrinsic value *e.g.* gold coins.

2. ***Token Money :*** It is that form of money the intrinsic value of which is less than its face value *e.g.* small coins and paper notes.

3. ***Paper Money :*** It is made of paper and issued by the government of a country. It is of two kinds *(a)* Convertible *(b)* Inconvertible.

(a) Paper money is convertible when it can be converted into standard money at the option of the holder.

(b) It is said to be inconvertible when it cannot be redeemed into gold or silver on presentation. Such notes are issued by the government of a country in times of emergency.

4. ***Legal Tender Money :*** Money which can be legally tendered payment of debts or other obligations is said to be legal tender money.

There are two kinds of legal tenders :

*(a)* *Limited Legal Tender :* It is that form of legal tender money which can be paid in discharge of an obligation upto a certain limit. Small coins other than 50 paise bits are legal tender upto Rs. 10.

*(b)* *Unlimited Legal Tender :* It is the form of legal tender money which can be paid in discharge of debt to any amount.

***(9) Trade Cycle : Introduction :***

Trade in any commodity does not always remain in the same state of activity. Sometimes it improves, at other times it deteriorates. It is seen that these changes follow one another, That is, a period of good trade is followed by a period of depression. The cycle of these changes is called the Trade Cycle.

During period of good trade, the prices rise, the unemployment percentage goes low, productive activities and orders increase, profit go up. The wages of workers increase.

During bad trade or "Slump" prices drop and profits decrease, unemployment increases, productive activities are curtailed and wages are cut. Lower standard of living is forced on majority of population. The wholesale prices fall much in excess of the retail, prices. The rate of interest falls.

All these factors, force the management to introduce economic measures in shape of stoppage of waste, introduction of greater efficiency or even retrenchment of staff. Thus the cost of production per unit is reduced below its price and a narrow margin of profit starts being earned. The fluctuations like the swing of a pendulum automatically generate movement in the other direction with equal momentum. Periods of prosperity contain in themselves seeds of depression. There is a regular time interval in the occurrence of boom and slump in trade, which varies from 7 to 10 years from peak to peak. These changes do not occur only in India but effect the whole world.

***Characteristics of Trade Cycle :***

1. *The trade cycle is synchronous* : That is, the upward and downward movements occur at, approximately the same period in all industries. A good business in one industry stimulates business in other industries.
2. *Trade cycle is an international feature* : Through International trade and foreign exchange, the prosperity or depression spreads to other countries.
3. Boom and slump affect all industries, but not to the same extent. The constructional industries manufacturing capital goods such as engineering, ship building, aircraft, etc., experience the heaviest fluctuations.
4. The cycles exhibit a wave-like movement and the different recorded cycles are members of the same family, but no two cycles are exactly similar.

***Causes of Trade Cycle :***

Following theories have been formulated in regard to the causes of the trade cycle :

1. Climate Theory.
2. Theory of Under-consumption.

3. Monetary Theory.
4. Psychological Theory.

1. ***Climate Theory :*** According to *'Jevons'* trade cycles caused by sun spots, which occur at an interval of 10—45 years. They adversely affect the crops, decrease the purchasing power 01 cultivator and cause depression.

2. ***Theory of Underconsumption :*** When inequality of incomes exist, that is, large portion of total wealth is owned by a few, and greater portion of this income is saved, the savings are invested in productive organisations which add more and more of consumption goods. But on the other hand, the equivalent income to buy these goods is not available. Thus the supply of goods increases in relation to demand, There is a glut (circulation of money) of market which cannot be sold at a profit. So the profits decrease further investment stops, more income is received than spent and depression sets in.

3. ***Monetary Theory :*** According to this theory, the trade cycle is a purely monetary phenomenon. The upward movement or the trade cycle is brought about by the expansion of credit, when rates of interest are low, the investors borrow more and expand their business activity. The process continues. Income increases and me prices also increase. The demand for loans rises. Bank reserves get depleted owing to increased cash circulation. The banks increase rates of interest and hesitate to advance loans. From this point the trend of trade takes a turn.

4. ***Psychological Theory :*** According to this theory, the cause of the cycle is business confidence or rather over confidence. During, boom, people expect more profits and expand their business and carry production beyond profitable sale. At some point, business has to be curtailed and conditions of depression start.

***(10) Profit :***

The profit of a company equals the total scale proceeds minus the cost of production. If the residual part of the total scale proceeds left over after paying off all the items of expenditure in the cost. Here cost of production including rent on land, wages for labour, interest on borrowed capital and salaries of management and organisation etc. But, out of this profit, later on certain adjustment is to be made.

We are to subtract not only actual cost but also certain imputed cost in order to obtain "gross profit". Owner's capital and owner's labour is to be paid although they have not been actually paid. These costs should be added to the actual costs In addition, certain tax obligations might have arisen during the course of the year but it is not essential for us to pay them up during that year. These can be paid next year also, but to arrive at a correct figure of gross profits we should add those tax payments on the cost side. The value of the existing stock is also obtained and this should also be deducted to obtain the true value of "Gross Profits".

To obtain "Net Profits", we are required to make still certain 'adjustments. From the gross profit, deduct depreciation charges and the cost of new investment during that period. The final position is called as "Net Profits". It can be summarised in the following ways :

| | | |
|---|---|---|
| (1) Residue | = | Actual Receipts during a period—Actual payments made during the period. |
| (2) Gross Profit | = | Residue-Imputed charges of owner's labour and capital—Tax obligations—Value of balance stock. |
| (3) Net Profit | = | Gross Profit—Value of capital equipment added during the period — Depreciation charges. |

***(11) Theories of Profits :***

Many theories of profit have been putforth by different economists to explain the profits. The important among these are :

(1) Risks and Uncertainty theory

(2) Dynamic Approach to the Profit theory

(3) Residual or Rent theory of Profits.

***(1) Risk and Uncertainty Theory :*** This theory was introduced by Howley and according to him net profit is the residual income of the owner after making payments for all factors of production and is the reward for the risk taken by him. It concludes that profits are due to the risk taken by the owner. The owner has to bear the risk of losing capital, there are certain risks which can not be issued. They are known as uninsurable risks. We cannot predict when fashion will change or when new invention will come or when will war outbreak etc. There are unforeseable changes and hence in value risks which cannot be insured payments made for these uninsurable risks are called 'profits'.

(2) ***Dynamic Theory of Profits :*** Mr. J.B. Clark introduced this theory. According to Clark, the pure profit in a dynamic society is the residual income of the owner after making all payments including rent, wages, interest and salary of management. Such profit in the form of residual earning result only in a dynamic society where the changes in population, changes in the stock of capital, changes in tastes or fashions, changes in production techniques and changes in management principles, occur dynamically. In a static society since there are no such changes, no pure profit may result. Thus pure profit is a sign of progress. Thus to increase profit an owner may produce a new commodity, popularise it and earn large profit and soon competition sets in; the profit decline. Thus in maintaining pure profits high continuous progress is essential.

(3) ***Rent Theory of Profit :*** This theory was introduced by Walker, who considered profit as a form of rent. He says that owner earns profit in the same way as land earns rent.

Marshall has criticized theory for the following reasons :

(a) Whereas rent on land is in the form of surplus earnings, profit is not.

(b) Land may produce zero or positive, zero or negative rent whereas net profit may be positive, zero or negative.

***(12) Annuity :***

An annuity is a series of equal payments occurring at equal periods of time. It may also be said as "Equal payment or uniform payment series". In certain business dealings, equal payments are made at the end of equal periods of time and all such accumulated payments are allowed to earn compound interest. Periods of time may be of any length say a year and a month etc. but periods should be of equal length. Interest is expressed in yearly terms but the actual interest is paid at the end of each equal period. Hire purchase payments, instalment buying, L.I.C. premium payments etc. are done by this method.

*Features :* These have the following common features :

(i) These involve series of payments.

(ii) All payments are of equal amount.

(iii) Payments occur at equal time intervals.

(iv) All payments are made at the end of periods.

(v) Compound interest is earned on all accumulated payments.

***(13) Cost Control and Cost Reduction :***

Cost control is a method of comparing actual costs with predetermined standards. Whereas cost reduction is meant to take drastic actions, even by changing the laid down standards. Therefore cost control is a continuous affair, while cost reduction measures are taken under some special programmes.

***Steps for Cost Control and Cost Reduction :***

1. Creating an all round cost awareness in the organisation.
2. Setting objectives and targets.

***(14) Price :***

Value of an item expressed in terms of money is called price. The price of everything falls and rises from time to time and place to place, and with every such change the purchasing power of money changes for that item. Price of everything is the rate at which, it can be exchanged for anything else. Price is determined by the interaction of two sets of influences, namely, demand and supply.

***(15) Price Determination :***

The function of price determination is very important because it affects the earnings of the concern. The function is also difficult task because prices are determined by considering large number of complex and interdependent factors. Following are the main factor which should be considered to determining the price.

*(i) Cost Factor :* It is a simplest proposition that prices charged must be such that it covers the average total unit cost and earn a reasonable profit. This system *i.e.* costs plus reasonable margin is more common in large contracts, in commodities whose prices are controlled by the government, items of basic need etc.

*(ii) Nature of Market :* Manufacture should attempt to find out the composition of his market and the nature of the prospective buyers of the product concerned. For this purpose many questions are considered, such as, how many of the prospective customers of his product belong to rich, middle or poor classes? Is the market of his product composed of industrial users, commercial houses or individual consumers? Is the product meant for young men or for grown-ups; for snobbish, sheapesh or intellectuals, for young boys or girls. The idea to know all this is to assess the relative utility of the product to the consumers, to determine the value which the prospective buyers will place upon the article, and the price is fixed in this light.

*(iii) Competitors Prices :* Competitors prices for similar items should be kept in mind.

*(iv) Channel of Distribution :* As the longer the chain of distribution the higher is the margin added to cost in fixing the prices.

*(v) Warranty and After-sale Service :* These also have a bearing on the pricing of goods in as mush as these cost the seller.

*(vi) Margin for Rebates or Concessions :* A proper adjustment should also be made for regular or irregular rebates, concessions, cuts or other reduction in prices allowed to consumers to attract them to promote sales.

*(vii) Government Policy :* Government may specially fixed and control prices of goods as in the case of sugar, coal, cement, steel, etc.

*(viii) Buying Habits of Customers :* The prices depend upon the buying habits of the customers who buy the products and whether they are price conscious.

*(ix) Nature of Sales :* Whether the product sells seasonally like refrigerator, water coolers, desert coolers etc.) or throughout the year.

*(x) Demand and Supply :* As discussed, separately, demand and supply are two forces pulling in opposite directions. They are

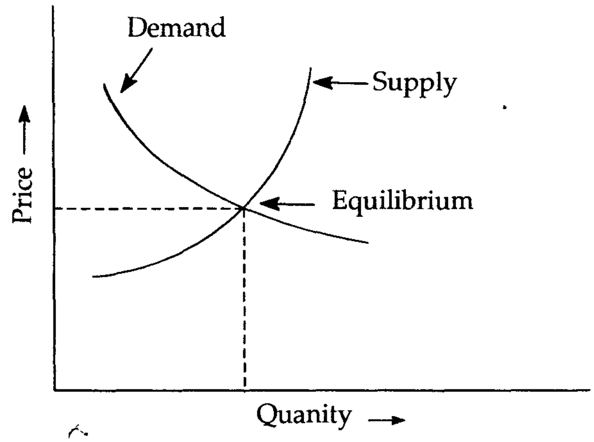


***Fig. 1. Equilibrium price***

balanced (known as equilibrium) at that market price at which the demand equals to the supply. This price is called equilibrium price.

At any price higher than the equilibrium price, the seller will find some of the articles left unsold. At a price lower than the equilibrium price demand will exceed the supply and there will be shortage of the commodity. The market price is only a short term equilibrium price and fluctuates on the influence of demand and supply.

*(xi) Public Utility Items :* Water, electricity, city passenger transport service, supply of cooking gas etc. are few examples of public utility. The broad aspects of price policy of these items are (i) Promotional aspects, *i.e.* to promote demand to ensure maximum utilisation of the total available capacity; (ii) Price discrimination. There are some markets where the demand is elastic because of the availability of the substitute, and some others where the demand is inelastic because no alternative is available.

*(16) Capital :*

Capital is that part of wealth other than land, which is used for further production of wealth. It generally consists of hard cash, raw-materials, tools, machinery. Part of wealth which is not used for production of wealth, is not the capital. Capital may also be defined as wealth which is used for the purpose of producing further wealth.

*(17) Value :*

The value is the exchange value of one thing in terms of another at any place and time. The value depends upon the utility, of a particular object.

*(18) Wants :*

Want is that desire which can be fulfilled and which is backed by the ability and willingness to fulfil (or satisfy) it. Wants can be classified into 3 categories, namely; necessities, comforts and luxuries.

*(19) Wealth :*

Wealth is a desirable thing which satisfy human wants directly or indirectly. Goods which are available in unlimited quantity are not wealth like air. A wealth can be exchanged.

A wealth must have qualities, like utility, scarcity, Exchangeability. The wealth may be *(a)* personal or private wealth like clothing, house, house hold articles etc., *(b)* collectively owned, like community facilities, private limited companies public libraries, etc. *(c)* National wealth, *(d)* International wealth like oceans etc.

*(20) Goods :*

Goods or product or commodity is any thing which can satisfy human wants. These can be material goods like gifts of nature, products buildings, machinery, patents, copy rights, bonds, shares etc. or non material goods like goodwill, supports, technical know-how etc.

*(21) Credit :*

Credit transaction means that buyer will pay for the commodity to the seller at a future date. Thus credit means deferring of a payment. For this, it is necessary that the seller must have confidence in the buyer.

*(22) Stock Exchange :*

Stock exchange is a place where dealings in stocks and shares takes place. This is a market where securities, stocks, shares, debentures and bonds etc. are bought and sold freely.

*(23) Demand :*

Demand means an effective desire that is the desire coupled with purchasing power in order to become demand. Demand varies with the price, there are many other factors which has influence over demand.

***Law of Demand :*** The relation of price and demand is known "law of demand", which states that, "higher the price, lower the demand and *vice-versa*, other things remain the same".

The 'law of demand' is also shown graphically in the form of a chart which is called 'Demand Curve' (Fig. 2). *DD* is the demand curve for an article of commodity. The curve slopes down towards right side indicates that when price rises, less is the demand and when price falls more is the demand. Such types of slopes are called Negative slopes.

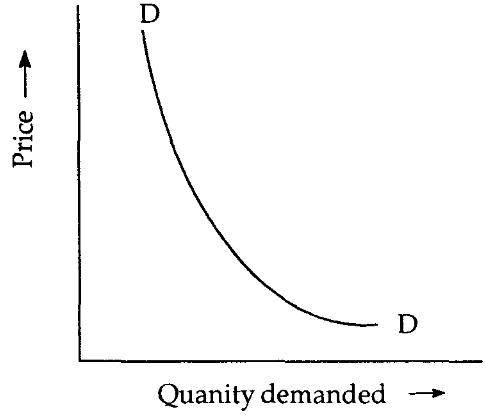


***Fig. 2. Demand Curve***

*(i) Electricity of Demand :* Law of demand states that higher the price, lower the demand and *vice-versa*. But definition is not clear about range of change, it only guides the direction of change. This means that it is not clear that how much increase in price lower how much the demand. For knowing the range, we should know the elasticity of demand. The elasticity of demand can be defined as "the degree of responsiveness of quantity demanded to a change in price". This means that it represents the rate of change m quantity demanded due to the change in the price. Strictly speaking elasticity of demand refers to the way in which the demand for a good response to a change in its price, whether a rise or a fall.

***Factors Affecting the Elasticity of Demand :***

***(a) Type of Commodity :*** The demand of necessities like wheat, sugar or salt never changes with the change of price. Such demand is inelastic, whereas, the demand of luxuries like Television. Cosmetics changes with the price, called elastic demand.

***(b) Customer's Income :*** People with high income are less affected by price change, whereas the low income group suffers more. Such as *a* rich man never cuts his consumption of milk or fruit with the pries rise whereas a lower income people certainly cut their demand.

***(c) Part of Income spent on the Commodity :*** If any one spends an definite small amount of the income on a commodity then there is no effect by the price rise.

***(d) Use of Commodity :*** A commodity having many uses, the demand is elastic, such as steel, having different uses, by price change the demand may be changed. If the commodity having limited uses the demand may be inelastic.

***(e) Durability of Commodity :*** If a commodity can be repaired, and the expenses are less, in comparison with the price of new commodity like foot wears etc., in such cases by the price rise, one would like to use the commodity even after repair. Thus more demand for such goods, causes higher elasticity of demand.

***(f) Substitute for the Commodity :*** If a commodity have number of substitutes, the demand is relatively elastic. Such as if petrol prices are high then people leave the cars, and like to use scooters, buses or cycles.

*(g) Urgency of Demand :* If the price of an essential commodity rises, such as sugar, wheat or salt, one would like to give up something else than giving up the sugar or salt. If one have the habit of smoking, the demand is inelastic, because with prise rise in cigarettes, one would like to give up smoking or reduce number of the same.

***Relative Elastic Demand :*** When a reduction in price leads to less than proportional increase in demand. Here the shape of demand curve is sleep.

***Change in Demand :*** The change in demand means 'an increase or decrease in demand'. An increase in demand means that at the same previous prices there is an increase in demand. If so then demand curve will lie to the right of the original curve (Fig. 3). The increase in demand may be due to increase in people's income, discovery of new use of the product, an improvement in customer taste's etc.

Likewise the decrease in demand would mean that at the same previous level of prices, less quantity would be sold. The demand curve will then lie towards left of the original curve.

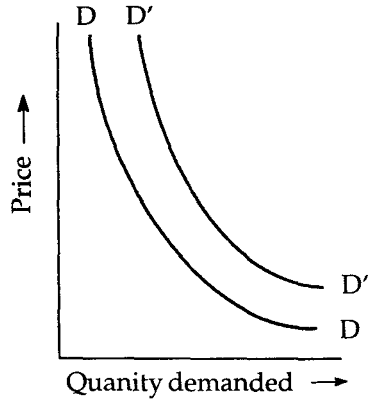


*Fig. 3*

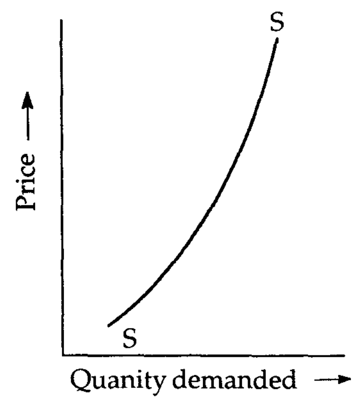


*Fig. 4*

The increase or decrease in demand is also termed as 'shift in demand schedule'. This is because the demand curve shifts towards left or right with decrease or increase in demand.

*(24) Supply :*

Supply of a commodity refers to the various quantities of a commodity which a seller is willing and able to sell at different prices in a given market, at a point of time, other things being constant. Price of a commodity is affected by the demand and the supply of that product.

***Law of Supply :*** "As the price of a commodity rises, its supply increases and as the price falls, its supply declines". Thus the quantity offered for sale is directly proportional to price, *i.e.* larger the supply, higher the price or *vice-versa*. Other things remain same.

***Increase and Decrease in Supply :*** This means a change in quantity supplied without any change in price. This, therefore indicates a shift in supply schedules to the right with increase in supply and to the left with decrease in supply.

***Determination of Price :*** Prices in perfect competition are determined by the laws of demand and supply. Prices will be fixed at a point where the supply and demand are at an equilibrium. The equilibrium will change by changes in forces of demand and supply.

# 6

# ECONOMIC THEORIES

Economic theories help the managerial economists to understand the actual business behaviour, which helps him to take right business decisions. Economic theory and the assumptions on which the are based when correctly understood, managerial economist can modify them to conform to actual business behaviour.

**Profit Maximisation Theory :**

The objectives of the company are clearly defined, which are profit maximisation, sales maximisation, cost minimisation, growth of company, excellence of a product, maintenance of good public relations, welfare of employees etc. Since all business activity involves allocation of scarce resources and expects return by employing the resource for the purpose. The return must be balanced against its opportunity cost *(i.e.* what it might have earned in its alternative uses), and most profitable alternative is then selected. Out of the above mentioned objective most important objective is the profit, maximisation.

Theory of company, model of profit maximisation have been developed on the basis of the assumption that rational firms or companies persue the objective of profit maximisation subject to technical and market constraints. The important propositions of this theory are :

(i) The company is struggling hard for profit maximisation.

(ii) The company always select an alternative which helps it to achieve profit maximisation.

(iii) The market conditions are known.

(iv) Quantities of inputs and outputs and changes in the prices are thoroughly analysed.

(v) The company is transferring the inputs to high value of outputs, given to the state of technology.

**Assumptions made in Theory :**

(i) The company has single goal of profit maximisation.

(ii) The company is a single ownership i.e. run by its owner.

(iii) The companies actions are rational in persuing its goal.

(iv) All the relevant variables are known at the time of decision-making.

***Profit Maximisation :*** Profit maximisation means generation of largest absolute amount of profits over the time period being considered. Since time period may be short run or long run, therefore profit maximisation are of two types, namely, short run profit maximisation and long run profit maximisation. In short run periods, adjustments to changed conditions are partial. For example, increased demand can be met for short-run through changes in manhour and intensive use of existing machinery, but the production capacity is not increased. For a long run adjustments to changed circumstances are complete. In the above mentioned example, the increased demand can be met in the long run by changing its production capacity or by setting up an additional plants, besides-above temporary measures. Thus long run and short run periods depend upon the company to company.

Decisions for short run and long run are different. For example, a dominating company may decide to restrict the supplies in order to increase the price to maximise the profit, but this would, in long run, win attract the rival companies to come up, which will ultimately defeat the purpose of long run profit maximisation. Thus the decisions are to be taken considering its repurcation in the market, government, employees etc.

*Theory or Model :* Approach of the theory of company is that the company compares the cost and revenue implications of different output levels, and then select the output level that maximised the profit (*i.e.* absolute difference between the cost and revenue.

Let $T_R$ = Total Revenue

$T_C$ = Totalcost

X = output

P = Profit

Then, profit for X output,

$$p = T_R - T_C$$

For maximisation of profit P, following two conditions should be satisfied

***I Condition :***

$$\frac{dP}{dX} = \frac{d(T_R)}{dX} - \frac{d(T_C)}{dX} = 0$$

or $$\frac{d(T_R)}{dX} = \frac{d(T_C)}{dX}$$

i.e., Marginal Revenue (M.R.)

= Marginal cost (M.C.)

***II Condition :***

$$\frac{d^2P}{dX^2} = \frac{d^2(T_R)}{dX^2} - \frac{d^2(T_C)}{dX^2} < 0$$

or $$\frac{d^2P(T_R)}{dX^2} < \frac{d^2(T_C)}{dX^2}$$

*i.e.,* slope of M.R. curve is less than that of M.C. curve.

At output level (X) which satisfies both the conditions, profit will be maximum.

The theory of company thus predicts that the company will produce output $X_2$, at a total cost of $X_2K_2$ and at this level output it generates a total revenue of $X_2K_1$ and the company generates a profit equals to $K_1K_2$. This theory also predicts that the price charged by the company shall be,

$$\text{Price} = \frac{\text{Total revenue}}{\text{Output}} = \frac{X_1K_2}{OX_2}$$

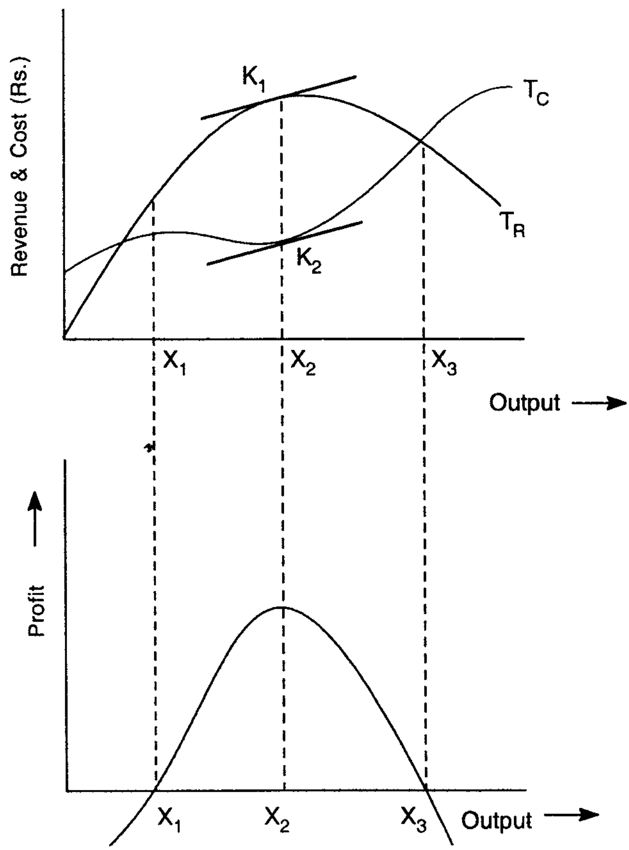


*Fig. 1. Theory of company or profit maximisation model.*

**Draw backs of Theory of Company :**

This traditional theory have been subjected to severse criticism, some of them are :

(i) It is not necessary that all the companies have same goal i.e. profit maximisation. They may have a goal of sales maximisation, expansion of market etc.

(ii) Most of the companies in present day, are not run by the owners or shareholders, but by the salaries managers, who interested generally differ from those of the owners. Assumption of one man company was correct in 19th century and not in this century.

(iii) Decision-makers cannot always take rational decisios, as he incomplete inforamtions i.e., he does not have perfect knowledge of all relevant variables.

(iv) In order to avoid competition, sometimes companies enter into agreements. ]n such case this theory cannot be applied Such agreements are common in automobile, aircrafts, soaps, detergents, chemical industries etc.

(v) In most fields, it has been observed that few large companies are generally dominating the market. In such cases small companies have to follow these large companies in fixing the price. In these circumstances how such companies can follow this theory?

(vi) Profit maximisation is done on the basis of cost figures, but if the cost figures are higher than those it should be due to inefficiency), then the result i.e. price fixation is bound to be incorrect.

(vii) Modern companies have departmental system of working, 'where each department is taking decisions related to them, these decisions may or not lead to overall optimisation of profit.

***Conclusion :*** Profit is not the only goal, it is usually dominant because survival of the company depends on it The business have multiple goals. Sometimes for survival, goodwill, security or growth sacrifices of short term profits have to be made. The businesses also must have their own objectives, decided to satisfy the needs of different groups like shareholders, managers, customers and employees, whose cooperation is necessary for the continued existence of the company.

**Managerial Theories of the Company :**

Since in modern large companies ownership lies with the shareholders, and control with the managers, the companies seems to behave so as to maximise managerial objectives rather than for profit to shareholders. Like theory of company, managerial theories are also optimising theories. Only difference is that theory of company maximises the profit, while managerial utility. Different managerial theories of the company view different utility functions. Some of the managerial theories are discussed hereunder :

*(1) Baumol's Sales Revenue Maximising Model :* According to this theory sales revenue is maximised, because financial institutions judge the health of a company in terms of rate of growth of its sales revenue. This also provides prestige to the top management and also to the company. The assumptions of this model are :

(a) Company's goal is the sales maximisation subject to minimum profit constraint.

(b) Price of product is constant.

(c) Production costs are independent of advertising.

*(2) Barle-Means-Galforaith Model of "Corporate Power Structure" :* While owners are interested in maximising profits, the managers are interested in fulfilling their own desires, needs and motivations. Since managers have a greater power on corporate policies, they are free to pursue their own goals. This theory is based on two propositions.

(a) Profits rates are higher in owner-controlled companies than it manager controlled companies.

(b) Professional corporate managers have no personal motivation to maximise profits. But it has generally been observed that this sweeping remarks are not correct.

*(3) O. Williamson's Model of "Managerial Discription" :* In this model, managers are free to pursue their own self-interest once they have achieved a level of profit that will pay satisfactory dividends to shareholders and still ensure growth.

**Behavioural Theories of Company :**

Unlike managerial theories, behavioural theories view company as engaged in non-maximising behaviour. According to these theories sub-optimal behaviour arised due to uncertainty and conflicting goals of various groups of the company like managers, supervisors, workers shareholders etc. Thus while management theories emphasise the role of the management, behavioural theories believe that groups within the company influence the behaviour of the company.

*(a) Simon's 'Satisfying' Model :* This theory believes that the relevant informations with the managers (decision-maker) are far from complete. The managers due to the complexity of calculations, uncertainties of future, and imperfection of the data to be used for determining 'optimal' decisions, can not take realy optimal decisions but he is satisfied with something less. Thus this model is termed as 'satisfying' model.

*(b) Cyert and March's Behavioural Theory :* This theory considers the company as a multigoal, multi decision organisational coalition. The coalition consists of various groups associated with the company *viz* : managers, workers, shareholders, supplies, customers, bankers etc. Each group has its own set of goals or demands. However, managers, workers and shareholders are the main groups who influences the maximum in the decision-making. Demands of each group are multiple and conflict with the demands of the other groups as well as overall goals of the organisation. Due to limited resources each group has priority of goals/demands but it results a sort of continuous state of conflict between different groups.

The goals of various group continuously change with the passage of time depending upon past achievements, changes in the environment. Here we are mentioning main goals of the company which are : production goal, sales goal, profit goal, market share goal, inventory goal. But as the number of goals of the company increases, the decision making process becomes increasingly complex and therefore quality of the decisions decreases.

□□□

# 7

# PRODUCTION THEORY

Production is an activity that creates utility or value. It includes any process which transforms input into outputs, thus, adding to the utility. This transformation can be changed in form *(i.e.* manufacturing), change in space *(i.e.* transportation), change in time *(i.e.* storage). Production theory is applicable not only to the manufacturing, distribution and storage of tangible of goods, but can also be applied to service activities. Thus, production is an activity that increases consumer usability of goods and services.

The decisions regarding production processed are related to the inputs or output, for solving various problems like : nature and extent of output inputs allocation to produce various outputs, allocation of funds, location of the production unit.

Production theory, though it can be applied to manufacturing, distribution, storage services, but we are considering here for manufacturing processes. Production function is purely a technical relationship which connects input factor and output factor, and is concerned with maximisation of the output with a given input combination, or minimisation of input quantities for a given level of output.

Production function is generally written in the form of equation,

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

where, Q is quantity of output, L is labour, and C is capital. Production function depicts the engineering relationship between the inputs and outputs.

In economic theory we are generally concerned with following three types of production functions:

(i) Production function with one variable input,

(ii) Production function with two variable inputs, and

(iii) Production function with all variable inputs.

**(1) Production Function with One Variable Input:**

Let us study a case where all inputs like plant, machinery, space etc. are fixed and only variable is labour. This follows the law of variable proportions, which states that, as more and more of one factor input is employed, all other input quantities are constant, a point will eventually we reached where additional quantities of varying input will yield diminishing marginal contributions to total product.

This law will be clear with the following example. Following table in Hcates variable input labour and production.

| *Number of labour units* | *Total Physical Product (TPP)* | *Average Physical Product (APP)* | *Marginal Physical Product (MPP)* |
|---|---|---|---|
| *1* | *2* | *3* | *4* |
| 1 | 10 | 10 | 10 |
| 2 | 21 | 10.5 | 11 |
| 3 | 33 | 11 | 12 |
| 4 | 43 | 10.75 | 10 |
| 5 | 52 | 10.4 | 9 |
| 6 | 60 | 10 | 8 |
| 7 | 67 | 9.6 | 7 |
| 8 | 72 | 9.5 | 5 |
| 9 | 75 | 8.3 | 3 |
| 10 | 76 | 7.6 | 1 |

From the table it may be noted from column 4 that the marginal physical product start declining from the 4th unit of labour. It is also seen that if the labour is employed more than 10 units, the M.P.P. (marginal physical product) will become zero and later on may turn to be negative. The stage from where the M.P.P. starts declining shows the law of diminishing returns, or the law of variable proportions.

***Stages of Production :*** If the figures of the above table are plotted on graph, shape as shown in following figure will be obtained.

This graph indicates that, the total output increases more than proportionately until $x$ units of labour are employed, while between $x$ and $y$ units of labour, total output though rises but with lesser rate, and beyond $y$ units of labour, the total output stans declining. The graph also indicates that, when TPP is rising at a diminishing

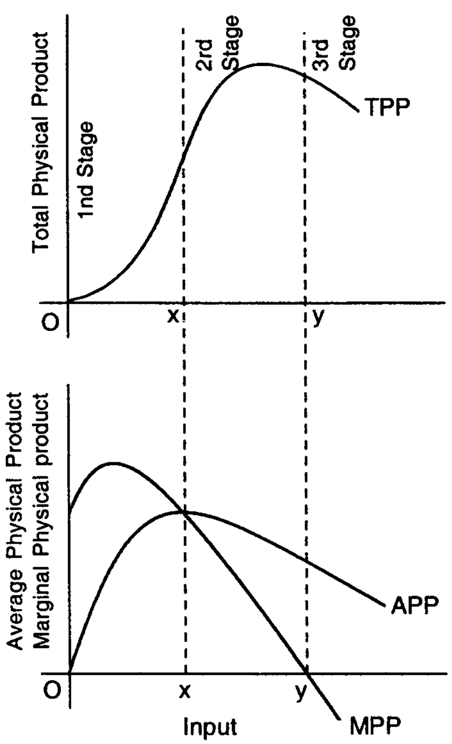


***Fig. 1 : Production Function : 3 Stages of production***

rate, the MPP and APP curves are declining. At *y* TPP is constant, MPP is zero. The three phases of TPP as shown in the graph are called the three stages of production.

From the above it is clear that, stage II is the only relevant range for a rational company in a competitive situation.

**(2) Production Function with two Variables :**

This is a case where company increases its output by using two increased inputs that are substitutes for each other say labour and? capital. Let us take a production function where we change only two mutually substitutable inputs keeping others as constant. This will be clear from the following example giving two variable inputs, and outputs in a tabular form :

| *Number of machines (capital)* ↓ | *Number of workers* → | *10* | *11* | *12* | *13* | *14* |
|---|---|---|---|---|---|---|
| 5 | Outputs | 100 | 104 | 108 | 112 | 118 |
| 4 | | 90 | 94 | 100 | 106 | 112 |
| 3 | | 80 | 84 | 90 | 96 | 100 |
| 2 | | 70 | 74 | 68 | 82 | 84 |

From above table, 100 units of output can be produced by either 5 machines and 10 workers, or 4 machines and 12 workers, or 3 machines and 14 workers. Similarly 90 units of output can be produced either by 4 machines and 10 workers, or 3 machines and 12 workers etc. Thus there are several technical possibilities for producing a given output by using different factor combinations. Selection of a particular factor combination depends upon both the technical possibilities of factors-substitution as well as on the prices of these factors of production.

*Isoquant :* Isoquant or isoproduct curve is a curve which shows the different combinations of the two inputs producing the same level of output. Following curves (Isoquants,) are drawn for above example :

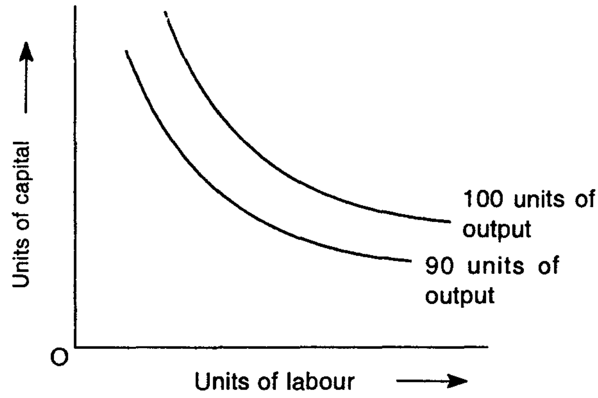


*Fig. 2 : Isoquants.*

There can be as many isoquants as the levels of output. The smooth con vex shaped (from 0 side) isoquant is assumed to have following properties:

(i) If one factor is used more, other is required in lesser quantity.

(ii) A higher isoquant represents larger output.

(iii) No two isoquants intersect or touch each other, Because it will mean that on common point same amount of labour and capital can produce the two levels of output, which is meaningless.

*Isocost Lines :* Isoquant lines indicate that any desired level of output can be produced by several combinations of inputs (represented by the points falling on the curve). Now our aim is to select one specific point. This point can be for attaining highest possible level of output for a given level of cost or the lowest possible cost for producing any given level of output. For this purpose isocost lines are drawn. For drawing the optimal combination company needs to know the prices of inputs. In other words to minimise production cost form should use more of the cheaper input and less of the costlier inputs.

Isocost line shows various combinations of the factor inputs that the company can buy with a given outlay and factor prices. Isocost lines are shown in the following fig. 3.

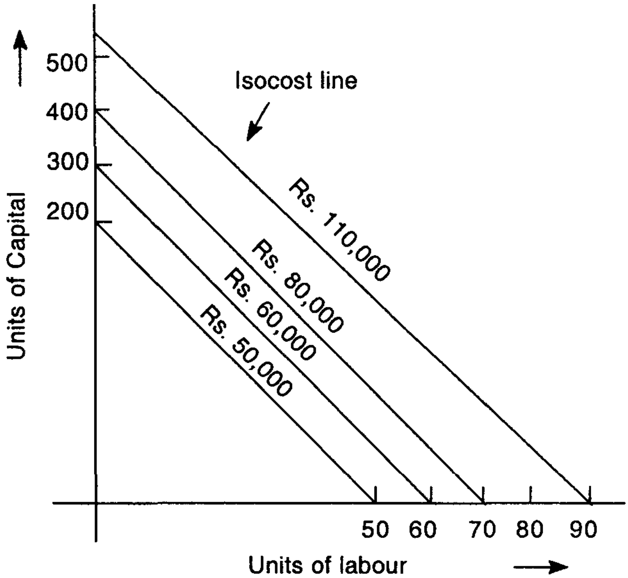


*Fig. 3 : Iscost lines.*

***Optimal Combination of Resources :*** Every company's objective is to optimise the combination of resources for its production. Let us analyse a graph shown in Fig. 2.

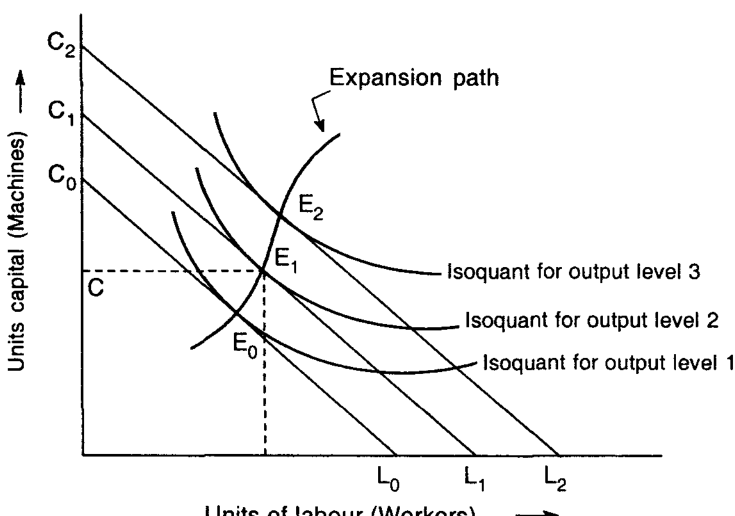


*Fig. 4 : Optimal combination of Resources*

Knowing the prices for machines and labour (two inputs) different isocost curves are drawn ($C_0 L_0$, $C_1L_1$, $C_2L_2$). To minimise the expenditure the company will like to produce desired level of output (say for output level 2), on the lowest possible isocost curve. In the Fig. 4 given output level is best produced at the cost represented by the isocost curve $C_1L_1$. Any expenditure below this point will not produce the desired output. Therefore, the optimal combination of inputs which minimises the cost for a given level of output is, L of labour and C of capital as given by equilibrium point $E_1$ in the figure.

*Expansion Path :* If a company wants to change its production it must follow the curve drawn by joining the equilibrium points for different level of output. The expansion path is indicated by $E_0E_1E_2$ curve shown in the figure.

**(3) Production Function with all Variable Inputs :**

Till now we have studied law of variables, where some of the inputs are held constant. Now we shall study the returns to scale, where all the inputs are changed in the same proportion.

In this case, behaviour of output is studied when all the inputs-change simultaneously in the same proportion (*i.e.* factor proportion is same). In such cases, following three situations are possible :

(a) Constant returns to scale. In this case output is also increase in the same proportion.

(b) Increasing returns to scale. In this case, proportionate increase in output is more than the proportion of increase in all inputs.

(c) Decreasing returns to scale. In this case, proportionate increase in output is less than the proportion of increase in all inputs.

*Empirical Production Functions :* Here we shall discuss the techniques by which the theoretical properties of the production function can be observed, empirically. The empirical production functions are drawn by statistical techniques using the past data about inputs and outputs. As we know that general form of production function, is $Q = f(C, L)$, where $Q$ is the quantity of output, L is labour, and C is capital. Using statistical techniques, one can hypothesise it in several alternative forms. Some of the important forms are discussed hereunder :

*(i) Simple Linear form of Production Function :* Simple linear form of production function is,

$$Q = \alpha C + \beta L$$

where per unit contribution of capital (C) is $\alpha$, and those of labour is $\beta$.

This form does rot hold good in certain, *i.e.* when either of the L or C is zero. As in this case production is not possible but this equation will still give the output value.

*(ii) Cobb-Douglas Production Function :* C.W. Cobb and P.H. Douglas developed this function, and its general form may be described as follows :

$$Q = A.L^{\alpha} . C^{\beta}.U$$

where, Q refers to output, L to labour and G to capital, while A and U are constant and disturbance terms respectively. The exponents $\alpha$ and $\beta$ are positive parameters. This function is subject to the condition that,

$$L > 0, C > 0, \alpha > 0, \text{and } \beta > 0$$

Here $(\alpha + \beta)$ represents the returns to scale. When $(\alpha + \beta) = 1$, the production function is constant returns to scale, if $(\alpha + \beta) > 1$, it is increasing returns to scale, and if $(\alpha + \beta) < 1$, it is decreasing returns to scale. But in Cobb-Douglas production function $(\alpha + \beta)$ is assumed as one.

Since this function is a multiple type and is non-linear, it can be transformed into a linear function by taking it in its logarithmic form. Therefore, this is also known as loglinear function, and is

$$\log Q = \log A + \alpha \log L + \beta \log C + \log U.$$

It is easier to compute this function in this form.

*(iii)* **Leontief (or Fixed Proportion) Production Function :** If an input is available in a quantity more than that required by this proportion, the additional quantity will be redundant, and when it

is available in lesser quantity than needed by the proportion, then other input will become redundant. This function, therefore has the following general form,

$$Q = \text{minimum}\left(\frac{C}{a}, \frac{L}{b}\right)$$

where, C and L refer to units of capital and labour respectively, a and b are constants. The word 'minimum' implies that output Q depends upon the smaller of the two ratios (given the bracket, *i.e.* C/a and L/b).

*(iv)* **Linear Programming Production Function :** Input use and the resulting outputs generally vary in a discrete way. This function can be represented the linear programming function in following general form :

$$\text{Maximise } Q = a_1Q_1 + a_2Q_2 + a_3Q_3 \ldots\ldots a_nQ_n$$

subject to budget constraints and certain input and capacity constraints, depending upon their availability with the company. Here in this function, $Q_1, Q_2 \ldots\ldots Q_n$ are the various outputs, and $a_1$, $a_2 \ldots\ldots a_n$ are constants.

### Theory of Cost

Production decisions are not possible without the cost considerations. Since the production resources are scarce with any company and also the resources have alternative uses, therefore these involves cost, and which needs to be analysed. With this idea, costs affecting production decisions are being discussed here.

***Costs in the Short-Run :*** Once the money is invested in land, building, machinery and other fixed assets, their amount can not be changed in short-run and is called fixed inputs. While there are other resources whose quantities used can be changed at any moment with output change, these are called as variable inputs. The sum of the costs of fixed inputs is known as 'total fixed cost' and the sum of the costs of variable inputs is known as 'total variable cost'. The sum of both the total fixed cost as well as total variable cost is Total Cost.

***Costs in the Long-Run :*** In the long run, all the factors are variable and the owner has a number of alternative plant sizes and levels of output which he can adopt. Thus, the owner can plan for future expansion of his output.

***Economies of Scale :*** Economies of scale means gains due to increasing the plant size or due to improvement in the environment in which the company is working. Economies of scale is of two kinds, namely, Internal economies of scale (gains due to increased plant size), and External economies of scale (gains due to change in outside the environment).

**Internal Economies :**

*(a)* ***Production Economies :*** These arise due to labour, technical, and inventory requirements of the company.

*(i)* ***Labour Economies :*** These may be :

— Division of labour economies, and

— Cumulative effect on the skills.

*(ii)* ***Technical Economies :*** These includes :

— Specialisation of capital equipment.

— Production can be increased for better capacity utilisation of the same machine, and there is no need for purchasing another machine for increasing the output bill it is used for full capacity.

— Economies of large machines, *i.e.* faster rate of production, hence over heads will be reduced.

*(iii)* **Inventory Economies :** Inventory maintained by the company will enable to increase production at any time.

*(b)* ***Marketing Economies :*** Economies related with the marketing activity are :

(i) Economies on advertising and other selling activities.

(ii) Economies due to exclusive dealers with after sales service-facilities.

(iii) Economies due to more varieties and designs.

(c) ***Managerial Economies :*** These are mainly :

(i) Specialisation of management.

(ii) Modern managerial and organisational techniques can be adopted.

(d) ***Transport and Storage Economies of Scale :*** Better and economical means of transport facilities and storage facilities.

(e) ***Other Economies :*** Due to large size, company can be get more discount on purchases, advertising etc.

**External Economies :**

With the expansion of an industry, environment may also change. This may lead to the following :

(i) Other companies may come upto supply raw materials etc. at cheaper rates.

(ii) Research can be taken up, jointly with other industries in the area.

(iii) Specialised company may come upto help in starting manufacture of a by-product and utilise waste material.

***Diseconomies of Scales :*** Beyond a certain limit expansion may result in reduction in gain, (known as diseconomies), and cause average cost of production to start rising. It may be due to following reasons :

(i) Problem of morale and motivation of both the management and labour force.

(ii) Communication problems.

**Cost Function :**

Cost function expresses the relation of cost with its determinants like plant size, level of output, input cost, technology, managerial efficiency etc. In mathematical form it can be written as follows :

$$C = f(S, Q, P, T, E......)$$

where C = Cost

S = Size pi ant

Q = level of output

P = Prices of inputs used for productions

T = Type of technology used

E = Managerial efficiency.

Cost function can be determined with the help of either accounting method, or engineering method, or statistical method.

*(i) Accounting Method :* In this method, the data is classified into various cost categories, and then observations of cost are taken at the extreme and various intermediate output levels. Then the output levels and the corresponding costs are then plotted on a graph. The cost functions are estimated considering the curve formed. These cost functions may be linear or non-linear.

*(ii) Engineering Method :* In this method, cost functions are estimated on the basis of physical relationships such as weight of supplies and materials used in the production process, rated capacity of the machinery etc. Physical relationship of production is then converted to money to determine the estimate of costs.

*(iii) Statistical Method :* In this method, statistical technique is used on economic data to find the nature of cost output relationship. This data may relate to the past data of the company or of the other companies engaged in the same business working under similar circumstances.

All the three methods discussed above are complementary to each other.

***Forms of Cost Function :*** If cost function is selected rightly, It is useful for practical applications. Total cost functions are of following forms :

**(i) Linear Total Cost Function :** A linear cost function is,

$T_c = a + 60$

where, $T_c$ = Total cost

Q = Output level

a = Fixed cost

b = Marginal rate of change in cost when output changes.

A linear cost function has a shape as shown in Fig. 5.

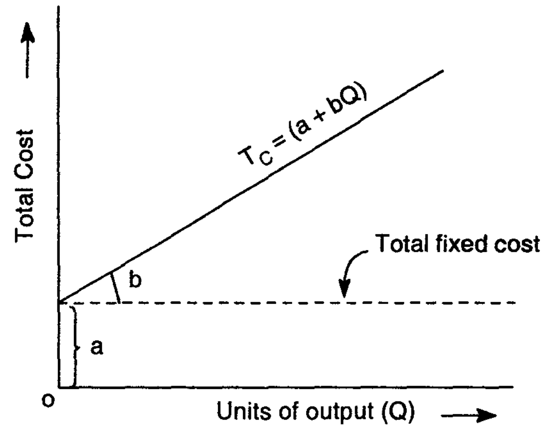


*Fig. 5 : Linear total cost function.*

In this case, average total cost

$$T_{ac} = \frac{T_c}{Q} = \frac{a}{Q} + b$$

and, Marginal cost,

$$M_c = \frac{d(T_c)}{dQ} = b$$

(ii) Quadratic Total Cost Function : A quadratic total cost function can be written as,

$$T_c = a + bQ + cQ^2$$

Therefore, average total cost

$$T_{ac} = \frac{a}{Q} + b + cQ$$

Average fixed cost

$$T_{ac} = \frac{a}{Q}$$

Average variable cost

$$V_{ac} = b + cQ$$

and $$M_c = \frac{d(T_c)}{dQ} = b + 2cQ.$$

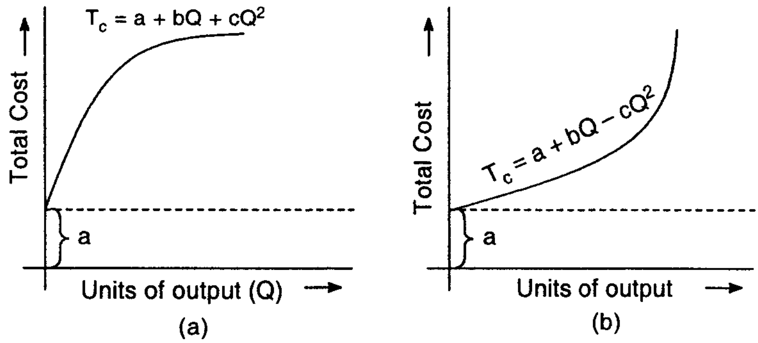


***Fig. 6 : Quadratic total cost function.***

A quadratic total cost function Tc = a + bQ + cQ$^2$ is of the shape similar to shown in Fig. 5, while that of Tc = a+6Q–cQ$^2$ is as shown in Fig. 6.

Here, average total cost

$$T_{ac} = \frac{a}{Q} + b + cQ$$

Average variable cost

$$V_{ac} = b - cQ$$

and Marginal cost $\quad = M_c = b - 2cQ$

***Example :*** A quadratic total cost function is

$T_c = 1000 + 40Q + 0.2Q^2$ where output level Q = 50. Determine $T_{ac}$, $M_c$, $F_{ac}$ and $V_{ac}$.

***Solution :*** Putting the value of output level in the given equation,

$$T_c = 1000 + 40(50) + 0.2(50)^2 = 3500.$$

$$T_{ac} = \frac{T_c}{Q} = \frac{3500}{50} = 70.$$

$$M_c = b + 2cQ = 40 + 2(0.2)(50) = 60.$$

$$F_c = \frac{a}{Q} = \frac{1000}{50} = 20\,.$$

$$V_{ac} = b + cQ = 40 + (0.2)(50) = 50.$$

□□□

# 8

# CONSUMER BEHAVIOUR

In formal economic theory of demand, the decision-making unit is the household. The demand pattern of the household is studied by the theory of consumer behaviour. In real world, the household need not be the only consumer. The business organisation and the government are equally important consumers; they also buy things as the household does. Thus, in the context of managerial economics, the demand decision making unit has a wider coverage.

Demand decisions are important for management in a number of ways. The nature of demand reflects the extent of the market. For a business organisation which is basically a production-cum-sale unit, demand analysis helps sales-forecasting and profit-planning. The study of demand behaviour also helps management in deciding a new product policy, advertisement policy, further research and development strategy, sales reorganisation and the like.

The concept of demand decision has reference to the buyer's willingness to pay, backed up by the ability to pay for goods or services. In economic sense, output is a bundle of utilities. The output of either goods or services or both renders satisfaction to its consumer. It is because of this utility value that the consumer is willing to pay for it. However, a mere desire to pay does not constitute a demand. The ability to pay is important as well. Payment is a sacrifice which must match the satisfaction of the consumer, when he buys any output. Demand decision is a decision to purchase on item X, because X has utility, scarcity and transferability in a market.

In analysing the demand for goods, certain conceptual distinctions are very helpful. Goods which are demanded can be classified at various levels and on different standards. These are :

*(i) **Consumers' Goods and Producers' Goods :*** The goods such as bread and butter, clothes and houses which when used, render direct satisfaction to their consumers are called consumers' goods. The goods such as machine and raw cotton, which are used for the production of other goods are called producers' goods. Both consumer-goods and producer-goods can be classified as 'single-use', or durable-use'. The goods which are used once for all are single-use goods, but the goods which can be used more than once are durable-use goods. A loaf of bread is a single-use consumer-goods. Cotton yarn used to make cloth is a single-use producer-goods. Machines are normally durable-use producer goods. A car is a durable-use consumer goods. Consumer durables like car and TV are often consumed by several members of the family so much so that family needs and family structure are important determinants of their demand. Certain consumer durables require the existence of special facilities for their use; e.g., the use of TV requires the prior establishment of telecasting stations. On the other hand, the demand for producer durables has also certain distinctive characteristics. Their demand mostly depends on the kind of business activity and business profits, their demand is less susceptible to "pressure advertising". A final point to note is that this distinction between consumers' goods and producers' goods is arbitrary. Whether a particular commodity is a consumer-goods or a producer-goods would depend on who buys it and why. Sugar is a consumer goods for a household, but it is a producer goods for a confectioner.

***(ii) Durable Goods and Non-durable Goods :*** This distinction is drawn almost on similar lines as between single-use and durable-use goods. Non-durable goods mostly meet current demand. Durable goods may be used to replace old stock and to expand new stock. Replacement demand depends on the rate and mode of depreciation The more important determinant of replacement demand is obsolescence due to technological innovations. The expansion demand depend on business conditions' present and future. The demand for non-durable goods depends on current conditions such as fashions, income and price expectations.

*(iii) Derived Demand and Direct Demand :* When the demand for an output is associated with the demand for another output, it is called "derived or induced demand". For example, the demand for cement is derived from the demand for construction activity. The demand for cotton yarn is derived from the demand for cotton cloth. The demand for factors of production like land, labour, capital and management is dependent on the demand for output of goods and services which are produced by these factors. The demand for factors of production is, therefore, a case of derived demand. When the demand for an output of goods and services is independent of the demand for other products, it is called "director autonomous demand". For example, the demand for cotton cloth is autonomous (direct), though the demand for cotton yarn is induced (derived) one. This distinction is, of course, not very distinct. Much would depend on the available relatedness or linkage or output effects. For example, the demand for cotton cloth itself may be 'derived' one, when we have the demand for cotton shirts as the 'direct' demand.

*(iv) Industry Demand and Company Demand :* Industry demand has reference to the total demand for the products of a particular industry, e.g., the demand for textiles. Company demand has reference to the demand for the product of a particular company which is a part of that industry, e.g. the demand for textiles produced by the DCM. The company demand may be expressed as a percentage of industry demand^ The percentage so calculated would indicate the market share of the company The market-share of the company normally depends on the nature of competition and the market structure. Under monopoly where a single firm constitutes the industry, company-demand and industry-demand will be same. Under non-monopoly situation, the market share will depend on factors like price spread (i.e. the difference between the price charged by one company and the price charged by another company), product improvement, promotional expenditure like advertisement, and governmental interference like protection The study of industry demand is an useful guide to the analysis and forecasting of company demand,

*(v) Individual Demand and Market Demand :* As a distinction is drawn between the industry demand and company demand from

the standpoint of producers, similarly a distinction may be drawn between individual demand and market demand from the standpoint of the consumers. An individual demand refers to the demand for a product by a single consumer, but market demand refers to the total demand for a product by all consumers who purchase that product. Market demand is the aggregate of individual demands. A product may be in demand in the market though an individual may or may not have a demand for the product. Under the case of monopsony where there is .a single buyer only, individual demand and market demand coincides. Market demand reflects the nature of competition and the form of market structure. Market demand provides useful guidance to management in deciding its market strategy and other economic and commercial policies.

***(vi) Total-Market-Demand and Market-Segment Demand :*** Demand for a product can be studied in its aggregate or in its parts by breaking the total demand into different segments on the basis of geographical areas, price sensitivities, sub-product, product uses, distribution channels, customers' size, sex etc. Problems such as sales forecasting calls for an analysis of total market demand, but problem such as pricing, delivery and promotion require analysis of market segments Market segments may differ significantly in respect of delivery prices, delivery quotas, profit margins, seasonal patterns, cyclical sensitivities and market competition. Management may have to follow different sets of policies for different market segments, say, home market and foreign market or say, wholesale market and retail market.

***(vii) Short-run Demand and Long-run Demand :*** Short-run demand refers to the existing demand with its immediate reaction to price changes, income changes, etc. Long-run demand is that demand which will ultimately exist as a result of adjustments following changes in pricing, product improvement, promotional strategies, consumption pattern etc. From the standpoint of management decision-making it is important to consider not only the short-run fluctuations in demand but also the long-run trend in demand. Short-run tendencies in demand tend to average out over long-run trend. Demand forecasting is normally based on long-run trends.

The point remains, there are many distinctions involved in demand analysis. The relevant demand distinction has to be picked up depending upon analytical purpose and convenience.

**Determinants of Demand :**

The demand for a product or a service depends on a host of factors. Some factors are specific to specific product or service-market. The importance of these factors may also vary over-time and over-space. However, there are certain factors which are common for all demands.

*(i) Price of Goods Demanded :* Price-demand relationship is a complex one. Price reflects demand. Excess demand may push up prices. Prices direct demand behaviour of the buyers. Thus price is the symptom, effect as well as the cause of demand. In the economic Law of Demand, we elaborate on the causal relationship. Price is treated as the determinant of demand. The Law of Demand states : higher the price, lower is the demand, and vice versa, 'other thing remaining the same'. That is, when we assume away the role of non price factors, then price is a very important determinant of demand. Price and demand move in the opposite direction. As price goes up, demand contracts; as price comes down, demand extends. This contraction and extension of demand following a price movement upward and downward is depicted through a downward falling demand curve. The negative slope indicates the inverse relationship between price and demand. The cardinal implications of a demand curve are stated in terms of a demand schedule.

***Table 1 : Demand Schedule***

| *Price of X per unit (Rs.)* | *Quantity of X demanded (Units)* |
|---|---|
| 1.00 | 300 |
| 2.00 | 200 |
| 3.00 | 120 |
| 3.25 | 100 |

Note that in terms of both schedule and curve as drawn below, as the price of X goes up from Rs. 1.00 per unit to Rs. 3 00 per unit, the demand for X contracts from 300 to 125 units; but as the price comes down from Rs. 3.00 to Rs. 200, the demand for X extends from 125 to 200. This a very typical demand behaviour in any commodity or factor market For example, if higher deposit rates are paid by banks, lower will be demand for money (i.e., the desire to hold liquid cash in hand) in the capital market. If wage rates come down, the employer will go for labour-intensive techniques and, therefore, will demand more labourers from the labour market. If vegetable prices go up, the housewives tend to economies on the preparation of vegetables. Such examples can be multiplied.

The question is : Why does it happen? What is the explanation of such demand behaviour? Why does the demand curve slope downward? In formal economic theory, different approaches or analyses are put forward as explanation :

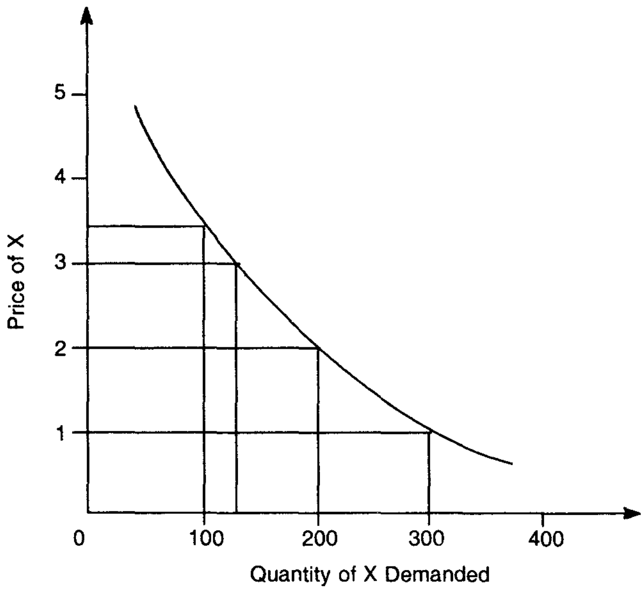


*Fig. 1*

***(a) Marginal Utility Approach :*** Under this traditional utility analysis, the following assumptions and propositions are made :

1. Utility, the want satisfying capacity is cardinally measurable. Numbers can be used to quantify the level of utility derived from any act of consumption.

2. In order that utility is measured, the measuring rod must be held constant. Hence, the assumption, marginal utility of money remains constant. It follows that the level of utility can be expressed in terms of money equivalent.

3. Utility is 'independent', i.e., the utility of X depends on the stock of X alone; utility of X is independent of the stock of other commodities like Y and Z. This means that relatedness of goods—substitutability and complementarily—is assumed away.

4. The marginal utility of the commodity X consumed falls steadily, as the successive units of X are consumed. More we have of a thing, the less we want to have more of it. So as consumption increases, total utility derived increases at a diminishing rate. This is the Principle of Diminishing Marginal Utility.

5. Marginal utility of money spent is the ratio of the marginal utility of the commodity to the price per unit of the commodity. In order that the marginal utility of money remains constant, the marginal utility of the commodity and the price per unit of the commodity must move in same direction and same proportion. This is quite logical. If the marginal utility of X is larger than the unit price of X, the consumer gains by increasing the consumption of X; if the marginal utility of X is less than the unit price of X, the consumer gains by reducing the consumption of X. Thus ultimately at the point of consumers' equilibrium when attained he has no desire to either increase or reduce the consumption of X. The marginal utility of X and unit price of X, both expressed in terms of money must be equal. If we consider the multi-commodity consumer who equates marginal utility and price separately for each commodity, then the equilibrium condition works out to be the one of proportionality between marginal utilities and prices.

At equilibrium,

$$Mu_x = P_x \tag{i}$$

$$Mu_y = P_y \tag{ii}$$

$$\frac{Mu_x}{Mu_y} = \frac{P_x}{P_y} \tag{iii}$$

Then by cross multiplying, we get

$$Mu_x.P_y = Mu_y.P_y \quad \text{(iv)}$$

or $$\frac{Mu_x}{P_x} = \frac{Mu_y}{P_y} \quad \text{(v)}$$

and note, by definition,

$$\frac{Mu_x}{P_x} = \frac{Mu_y}{P_y} = \text{MU, which is constant} \quad \text{(vi)}$$

Where

Mum = Marginal utility of money,

$Mu_x$, $Mu_y$ = Marginal utility of X and Y respectively,

$P_x$, $P_y$ = Unit price of X and unit price of Y respectively.

The proportionality rule stated in (v) is the tenet of the Law of Consumer Equilibrium. Note that the assumption of the diminishing marginal utility and the proportionality rule when considered along with the equi-marginal concept imply that a single price prevails for a commodity in the market. This is true of a perfectly competitive market.

6. If utilities are measurable, then they must be comparable also. Comparison follows measurement. Therefore, it may be assumed that the interpersonal comparison of utility is possible. The transfer of a consumption item, Z, from a rich man who has more of Z, to a poor man who has less of Z, is a step towards maximizing the total utility derived form the consumption of Z. Herein .lies the argument for progressive taxation.

The law of demand is explained mainly in terms of assumptions (2) (4), and (5). As the price of X goes up in order that the marginal utility of money remains constant, the marginal utility of X must go up in the same proportion. But the marginal utility of X can go up only when the successive consumption of X is reduced, i.e., the demand for X contracts. Thus, with the rise in the price of X, the demand for X contracts, and vice-versa— the demand for X extends, when the price of X falls. This normal demand behaviour follows from costancy of marginal utility of money spent, diminishing marginal utility and proportionality rule i.e., equi-marginatism.

□□□

# 9

# INDIFFERENCE CURVES APPROACH

Indifference curves-analysis of demand behaviour of consumer is based on the following important assumptions:

1. *Utility is Ordinally Measurable* : Scale of preference can be drawn and ordered, but it need not be quantified. What is important for analysing the consumer behaviour pattern is the assumption that the situation A is chosen, because A offers more utility than B, we need not know by how much A is preferred to B.

2. *Utility is 'depedent'* : The utility of X depends not only on the stock of X, but also on the availability of Y and Z to which X may be related. In other words, the cases of substitutablity and complementarity of consumable items must be considerd.

3. Availability of resources at the disposal of consumer is limited so that the question of choice arises. Since the consumer is a multi-commodity consumer, he chooses between different combinations of consumable items. Resource scarcity is such that if he chooses more of X, he has to choose less of Y in the given combination of X and Y or if he chooses more of Y, he has to be satisfied with less of X in a given combination; he cannot get both more of X and more of Y at the same time. As he substitutes X for Y (or Y for X), the rate at which the substitution takes place diminishes. This assumption of diminishing marginal rate of substitution follows from the principle of diminishing marginal utility.

Using these assumptions, we may come across a consumer whose scale of preference is revealed as follows :

| ***Combination*** | ***Units of consumable items*** | |
|---|---|---|
| | ***X*** | ***Y*** |
| I | 1 | 4 |
| II | 3 | 2 |
| III | 4 | 1½ |
| IV | 5 | 1 |

Note that the consumer is consuming both of the items X and Y. As he moves from combination I to combination II, the rate of substitution between X and Y is 2 : 2 (i.e., 1 : 1) as he moves from combination II to III. this rate becomes 1 : ½. These combination are plotted in the diagram below at Curve 1.

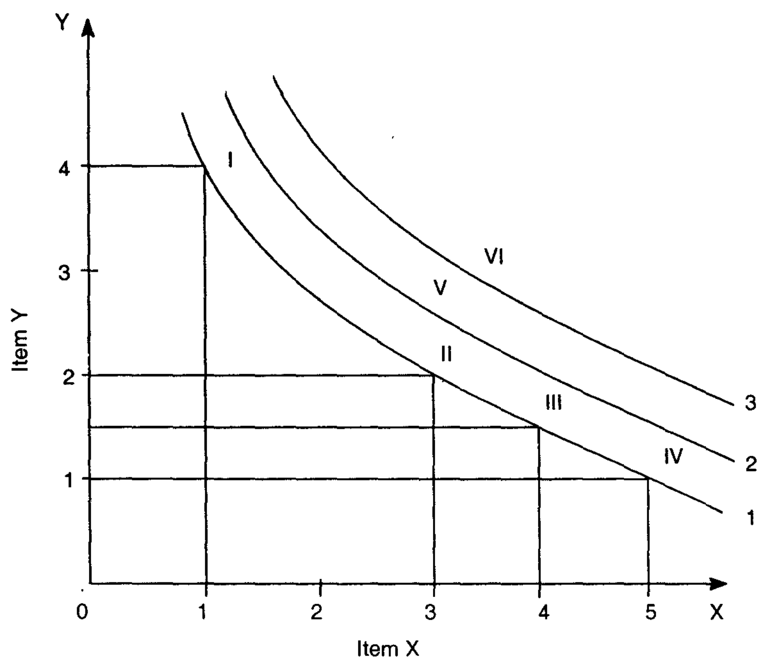


*Fig. 1*

A: this stage we make a very important assumption that these are equally preferable combinations, different combinations yield the same level of satisfaction so that the consumer can afford to become indifferent to choice. With the given resources, he can choose any combination at random. The curve which is a collection of such equally-preferable combinations is called the Indifference Curve.

The Fig. 1 which is collection of such indifference curves, is called the Indifference Map. One indifference curve denotes one level of utility, the highest Indifference curve denotes the highest level of satisfaction. In other words, the combination I may be equally preferable to II, III or IV, but the combination V is definitely preferred to either I or II or III or IV; and the combination VI is definitely preferred to V, and so VI is definitely preferred to I through IV. As such, our consumer will be interested in getting on to the highest curve, if possible. The possibility depends on the real purchasing capacity of the consumer.

The real purchasing capacity depends on the (a) nominal value of the available resources at the disposal of consumer and (b) the price level. Suppose that our consumer has Rs. 120 at his disposal and that X is selling at Rs. 10 per unit, and that Y is selling at Rs. 12 per unit.

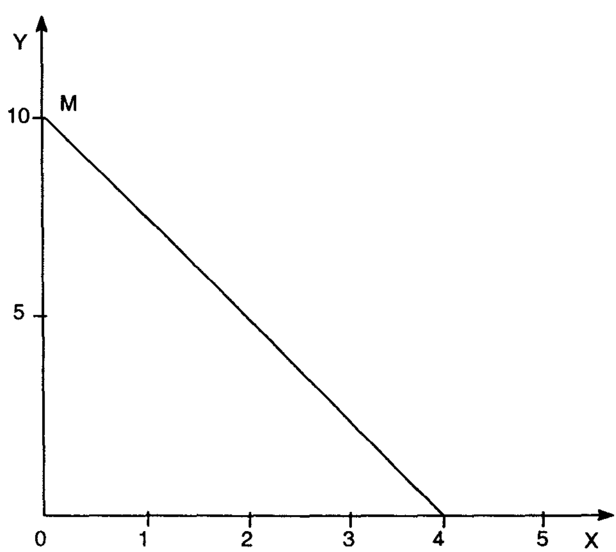


*Fig. 2*

In this case our consumer can buy either 12X and no-Y or 10Y and no-X. In other words, his real budget position puts a constraint such that he can buy any combination of X and Y which does not involve any excess of 12 X or of 10Y. This budget constraint is illustrated by the budget line or price line ML in the Fig. 2.

The consumer cannot move beyond this line. Actually the consumer, while deciding on his choice, has to adjust his scale of preferences with the budget posUion. Let us study its adjustment by superimposing the Fig. 1 on Fig. 2 as in Fig. 3. The combination D is beyond the reach of our consumer. His budget does not permit it, though the consumer's scale of preference indicates that curve. 3 (i.e., any combination on that) is the mostprefered level of satisfaction The combination A and B, being on curve 1 are equally preferred and within budget. But, by moving along the same budget line, the consumer can get on to a point C, on a higher Indifference curve. The combination C is equally preferable to combinations E and F, but while E and F are beyond the budget, C is not. Taking a stock of the situation, we find that D is desirable but not possible. A or B is possible but not desirable, the combination C is possible as well as desirable under the available circumstances. Hence, our consumer decides to purchase the combination given by C. At this point of equilibrium C, the price line is touching the Indifference line

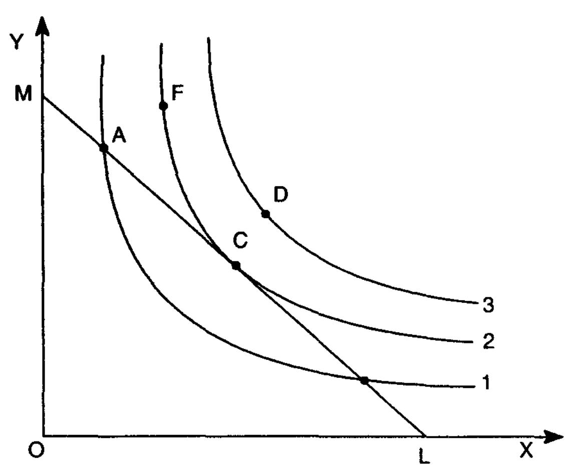


*Fig. 3*

tangentially meaning that their slopes are equal. What do these slopes indicate? The slope of the Indifference Curve indicates the marginal rate of substitution between X and Y; and the slope of the Price line indicates the ratio of price of X to that of Y. Thus the principle of consumer.s' equilibrium works out : the marginal rate of substitution between X and Y most be proportional to the ratio of price of X to that of Y.

$$MRSxy = \frac{P_x}{P_y}$$

In order to see the implications of the above proportionality condition, let us derive it a little more rigorously.

While considering the Indifference Curve, we are assuming our utility function to be :

$$U = u(x, y) = c$$

where c is constant, because the Indifference Curve by definition is an iso-utility curve. Taking the total differential of the function. We obtain :

$$dU = \frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy = 0$$

Now solving for $\frac{dy}{dx}$, the slope of the difference curve we find that :

$$-\frac{\partial u / \partial x}{\partial u / \partial y} = MRS_{xy}$$

In our older terminology $\partial u/\partial x$ and $\partial u/\partial y$ are respectively marginal utility of X and marginal utility of Y. Thus the marginal rate of substitution between X and Y turns out to be the ratio of marginal utility of X and Y. Also note that because of the assumption of the diminishing marginal rate of substitution, we are getting the negative slope of the Indifference curve $\left(-\frac{dy}{dx}\right)$.

Coming to the price line, we assume that our consumer has a fixed money income B and he faces the market determined prices $P_x$

and $P_y$ of X and Y respectively. Thus the amount spent on X (i.e., x. $P_x$) plus the amount spent on Y (i.e., y. $P_y$) must not exceed the stipulated money income $\overline{B}$ .

$$\overline{B} = x.P_x + y.P_y$$

Considering the equality

$\overline{B} = x.P_x + y.P_y$, we get

$$y = \frac{1}{P_y}\overline{B} - \frac{P_x}{P_y}x$$

$$\text{or,}\quad x = \frac{1}{P_x}\overline{B} - \frac{P_y}{P_x}y$$

The first term on the right hand side of (xii), $\frac{1}{P_y}\overline{B}$ is the ordinate intercept. It shows the amount of Y that can be purchased if X is not bought at all. This is represented by the distance OM in Fig 4. The term, $\frac{P_x}{P_y}$ in it is the slope of the Price line. Consequently, the slope of the line is the negative price ratio. Also consider the quantity of X that can be purchased if Y is not bought. This amount is $\frac{1}{P_x}\overline{B}$ shown by the distance OL in Fig. 4. The price line has a negative slope, its slope is given by :

$$\frac{OM}{OL} = -\frac{\frac{1}{P_y}\overline{B}}{\frac{1}{P_x}\overline{B}} = -\frac{P_x}{P_y}$$

The indifference curve shows the substitution ratio between X and Y; and the Price line shows the Price ratio. The condition of consumers, equilibrium is the equality between these two rates. These conditions can now be derived.

The problem before our consumer is to maximise satisfaction as embodied in the utility (or preference) function U=u (x, y) subject to the constraint imposed by the budget equation $\overline{B} = x.P_x + y.P_y$. Here is a simple Lagrangean Extremum problem. Construct the Lagrangean Function,

$$F=u(x, y) - \lambda(x.P_x + y.P_y - \overline{B})$$

Where $\lambda$ is the lagrangean multiplier. The first order conditions require both partial derivatives to equal zero.

$$= \frac{\partial F}{\partial x}\left(\frac{\partial u}{\partial x} - \lambda P_x\right) = 0$$

$$= \frac{\partial F}{\partial y}\left(\frac{\partial u}{\partial y} - \lambda P_y\right) = 0$$

Transforming the second term to the right hand side in each equation and dividing the first equation by the second, one obtain

$$= \frac{\frac{\partial u}{\partial x}}{\frac{\partial u}{\partial y}} = \frac{P_x}{P_y}$$

Earlier we have derived in (x)

$$= \frac{\frac{\partial u}{\partial x}}{\frac{\partial u}{\partial y}} = \frac{dy}{dx} = MRS_{xy}$$

Thus we get the equilibrium condition from (xvii) and (x)

$$= \frac{\frac{\partial u}{\partial x}}{\frac{\partial u}{\partial y}} = \frac{dy}{dx} = \frac{P_x}{P_y}$$

The second-order stability conditions for a maximum require

$$\left[\frac{\partial u^2}{\partial x^2} + 2\frac{\partial^2 u}{\partial x \partial y}\left(-\frac{P_x}{P_y}\right) - \frac{\partial^2 u}{\partial y^2}\left(-\frac{P_x}{P_y}\right)^2\right] < 0$$

Multiply (xix) by $Py^2$ to get

$$\left[\frac{\partial^2 u}{\partial x^2}P_y{}^2 + 2\frac{\partial^2 u}{\partial x \partial y}P_x P_y - \frac{\partial^2 u}{\partial y^2}Px^2\right] < 0$$

Our consumer obtains a true stable equilibrium only when he satisfies both equations. For simplicity, we shall confine ourselves only to the equilibrium condition. It is right from this equilibrium condition that the demand behaviour of the consumer can be derived. Let us take an example.

Suppose, a Purchase-Manager has Rs, 8,000 available to be divided between two materials $M_1$ and $M_2$. Also suppose that the $P_2$, unit price of material $M_2$ is fixed by the government at Rs. 2 and that the preference function of the manager has been set by the firm where he is employed, as $F=3 \log M_1+9 \log M_2$. This preference function is arrived at by considering so many factors like the production requirement of the firm, market potential of the firm's product, the price and quality of the available materials etc.

From the equilibrium condition (xviii) and the available information above, we get :

$$= \left[\frac{\frac{\partial F}{\partial M_1}}{\frac{\partial F}{\partial M_2}} = \frac{\frac{3}{M_1}}{\frac{9}{M_2}}\right] = \left[\frac{P_1}{P_2} = \frac{P_1}{2}\right]$$

or $M2 = \frac{3}{2} M_1 P_1$

Substituting this value of $M_2$ and $P_2$ in to the budget constraint,

$$\bar{B} = M_1P_1 + M_2P_2$$

$$\begin{aligned} \text{or} \quad 8000 &= M_1P_1 + (\tfrac{3}{2} M_1P_1.2) \\ &= M_1P_1 + 3M_1P_1 \\ &= 4M_1P_1 \end{aligned}$$

or $M_1P_1 = 2000$

$$\text{or} \quad M_1 = \frac{2000}{P_1} = P_1 = \frac{2000}{M_1}$$

We have got our desired demand equation, $M_1$ in terms of $P_1$ i.e., $M_1=f(P_1)$ or $P_1$ in terms of $M_1$, i.e., $P_1=g(M_1)$. Now we may raise the question : Can we derive the demand function for $M_1$? Say how much materials $M_1$ will be demanded if the government fixes $P_1$ the price of $M_1$ at Rs. 5 per unit? If the government fixes $P_1$ at Rs. 5 per unit then $M_1 = \frac{2000}{5} = 400$ units of m1 will be purchased by our manager. Alternatively, had the govt. fixed the material quota such that the firm can purchase only 400 units of $M_1$ then the manager would be wise to offer a price.

$$P_1 = \frac{2000}{400} = \text{Rs. 5 per unit of } M_1$$

The point remains, from the solution of the problem, either $P_1$ can be found given $M_1$ or $M_1$ can be found given $P_1$. Also note that if the government raises the price $P_1$ upward from Rs. 5 to Rs. 10 per unit, the amount of m1 purchased will at once contract from 400 units to 200 units. We are back to the typical normal demand behaviour of any purchaser. Thus we derive the law of demand from the condition of consumer's equilbeium.

What we have done in terms of the Differential Calculus method can be demonstrated in terms of Fig. 5 as well. Let us recall that the consumer's equilibrium point is given by the tangency between the Price line and Indifference curve at point C. If the price of X falls the new Price line becomes M–L′, as more of X can be brought out of a given budget and accordingly the new equibrium point is attained at C′ on Indifference curve 2. If the price of X falls again, the price of Y and the budget remaining the same, the new equilibrium point shifts to C″ which is the point of tangency between the price line M–L″ and the Indifference curve 3. The line connecting such successive equilibrium points as C, C′ and C″ is called the price-consumption-curve (PCC) in Fig. 4.

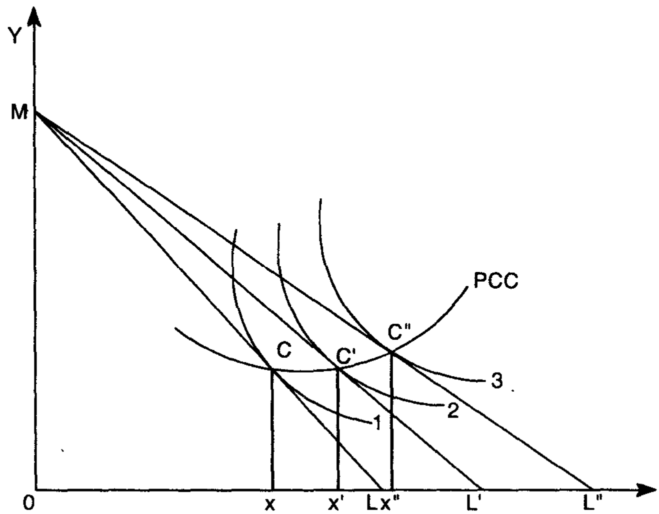


*Fig. 4*

The individual consumer demand curve for the commodity X can be derived from this price consumption curve. For example, when the price of X is given by the slope of ML, the amount of X demanded is OX; similarly when the price of X is given by the slope of ML′. OX′ amount of X is purchased; and OX″ is purchased at a price of X denoted by the of ML″. Thus the price consumption

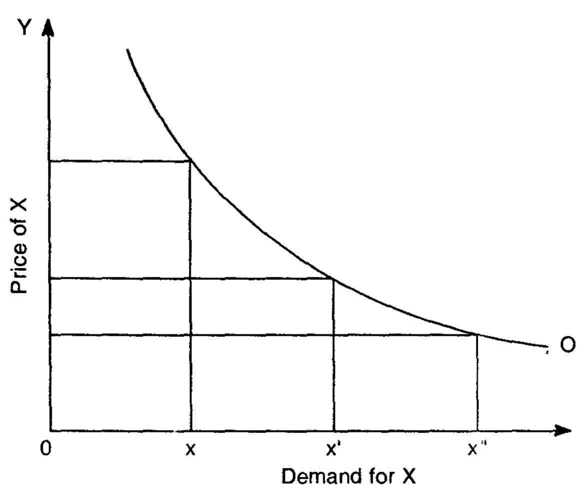


*Fig. 5*

relations when taken out of Fig. 4 and plotted separately in Fig 5 give us the demand curve, D.

**Income of the Consumer:**

When the price of the commodity X changes, the real income position of the consumer also changes and this has considerable effects on the consumer's demand. The traditional Marginal Utility Analysis ignored this income effect by the assumption of constant marginal utility of money spent. The Indifference Analysis considers this income effect, because it is a very important determinant of demand.

In considering the income-demand relationship, let us assume that prices remain unchanged, i.e., the price-ratio (the slope of the Price line) remains the same. In this case, if the consumer's money income increases, then the Price line shifts rightward from M L to M'L' and hence new equilibrium point C at which the consumer ends up buying more of both X and Y On the other hand if the income of the purchaser is reduced, prices being unchanged, the Price line will shift downward and leftward, from M'L' to ML and thus our purchaser will end up buying less of both X and Y at the equilibrium point C. The locus of these equilibrium points like C",

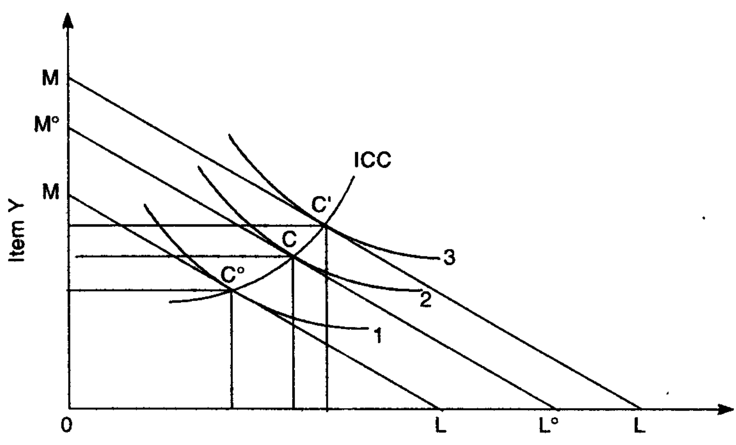


*Fig. 6*

and C° and C traces out the income-consumption-curve (ICC) in Fig. 6.

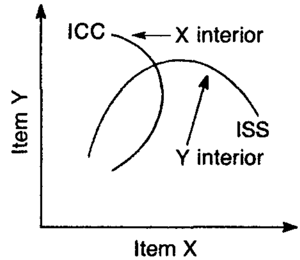


*Fig. 7*

As the price-consumption curve traces out the price-effect on demand decisions, the income-consumption curve traces out the income-effect on demand decisions of the purchaser. The income-effect may be positive or negative. The commodities, for which the demand goes up, as the consumers' income goes up. are called "normal" goods. In contrast, the "inferior" goods are those commodities which face declining demand as the consumer income goes up. For example, as and when the price of Vanaspati decreases, people demand less of Vanaspati and more of pure ghee presumably because Vanaspati as an inferior commodity subject to negative income effect, the rise in income discourages its demand. If X is an "inferior" commodity and Y is a "normal" commodity then the ICC will be upward-leftward bending; but if X is normal and Y inferior, then the ICC will be downward-rightward bending as illustrated in Fig. 7.

The point remains that the impact of a change in income (budget) of the consumer on his demand decision is not definite, much would depend on the type of the commodities.

**Price of Related Goods :**

All most all the goods that a consumer purchases in a market are "related goods" in one way or the other way. Goods may be related to each other by way of either complementarity or substitutability. X and Y are complements, if the rise in demand for X increases the demand for Y e.g., pen and ink, bread and butter etc. X and Y are substitutes, if the rise in demand for X reduces the demand for Y, e.g., tea and coffee, pork and beef etc. Then it follows that the demand for X is determined not only by the price of X, but also by the price of Y and other commodities which may be related to X. In our familiar Indifference diagram, we have assumed X and Y to be substitutes. As the price of X becomes cheaper relative to other substitutable commodities, more of X is demanded replacing the demand for its substitutes. Thus the demand decision for X is influenced by the change in the relative structure (price-ratio) in the market. A fall in the price of X reduces demand for the substitutes of X, but increases the demand for the complements of X. Thus when X is related to Y, the demand for X changes due to a change in the price of Y. This cross-demand relationship in contrast to price-demand arid income-demand relations that we have described earlier, is termed as substitution-effect on demand decisions.

Let us now take a stock of the different effects that we have introduced. As the price of X falls, two things happen simultaneously (a). The relative price structure changes so that more

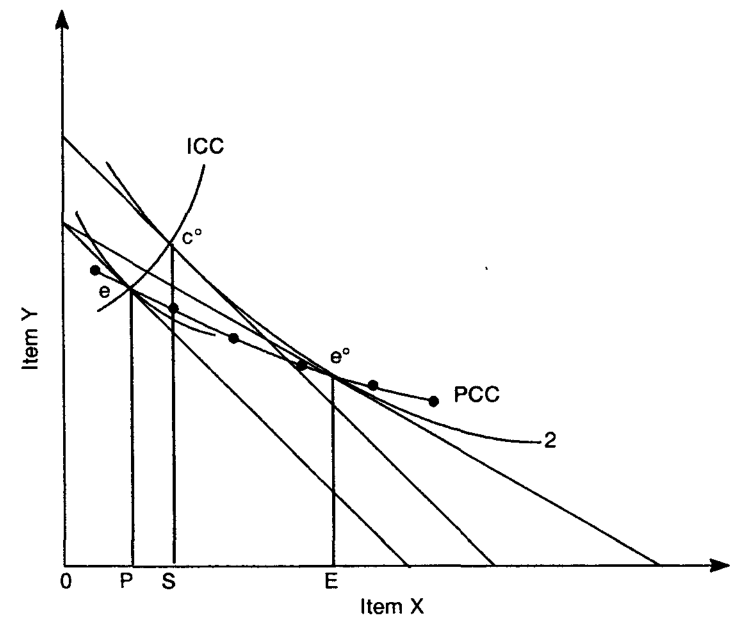


*Fig. 8*

of X is or demanded because X is relatively cheaper. This is substitution effec of Slutsky effect. (b) The real income of the X-

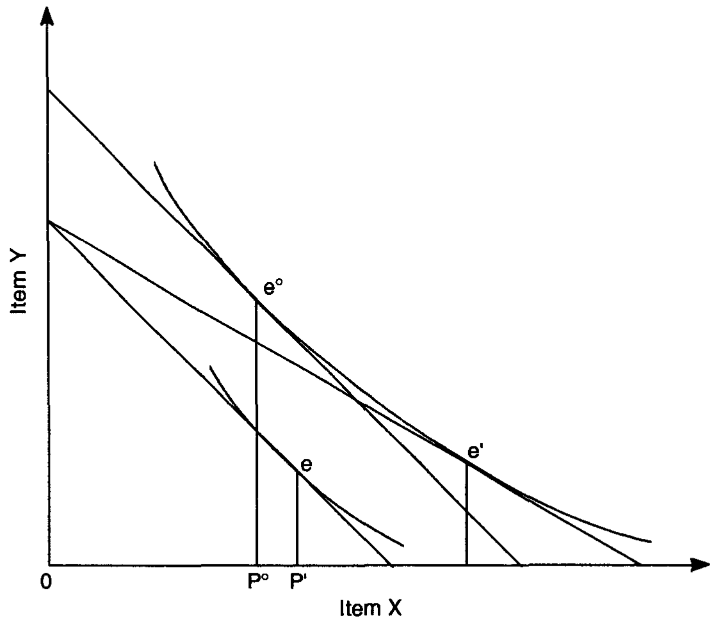


*Fig. 9*

consumer goes up so that more of X is demanded, assuming X is a normal commodity characterised by positive income effect. If X is inferior characterised by negative income effect, then the demand for X falls. It is the aggregate of these two effects, income and substitution, that decides the total price effect on demand. The substitution-effect may be reinforced by the positive income-effect or it may be cut short by the negative income-effect.

Price effect = Substitution-effect + Income-effect.

Therefore, Substitution-effect = Price-effect – Income-effect

*Note :* Below that in Fig. 9 when X is inferior (with negative income effect, $P''P^0$), the weight of total price-effect is less than that of substitution effect. Had X been normal (with positive income effect), the weight of total price-effect would have been greater than that of substitution-effect.

In exceptional cases, the negative income-effect may outweigh the positive substitution-effect such that the total price-effect may turn negative : as price of X falls, the demand for X contracts. The weight of the price-effect depends on the relative pull and/or push of the income-and substitution-effects, and the weight of these income and substitution-effects, in their turn, depends on the related ness and the type of the commodity in question.

**Revealed Preference Approach :**

Indifference analysis of consumer behaviour requires the consumer to supply information about his scale of preferences. Such information need not be supplied under the Revealed Preference Approach. This approach is based on the following assumptions:

*(1) Non-satiety :* The consumer is not oversupplied with either commodity; i e.. he prefers to have more of X and/or Y.

*(2) Consistency :* If the consumer prefers X to Y in situation A, he must prefer X to Y is situation B also, if the available items under both the situations remain unchanged.

*(3) Transitivity :* If the consumer prefers X to Y and Y to Z; then X is preferred to Z.

*(4) Ordering :* If the, consumer is indifferent between two combinations, his ordering is "weak", but if the consumer definitely chooses one over another combination, his ordering is "strong". Indifference analysis is based on weak ordering, but Revealed preference is based on strong ordering.

Under these conditions, choice reveals preferences. If the consumer decides to choose X rather than Y, then X is revealed preferred to Y.

This Revealed Preference Approach enables us to derive Slutsky theorem, e.g., negative substitution effect in the three (or more)— commodity case. Suppose, our consumer would purchase quantities X, Y, Z of three commodities at prices Px, Py and Pz

If the price of X goes up to Px + ΔPx, and his income is changed so as to leave him exactly as well off as before (i.e., the income effect is removed), his purchases change to X+ΔX, Y+ΔY and Z+ΔZ. Thus combination (X, Y. Z) is indifferent with (X+ΔX, Y+ΔY, Z+ΔZ), that is the consumer is exactly as well off as before the price change, and the increments $\Delta X$, $\Delta Y$ and $\Delta Z$ then clearly represent the substitution effects of the price change, $\Delta Px$, on the purchases of various commodities. We can prove $\frac{dX}{dPx} < 0$, i.e , $\Delta X$ is of the opposite sign from $\Delta Px$, inplying as Px falls, the 'substitution effect induces an extension in the purchase of X and vice versa.

Since (X, Y, Z) is indifferent to ($X+\Delta X$, $Y+\Delta Y$, $Z+\Delta Z$) the former cannot be revealed preferred to the latter, i.e.,

$$Px.X+Py.Y+Pz.\ Z \leq Px(X+\Delta X)+Py(Y+\Delta Y)+Pz(Z+\Delta Z)$$

That is, when (X, Y, Z) was purchased at prices (Px, Py, Pz), it cannot have been more expensive combination. Similarly the new combination cannot have been revealed preferred to the old, so that at the new prices (Px+DPx, Py, Pz), we must have

$$(Px+\Delta Px)\ X+Py.Y+PzZ \geq (Px+\Delta Px)(X+\Delta X)+Py(Y+DY) +Pz(Z+DZ)$$

The first of our inequalities may be rewritten as

$$-Px.\ X - Py.\ Y - Pz.Z \geq Px(X+\Delta X) - Py(Y+\Delta Y) - Pz(Z+\Delta Z)$$

Adding this to the second inequality we obtain,

$$\Delta Px.X \geq \Delta Px(X+\Delta X)$$

or $0 \geq \Delta Px\ \Delta X$; and this is the Slutsky theorem.

**Advertisement :**

When goods are related, particularly when they are substitutes, promotional expenditure like advertisement plays a very important role in influencing the demand decisions of the consumer and, therefore, the sales revenue of the companies. The advertisement-demand relation has some striking features :

(a) Some amount of demand is independent of advertisement. A certain amount of sale is possible even without advertisement.

(b) Some consumers' purchase-pattern and consumption-habit may be so rigidly fixed that their demand decisions do not get influenced by advertisement.

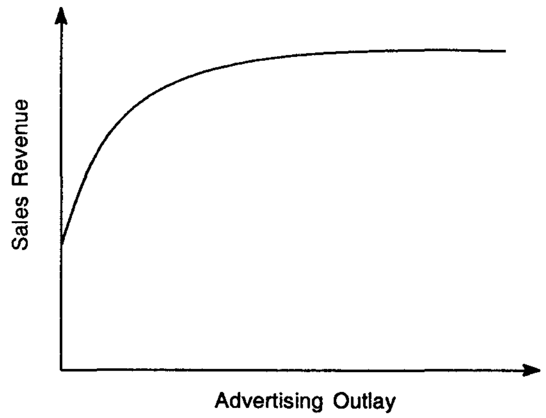


*Fig. 10*

(c) Normally advertisement is effective in altering demand decisions and consumer's preference. Upto a point, an increase in advertisement may lead to a more than proportionate increase in sales, beyond that point an increase in advertisement leads to a less than proportionate increase in sales till the point of saturation beyond which the sales do not respond to increasing advertisement. Such a relationship between advertisement and sales is illustrated in diagram below.

Sometimes too much advertisement may have adverse effect on the demand decisions so that the sale may start falling also. Some people believe that advertisement attempts to mislead consumers and create illogical buyers' preference. Of course, there is no denying the fact that advertisement does help in creating/maintaining market for a product. Hence, advertisement management is a specific job.

Different companies adopt different strategies in advertising their product. For example, some companies regularly spend a fixed percentage of their sales revenue or net profit on advertisement. Some companies adopt 'all you can afford approach'. Some companies advertise to create a brand image and to build up secure market from the long-run view-point. Some companies consider the discounted value of net return from advertisement. Some companies decide on their advertisement outlay on the basis of what the similar companies are spending on advertisement for their market share. Some companies take a target approach—they advertise till they are able to attain a given sales target. Sometimes the consumer try to make an evaluation of these motives and strategies while considering their demand decisions about the advertised product.

Advertising may be undertaken either through price-competition or through non- price competition. Keeping the goods under priced is a form of advertisement. Product-differentiation is another form : product may be differentiated by colour, packaging etc or sometimes a free product may be given with the main product Such methods do attract the consumer and influence their demand decisions.

Economists have been reluctant, by and large, to inclade advertisement and other business tools used to manipulate consumer demand in their considerations, because they assume that business attempts to match consumers' preference as they are revealed by their choices in a free market place. Economists' theory of consumers' behaviour (like the Revealed Preference Approach) assumes hat choice reveals preferences. It does not go to èxplain the factors (like advertisement) which lie behind such choice But such a theory has not much predictive value To predict the behaviour of consumer, we need to consider factors like advertisement, inducing a change in the pattern of choice.

**Price-Expectations :**

One of the limitations of the economists' theory of demand is that it deals with prices as they exist at the exact moment when the demand schedule ,s drawn up, but it does no, consider the expected level of price, which are likely to prevail in future. Such a static demand theory is of limited use to a businessman, no matter whether he is a producer or a consumer. For purposes of increasing the operational value of demand analysis, have to consider dynamic factors like price-expectations. The price which prevails today reflecting certain amount of demand-supply adjustments and/or control in present induces the consumer to expect some or other prices which may prevail tomorrow, reflecting adjustments and control in future. The quantity of X demanded in period t may depend on the price of X in period t + 1, and the expected Px in period t-fl may be functionally related to a actual Px in period t, sometimes it may be related to actual Px in periods t–1, t–2 and so on. If the Px in period t already reflects Px in periods preceding them the demand for X will be more influenced by Px in periods following t. The period following t lies in future about which there is uncertainty. We can only talk of some expected value of Px in periods following t. Such expected values are usually calculated as the product of the amount expected and the probability of it being received at the end of the relevant time period. In calculating the amount expected, we can use discounting and opportunity cost concepts. The calculation of probabilities is a difficult task. Statisticians and decision-theorists speak of two classes of probabilities—objective and subjective. Objective Probabilities exists when the price-calculation is made on the basis of some historical data, evidence and experience For example, when the coin is tossed, only two possibilities, either head or tail, exist; this has been true of all past tossings and hence it is going to be true for all future tossing; the calculation that the probability of getting a head or a tail, therefore, an objective one. Subjective Probabilities refer to estimates based on individual's past guess as to the future in the absence of past data. For example, the management of a firm, introducing a new product, claims that we are going to keep the price of the new product, as far as possible, within the reach of the common man, But different people have different idea about the purchasing capacity of the common man; so they will have different expectations about the price of the new product. When same information thus results in differing expectations depending on the way in which different people extrapolate information at their disposal, we have subjective probability calculations —a host of probabilities.

Subjective feelings about demands and pıice are rooted in individual value systems; these are not subject to scientific investigation and verification. As such, the demand behaviour of different consumers, subject to subjective price expectations, may reveal a bewildering variety of possibilities. The demand behaviour of consumers, subject to objective price expectations follows more or less a definite pattern. As a rule if prices are increasing consumers expect that the prices will increase further in future, and in anticipation of that, some consumers may extend the demand for X, even when the price of X is increasing. Similarly price-falls may be treated prelude to further price reductions, and so price-fall may not effectuate any extension of demand. Such price expectations can explain the speculative hoarding tendency on the part of consumers, retailers and wholesalers during periods of inflation. Thus the anticipation about the future level of prices is an important determinant of the demand decisions.

**Theory of Consumer Choice Under Risk and Uncertainty :**

When we consider expectation about future (prices and production) as a demand-determining factor, we are implicitly assumining the role of risk and uncertainty, because future invoves incalculable indefiniteness. In this context, by way of a short digression, a reference may be made to the theory of consumer choice under risk and uncertainty as developed by Von Neumann and Morgenstern. According to this theory, if the consumer satisfies certain crucial axioms like complete ordering, continuity, independence, unequal probability and complexity, then his utility function can be derived by presenting him with a series of choice between a certain outcome on the one hand and a probabilistic combination of two uncertain outcomes on the other1. The utility function thus derived is unique upto a linear transformation and provides a ranking of alternatives in situations that do not involve risk. Consumer maximises expected utility, and Von-Neumann-Morgenstern utilities are cardinal in the sense that they can be combined to calculate expected utilities and can be used to compare differences in utilities The expected utility calculation can be used to determine the consumers' choice and demand decisions in situations involving risk.

**Other Factors :**

There are a few other factors which influence demand decisions. The importance of these factors depend on time, person and the type of the commodities in question. For example, the size and age composition of population is a very important factor.

More babies we have in a family, more will be the demand for toys; and more old men we have, more will be the demand for sticks. Income distribution pattern and relative income structure of the community is also a quite important factor. If each family has a TV set in a given locality, it becomes difficult for one family in that locality not to have a TV set; this is the local demonstration effect (to keep up with the Jones). Sometimes people demand a commodity, just because others do not have it. This is to satisfy the snob-appeal of the person concerned. People demand such articles of ostentatious expenditure as diamond without considering their price. The money supply is an equally important determinant of demand. Larger the money supply (and credit facilities, e.g., mortgage and higher purchase terms) more will be the nominal purchasing capacity of the people and hence more demand as reflected in the volume of consumption expenditure, and vice versa. Sometimes people accumulate unaccounted or black money; then they spend such money on conspicuous consumption. Thus, sometimes demand decisions are merely to find an outlet for the use of black money. Some people take a preview of the 'life time income' or the 'permanent income' (in contrast to transitory income) which they are going to earn, and on that basis they decide their expenditure on items like consumer durables. Thus some household may not have immediate capacity to pay, yet they decide to demand and to pay in installments over a period; in this case the household always calculate the opportunity cost involved. Some of these factors are elaborated in the context of the discussion of consumption function in Macroeconomics. In Microeconomics, most of these factors are assumed away by way of the assumption of other things remaining equal. For a practical businessman, it is needless to emphasize now that the demand decision is a complex decision, because a host of factors influence the psychology of consumers—Household, Corporation and Government.

□□□

# 10

# EXTENSION AND CONTRACTION VERSUS INCREASE AND DECREASE IN DEMAND

In formal economic theory, a contrast is drawn between extension and increase of demand on the one hand, and between contraction and decrease in demand on the other hand. This distinction, which follows readily from the above discussion, is an important one. The extension and contraction of demand has

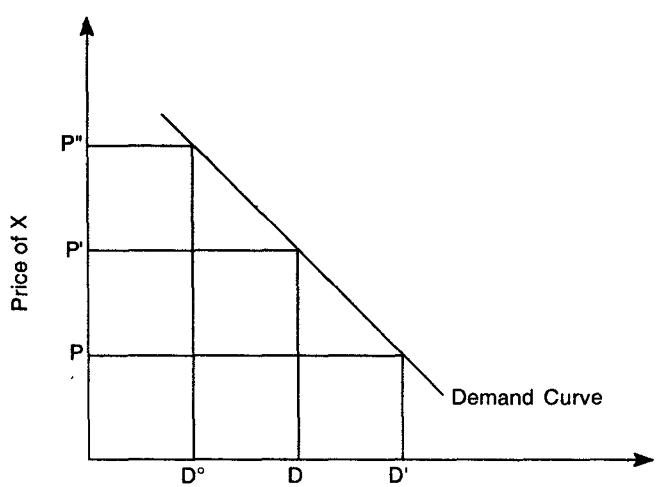


*Fig. 1*

reference to the movement along the demand curve. As price falls from P to P′, demand extends from D to D′. As price rises from P to P″, demand contracts from D to D″. Here the determining factor is the price. This demand-price relation goes by the name of *law of demand,* as illustrated in Fig. 1

Increase and decrease in demand go by the name of *charges in demand.* Such changes may come due to non-price factors. If more is demanded at the same price or same is demanded at a higher price, than we have the 'increase in demand' as a result of which the demand curve shifts upward to right from D to D′. If fewer is demanded at the same price or same is demanded at a lower price then we have the decrease in demand, as a result of which the demand curve shift downward to left from D to D″. Thus the reference is not to the movement along the curve, but to shifts in the position of the curve as shown in Fig. 2.

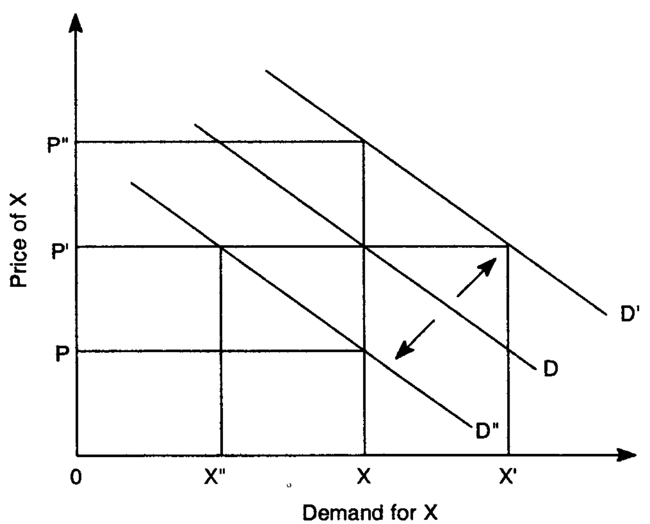


*Fig.* 2

During the period of business recession, the industry faces a decrease in demand less and less is sold, even if price remains same or as price falls, demand remains the same. During the period of business prosperity, even if prices go up, demand remains the same or increase at times. In the context of recession or prosperity, the normal reference is to the aggregate demand: but the description is true of market and individual demand as well.

**Exceptional Demand Decisions :**

We have seen that the normal demand decision of a consumer is to purchase more when the price falls, and *vice versa*. However, under certain circumstances, the consumer may purchase less as price falls, and purchase more as the price rises. We have already indicated such circumstances. Let us now take a stock of these conditions :

(1) If the goods in question is an *"inferior goods"* (Giffen goods), then the consumer's demand for it contracts, as the price of it falls and *vice versa*, because the negative income effect may be stronger than the substitution effect so as to yield a back-as Unrated in diagram 2.

(2) Such exceptional demand curve also results in the case of *speculate demand*. The price-rise may be expected to be a prelude to a further rise in prices so much so that consumers, retailers and wholesalers may demand more and hoard more.

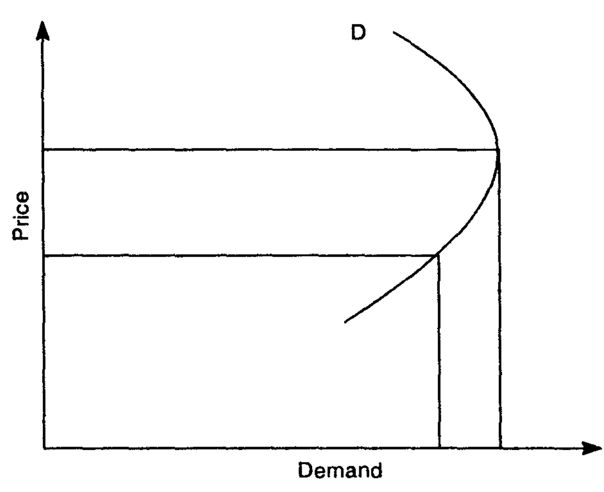


*Fig. 3*

(3) Another exceptional condition is that of *derived demand.* The demand for labour is derived from the demand for goods which employ labour as a productive factor. Due to tax concessions granted as the price of a TV set falls, the demand for TV sets may extend and hence the demand for labour by the electronic industry, which is labour-intensive, may increase even if the wage rate i.e. 'the price of labour does not change.

(4) Exception also arises in the case of *complementary goods.* When the price of petrol rises, the demand for petrol contracts such that the demand for motor cars may decrease or the demand for scooter by car-owners may increase. Note that the demand for car or the demand for scooter may not be dependent on the price of car or the price of scooter.

(5) Some consumers are very much concerned about their ego prestige, snob appeal and other habits such that they buy more of a thing when its price rise, and less of a thing when its price falls. These are articles of ostentatious expenditure- or conspicuous consumption.

The conditions which are stated above explain why the demand for investable loanable funds increases even when the rate of interest rises or why the demand for drinks increases even when the price of drinks rises or why the demand for goods and services may not extend in response to a fall in their prices.

**Demand Functions :**

The discussion about the determinants of demand leads us directly and easily to the formulation of demand functions. Traditionally, the demand for X has been treated as a function of the price of X only. Such a single variable function can be expressed as

$$Dx = D(Px) \qquad \text{(i)}$$

The equation for a linear downward falling demand curve will be

$$Dx = a - b\,Px \qquad \text{(ii)}$$

Here is the equation of a straight line in its slope-intercept from with b as the slope and a as the intercept term. In professional lectures, such demand functions often seem to appear as readily as rabbits from a magician's hat. This approach is perfectly appropriate for those concerned oily with the understanding of theory, but it is not sufficient for those concerned with using the apparatus to analyze business problems.

We have seen that demand is, in reality, a many-variable function. The demand for X (Dx) depends on the price of X (Px), prices of Y and Z, (Py, Pz) to which the commodity X may be related, the income of the X consumer (I), the money supply (M), advertisement (A) and other factors which may be summed in a random error term (n) so that we write our generalised demand function

$$Dx = D(Px, Py, Pz, I, A, M, \mu) \quad \text{(iii)}$$

When we estimate such a demand through the linear regression method, we may construct :

$$Dx = a+Px+b_2Py+b_3Pz+b_4I+ b_5A+b_6M+\mu \quad \text{(iv)}$$

The sign of the slope coefficients $b_1$ .........$b_6$ indicate the nature of relation between Dx and its explanatory variables. Normally the actual market conditions do not create all possible combinations of Px, Py, Pz, I, A and M such that a thoroughly exhaustive evaluation can be made of the relative impact of each on Dx when the others take on various values. Necessarily, many of the actual computed values of Dx that result from various sets of the explanatory variables are inferences established on the basis of other observations. In the measurement of demand, we must have a sufficient pattern of fluctuation in the independent (explanatory variables to enable these inferences to be valid and reliable. In addition, simultaneity must be considered when we specify price in a competitive market. The implication is that the quantity demanded is known, as price is the reflection of demand-supply adjustment ; but we are using it to estimate the quantity demanded.

# 11

# ELASTICITIES OF DEMAND

We know that demand extends as price falls and contracts as price rises. Now we raise the question : how much will demand for X extend (contract) when the price of X falls (rises)? For making business decisions, such questions are very important. The decision maker must know both the direction and the proportion of change in Dx as the Px or I or any other explanatory variables change. It is this idea of proportion which is expressed by the concept of elasticities. Depending upon the explanatory variable, we have different concepts of demand elasticity :

**Price Elasticity of Demand ($e_p$) :**

It is defined as the degree of responsivness of the quantity demanded to a change in price. It can be measured by the following formula :

$$e_p = \frac{\text{Proportionate change in the quantity of X demanded}}{\text{Proportionate change in the price of X}}$$

$$\text{or} \quad e_p = \frac{\text{change in Dx}}{\text{original Dx}} \div \frac{\text{change in Px}}{\text{original Px}}$$

$$\text{or} \quad e_p = \frac{Dx_2 - Dx_1}{Dx_1} \div \frac{Px_2 - Px_1}{Px_1} \quad \text{where}$$

$Dx_1$ and $Px_1$ = Demand for X, and price of X before price change

$Dx_1$ and $Px_1$ = Demand for X, and price of X after price change. For example, if $Dx_1$=100, $Dx_2$=150, $Px_1$=12, $Px_2$=10

then $$e_{px} = \frac{150-100}{100} \div \frac{10-12}{12} = -3$$

The negative sign indicates the inverse relation between Dx and Px. Normally we ignore the sign and consider only the absolute value. If

$e_p > 1$ we say : demand is elastic;

$e_p < 1$ we say : demand is inelastic;

$e_p = 1$ we say : demand is unitary elastic.

To ensure consistency of results in the case of unitary elasticity, our formula needs some modification where discrete demand-price information is available.

$$e_{px} = \frac{Dx_2 - Dx_1}{\frac{Dx_2 + Dx_1}{2}} \div \frac{Px_2 - Px_1}{\frac{Px_2 + Px_1}{2}}$$

or $$\frac{\Delta Dx}{Dx_1 + Dx_2} \cdot \frac{Px_2 + Px_1}{\Delta Px}$$

Using our previous example in terms of this modified formula the estimated $e_{px}$= 2.2, we interpret this result as : A 1% reduction in the price of X will extend the demand for X by 2.2% (but 3% according to the earlier formula).

The various categories of price-elasticity of demand is shown in the set of diagrams 1 below :

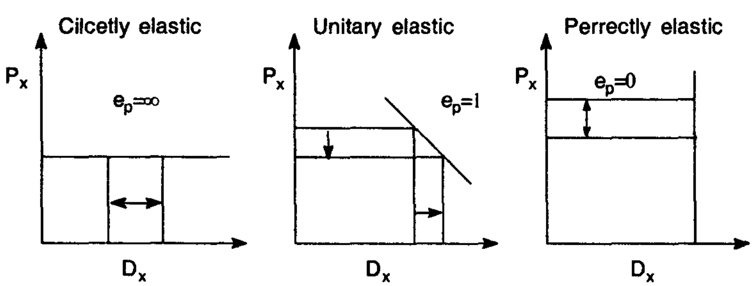


*Diagram 1 (a)*

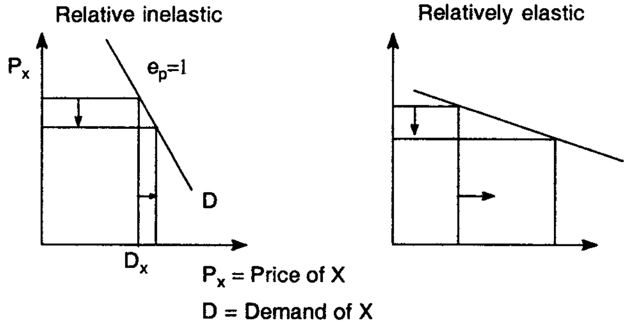


*Diagram 1 (a)*

There are many factors which exercise an influence on the types of price-elasticity of demand. These factors include : nature of the commodity, intensity of demand for the commodity, proportion of total expenditure spent on the commodity, available range of substitutes for the commodity, durability of the commodity, purchase frequency of the consumer, consumer's income, taste and habits etc. A few examples may illustrate these factors. The demand for necessaries like salt and match sticks is highly inelastic. The demand for easily substitutable commodities like different brands of tooth paste is highly elastic. The demand for luxury items is elastic.

So far we have considered only elasticity i.e., the elasticity of demand between two finite points on the demand curve. An alternative possibility is point elasticity i.e., the elasticity of demand at a point on the demand curve. The formula for calculating point (price) elasticity of demand for X is

$$epx = \frac{dD_x}{dP_x} \cdot \frac{P_x}{D_x}$$

Note, the price elasticity of demand ($e_{px}$) is not same as the slope of the demand curve $\left(\frac{dD_x}{dP_x}\right)$ unless the curve is plotted from the logarithms of the data.

The relation between price elasticity of demand ($e_{px}$, total revenue (TR), average revenue (AR) and marginal revenue (MR) is a handy tool in economic analysis. Let us examine this relationship.

$$TR = Px.Dx$$

$$AR = \frac{Px.Dx}{Dx} = Px$$

$$MR = \frac{d(TR)}{dDx} = Px + Dx.\frac{dPx}{dDx}$$

$$e_{px} = Px\left(1 + \frac{Dx}{Px}.\frac{dPx}{dDx}\right)$$

Since $\left[\frac{Dx}{Px}.\frac{dPx}{dDx}\right] = \frac{1}{-e_{px}}$

$$MR = Px\left(1 - \frac{1}{e_{px}}\right)$$

Since $Px = AR$, we can further rewrite

$$MR = AR\left(1 - \frac{1}{e_{px}}\right) \quad \text{(i)}$$

$$= AR.\left(\frac{e_{px} - 1}{e_{px}}\right)$$

or, $AR = MR.\ \frac{e_{px}}{e_{px} - 1}$ (ii)

If $MR=AR\left(1 - \frac{1}{e_{px}}\right)$

then $\frac{MR}{AR} = 1 - \frac{1}{e_{px}}$

or $\left[\frac{MR}{AR} - 1\right] = -\frac{1}{e_{px}}$

or $\frac{1}{e_{px}} = \left[1 - \frac{MR}{AR}\right] = \frac{AR - MR}{AR}$

$$e_{px} = \frac{AR}{AR - MR} \quad \text{(iii)}$$

or $$e_{px} = \frac{Px}{Px - \frac{d(Px.Dx)}{dDx}}$$

Thus, the information about average and marginal revenues is sufficient to yield an estimate of price elasticity of demand. If the market price, Px, is a given datum (i.e., Px is constant) then AR= MR, and therefore, epx turns out infinity, as it is under the case of perfect competition. Under imperfect competition in the market, AR>MR, and therefore, absolute value of epx is positive.

Let us examine the relation between AR and MR with the use of a simple demand function :

$$Px = a - bDx$$

$$TR = Px.Dx$$

$$= aDx - bDx^2$$

$$MR = \frac{d(TR)}{dDx} = a - 2bDx$$

This result readily implies three things when function is linear: (a) the MR function is also linear, (b) the MR function has the same ordinate intercept as the demand (AR) function, and (c) the MR function has a slope twice as great as the slope of the demand (AR) function. Illustrating these propositions we have the diagram 2.

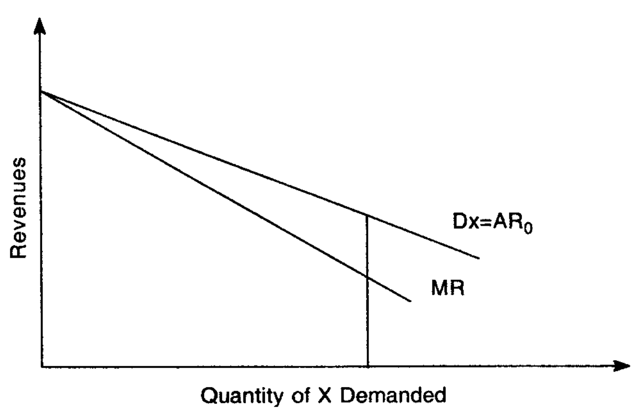


*Fig. 2*

Also study this table below :

| Px (in Rs) | Dx (units) | TR (in Rs.) | MR (in Rs.) |
|---|---|---|---|
| 25 | 1 | 25 | – |
| 20 | 2 | 40 | 15 |
| 10 | 4 | 40 | 0 |
| 5 | 6 | 30 | –10 |
| 2 | 8 | 16 | –14 |

Note that the point at which MR=0, TR is at maximum, and thereafter TR starts declining. Therefore, the price elasticity of demand goes through the unit position where MR ==0, and $e_{px}>1$, where MR is positive, $e_{px}<1$ where MR is negative The formal relationship between epx and TR can be summarised.

| Situation | $e_{px}>1$ | $e_{px}=1$ | $e_{px}<1$ |
|---|---|---|---|
| Price falls | TR rises | TR unchanged | Tg falls |
| Price rises | TR falls | TR unchanged | TR rises |

Consider the demand function of the form a hyperbola :

$$D = \alpha p^{-n} = \frac{\alpha}{p^n}$$

Where D is quantity demanded, P its price and $\alpha$ and n are constants.

$$\frac{dD}{dp} = -n\alpha p^{-n-1}$$

$$\frac{dD}{dp} \cdot \frac{P}{D} = \frac{-n\alpha p^{-n-1}}{1} \cdot \frac{P}{D}$$

$$= \frac{-n\alpha^{-n-1}.p}{\alpha p^{-n}} \cdot \frac{P}{D} \quad \text{since } D = \alpha p^{-n}$$

$$= \frac{n\alpha p^{-n-1+1}}{\alpha p^{-n}}$$

$$= \frac{-n\alpha p^{-n}}{\alpha p^{-n}}$$

$$e_p = \frac{dD}{dp} \cdot \frac{P}{D} = -n$$

Thus, we find that if P stands for price, then its power term works out to be the constant price elasticity of demand; it says that if P changes by 1% then D will change in the opposite direction by n%. Here n is a measure of proportion, its sign is an indicator of the direction of change.

**Income Elasticity of Demand ($e_y$) :**

Based on our previous discussion, we define income elasticity of demand as the proportionate change in demand for X resulting from a 1% change in the income of the X-consumer. If we use Y for income and Dx for the quantity demanded then the measure of arc income-elasticity can be stated as :

$$e_y = \frac{Dx_2 - Dx_1}{½(Dx_2 + Dx_1)} / \frac{Y_2 - Y_1}{½(Y_2 + Y_1)}$$

The measure of point income elasticity of demand for X can be stated as :

$$e_p = \frac{dDx}{dY} \cdot \frac{Y}{Dx}$$

If we state this income-demand relation in form of a hyperbolic function with Y as the independent variable then its power term turns out to be the constant income elasticity of demand, i.e., If $D = \alpha Ys$ then $s = e_y$.

If the sign of ey is positive then the commodity in question is a normal commodity. For an inferior commodity, $e_y$ will be negative and strong enough to outweigh the substitution elasticity.

**Cross Elasticity of Demand ($e_{xy}$) :**

The cross elasticity of demand for X has reference to the percentage change in the demand for X resulting from 1% change in the price of Y, where Y may be related to X by way of either substitutes or complements. The measure for arc cross-elasticity of demand for X will be

$$e_{xy} = \frac{Dx_2 - Dx_1}{½(Dx_2 + Dx_1)} \div \frac{Py_2 - Py_1}{½(Py_2 + Py_1)}$$

The measure for point cross elasticity of demand for X will be:

$$e_p = \frac{dDx}{dPy} \cdot \frac{Py}{Dx}$$

The co-efficient of cross-elasticity of demand, exy will be positive, if X and Y are substitutes (competing goods), but exy will be negative if X and Y are complements (companion goods).

The absolute value of the co-efficient will indicate whether the relatedness between X and Y is "strong" or "weak", Sometimes the size of the co-efficient exy is used to determine if the products belong to the same industry or represent the same commodity. Of course, this criterion is not always a dependable one where products may be jointly used or jointly produced.

**Promotional Elasticity of Demand ($e_A$) :**

This has reference to the percentage change in the demand for X resulting from 1% change in the advertisement outlay on X. This is also called advertisement elasticity. This has got operational significance in marketing management. The corresponding formula for measuring eA will be :

$$e_A = \frac{Dx_2 - Dx_1}{½(Dx_2 + Dx_1)} \div \frac{A_2 - A_1}{½(A_2 + A_1)} \quad \text{[for are elasticity]}$$

Here periods 1 & 2 are periods before and after fresh advertisement expenditure A.

$$e_A = \frac{dDx}{dA} \cdot \frac{A}{Dx} \quad \text{[for are elasticity]}$$

The luxuries, commodities or goods in fashion normally have a very high $e_A$ co-efficient.

**Elasticity of Price Expectation ($e_e$) :**

This is a concept which J.R. Hicks has popularised. It has reference to the percentage change in the level of future price ($p_{t+1}$)

expected as a result of a change in the level of current prices ($P_t$). It may be stated as :

$$e_e = \frac{dP_{t+1}}{dP_t} \cdot \frac{P_t}{P_{t+1}}$$

Thus, $e_e$ co-fficient measures the ratio of the percent rise in expected future prices to the per cent rise in its current price. When an increase in the current price is expected to result in a proportional increase in future prices, the $e_e$=1. If a rise in $P_t$ it believed to cause a larger than proportionate change in $P_{t+1}$ then $e_e$>1 If a rise in $P_t$ is expected to cause a less than proportionate rise in $P_{t+1}$, then $e_e$<I. The expectation that the rise in current prices will lead to a further rise in prices in future mean $e_e$>0, while a rise in price leading to expectation that prices will fall in future will give in $e_e$<O.

As we have discussed of elasticity of price expectations, so we can talk of elasticity of demand expectations to consider expected future demand as a function of current demand.

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# 12

# EMPIRICAL STUDIES ON DEMAND

Empirical studies of demand are of three broad types: consumer surveys, statistical studies and experimental surveys.

Consumer surveys are concerned largely with purchasers intentions and are concerned with sales forecasting rather than giving information for price policy making. This approach does not normally expose and measure the variables under management's control. Such surveys reveal intentions of the consumers, these intentions may/may not be actual actions.

Statistical studies of a rudimentary type such as trends analysis, postdate time series of the single independent variable. Such studies ignore significant demand determinants such as prices, which are controlled by management. More sophisticated statistical analyses using multiple correlation techniques are capable of isolating and measuring the fluctuations in demand which occur in response to principal demand determinants like price and disposable income.

Experimental surveys may also be undertaken to estimate demand. Controlled experiments can estimate the influence of important demand determinants under management's control, but care must be taken to reduce the effect of unimportant variables to a minimum. Sometimes stimulated exercises are also undertaken. The most reliable method of estimating a demand function is to combine experiments with statistical studies. For example, an experiment may be carried out by changing the price of V and thereby noting the possible changes in demand for V; these results may be anlaysed further through statistical techniques. Of course, such combined methods can be normally applied more by a large company than by a small company.

It is more than obvious that in empirical estimation of demand function (and elasticity), there is no escape from statistical techniques. Much of the usefulness of these techniques depend on them ture of demand data which are available. The limitations on measuring demand may arise due to a number of reasons. Firstly, actual demand relation may be too volatile to be significantly explained by analytical functions. Secondly, models (of demand function) mathematically identified a priori may become under-identified when statistical evidence is gathered. Thirdly, there may be too much multi-collinearity inherent in the variables to allow their separate effects to be disentangled. Fourthly, the available data may seriously violate one or more of the statistical assumptions about the error term. Thus, the empirical demand estimates may not always be reliable. This is not to question the usefulness of empirical demand estimates, but to maintain that we must interpret the available estimates with caution and proceed for fresh estimation with care.

With the above qualifications in mind, we may interpret some statistical demand functions which have been estimated :

(1) R. Stone estimated the demand function for beer in UK by following equation :

$$Q = 1.058Y^{0.136}\ P^{-0.727}\ R^{0.214}\ G^{0.816}$$

Where Q is the quantity of been consumed, Y is the aggregate real income, P is the average retail price of beer, R is the average retail price of all other commodities and G is the index of the strength of beer. A price drop of 1% will increase beer consumption by 0.727%, a rise in aggregate real income of 1% will increase beer consumption by 0.136%, a rise in G of 1% will increase the demand for beer by 0.816%.

(2) The demand function for medical care in USA has been estimated as :

$$Q = 0.1251\ Y^{0.47}\ S^{0.455}$$

Where Q is the amount of medical care demanded in dollars; Y is the disposable income per capita in dollars and S is the liquid assets per capita dollars. The demand for medical care is almost equally responsive to changes in both Y and S.

(3) Schultz estimated the demand for wheat in USA in the from of :

$$\log Q = 1.0802 - 0.2143\ P - 0.00385\ t - 0.00163\ t^2$$

This shows the price elasticity of demand for wheat 0.2143. Since the regression co-efficients of t and $t^2$ are not significant, it was concluded that during the period of reference (t represents time), the demand function did not change much.

(4) The National Council of Applied Economic Research estimated the price elasticity ($e_y$) and income elasticity ($e_p$) of demand for some commodities in India from time-series data:

| Commodities | $e_p$ | $e_y$ |
|---|---|---|
| Rice | 0.16 | (–) 0.19 |
| Wheat | 1.25 | (–) 0.73 |
| Major cereals | 0.46 | (–) 0.34 |

(5) G.S, Gupta has estimated the demand for various types of bank deposits in India as a function of national income (Y), interest rate on 3 month's time deposit ($I_n$), interest rate on saving deposit ($I_s$), yield on variable dividend industrial securities ($I_i$), maximum permissble interest rate on 3 months deposits ($I_m$) and all scheduled commercial bank offices (B) :

$$CD = 1428.85 + .0332\ Y - 572.791_n + .4450\ B$$

$$SD = -2588.12 + .0.387Y + 525.11\ I_s - 176.39\ I_n$$

$$FD = -7441.41 \div .0873Y + 659.94\ I_n - 1082\ I_i + 1791.791_m$$

Where CD = current deposits

SD = saving deposits

FD = fixed deposits

These equations indicate that :

(a) a Rs. 1 million increase in national income leads to Rs. 0.0332 millon increase in the demand for current deposits, a Rs. 0.0387 millon increase in the demand for saving deposits, and a Rs. 0.0873 million increase in the demand for fixed deposits;

(b) a 1% increase in the interest rate on 3-months time deposits causes a Rs. 572.79 million decrease in the demand of currents deposits, a Rs. 179.39 millon decrease in the demand for savings deposits, and a Rs 659.94 million increase in the demand for fixed deposits;

(c) an increase in all scheduled commercial banking offices by one brings an increase in the demand for current deposits by Rs 0.4450 million and an increase is the demand for fixed deposits by Rs 0.1256 million;

(d) a 1% increase in the interest rate on savings deposits causes a Rs 525.11 million increase in the demand for saving deposits;

(e) a 1% increase in the yield on variable dividend industrial securities brings about a Rs. 1082.18 million decrease in the demand for fixed deposits; and

(f) a 1% increase in the maximum permissible interest rate on 3-months deposits leads to a Rs 1791.79 million increase in the demand for fixed deposits.

**Socio Psychological Analysis of Demand — A Critique of the Conventional Economic Theory :**

The orthodox micro-economic demand theory has come in for criticism because of its apparent neglect of important psycho-sociological factor. These noneconomic ideas, when more fully-developed, may possibly contribute more to managerial economics than the "arid formalism" of conventional theory.

Robert Marris of Cambridge relates his analysis to a dynamic theory of the company. One way in which the company can grow is by diversifying its product range. Diversification can be either (a) imitative or (b) differentiated. Marris, following Duesenberry's Demonstration Effect and Relative Income hypotheses shows that conventional demand theory is inadequate for the analysis of differentiated diversification, largely because it is a static theory and consumers' demand curves are not independent. The consumer may well be concerned with 'the maximization of the rate of refinement of preferences' rather than the achievement of a stable state within a given system. Thus, Marris's theory of demand, instead of considering adjustment to price changes among established commodities, emphasizes the process of inter-personal stimulation and want-creation. People buy a product they have not previously purchased as a result of "socio-economic contact and stimulation of another consumer or family, who have already bought one, rather than because of reading or hearing advertisements." Once a person has been stimulated to buy a new commodity in this way, he possesses a "want" or "need" which he had none before. Thus, it is argued, demand is largely the result of interpersonal stimulation and want-creation.

Marris' interesting thesis is clearly related to J.K. Galbraith's Dependence Effect. According to Galbraith "one man's consumption become his neighbour's wish. There is a process by which wants are created, the more new ones are born." Galbraith's theory is less formalized than that of Marris and is part of his larger thesis on the Affluent Society.

Finally, Ronald Brech takes the view in a book designed to stimulate imagination that long-term economic analysis must include a study of the socio-psychological and sociological aspects, and in particular an analysis of the interrelationship of economic, psychological and sociological factors determining consumer behaviour. While it is relatively straight forward to project statistically economic data, Brech points out that it has not yet been possible to project over time the psychological and sociological factors.

Recognizing that an adequate psycho-socio economic analysis of demand has not yet been fully developed, Brech considers the significance of an adequate theory for such psychological factors as the new attitude to obsolescence, attitude to leisure, the significance of social status for products that offer freedom from drudgery and the significance of goods and services that offer freedom from the tension of modern life. Aspects of social changes which affect longterm demand are also considered. Such factors are education, emancipation of the housewife, younger marriages, later retirement and the size of the household.

George Katona in his book Psychological Economics has attempted an analysis of economic processes as manifestation of human behaviour from the point of view of modern Psychology. He studies the behaviour of not only consumers but also businessmen and government policy-makers in spending, saving, investing, price setting and other economic activities. This only shows how the orthodox theories are getting modified to consider the socio-economic factors at work. Much of the strength of this line of development for managerial economics would, of course, depend on the possibility of empirical estimation of the impact of these non-economic factors.

**Control and Management of Demand :**

From the standpoint of the economic unit, the company, the control or management of demand is an important task. To maintain the level of production activity of the company, the market for the company's product must be kept secured and stable. The inducement to exploit the full capacity of the company and to enlarge the capacity through new investment, depends on the size of the market, What is necessary, therefore, is not merely demand-estimates or demand-forecasts but control.or management of demand.

The large companies in the industrialised countries like the USA usually draw their production plan well in advance. If there are erratic price movements, then there will be uncertainty about the magnitude of profit or loss the company can make. It would, however, be quixotic for the company to seek control over its prices and then leave purchaser at these prices to the random fate of taste and accident. So the need arises to control what is sold at these prices. The purpose of demand management is to ensure that people buy what is produced. Attempt is made to control demand so as to avoid market-glut. Advertising is a necessary but not a sufficient step for this management; the effective management of demand calls for a control over consumer's income-earning activity, allocation of income among items of expenditure and an evaluation of a sales strategy for a particular product. It may be necessary to tailor a product—product design, model change, packaging, product performance according to customer's choice and preferences. The point remains that the control and management of demand, just like control and management of costs, is important for control and management of profit by the company.

**An Overview:**

The demand-decision-making unit may be either a household of a company or the government. The consumer behaviour pattern of these units is to be explained with reference to both economic and non-economic (socio-psychological) factors. As a prelude to this discussion, certain concepts have been defined at the outset : consumer durables, producer goods, direct and derived demand, company and industry demand etc. Among the economic determinants of demand, the reference is made to the role of factors like price, income, availability of related goods, advertisement and price expectations. The economic law of demand is discussed on the assumptions of (a) utility approach, (b) indifference curve approach and (c) revealed preference approach. Attempt is made to understand the exceptions to the law of demand in terms of concepts like negative income effect. The law of demand, which has reference to the extension and contraction of demand, is made distinct from the 'changes in demand', i.e. the increase and decrease in demand. To quantify the proportion of change in demand resulting from a change in price and/or nonprice-determinants of demand, the concept of elasticity is introduced. There are various concepts : price elasticity, income elasticity, cross elasticity, promotional elasticity and elasticity of expectations. Finally, some empirical studies on demand have been quoted to illustrate and explain the economic interpretation of various demand concepts and estimates.

# 13

# DEMAND FORECASTING

The formulation of appropriate and useful production policy is an important aspect for a company. This involves determination of level of production, manpower requirements, equipment and inventory levels etc. All these decisions are basically related to the size of production which in turn can be determined from potential demand for the product or service. Thus the starting point of all decisions related to production strategy is the product demand forecast for a specified period. To know what a business should perform we must know its future sales. In the absence of this information, both short and long term planning will rest on a foundation which is much less substantial than sand. A poor job of demand forecasting will lead to an ineffective production planning and towards an inventory that is either too large or too small.

In literary sense forecasting mean prediction. Forecasting may be defined as a technique of translating past experience into prediction of things to come. It tries to evaluate the magnitude and significance of forces that will affect future operating conditions in an company.

In the words of Garfield, "Production is an integral part of any scientific generalisation as to the relationship between two or more factors. The generalisations must hold not only with regard to the past observations but also for all future observations related to the same phenomenon. Production is even more organically related to those generalisations which establish a definite time sequence in the occurrence of certain factors".

Due to dynamic nature of market phenomenon demand forecasting has become a continuous process and requires regular monitoring of the situation.

Demand forecasts are first approximations in production planning. These provide foundations upon which plans may rest and adjustments may be made. "Demand forecast is an estimate of sales in monetary or physical units for a specified future period under a proposed business plan or programme or under an assumed set of economic and other environmental forces, planning premises outside the business organisation for which the forecast or estimate is made".

Sales forecast is an estimate based on some past information, the prevailing situation and prospects, of future. It is based on an effective system and is valid only for some specific period. The following are the main components of a sales forecasting system :

(i) Market Research Operations to get the relevant and reliable information about the trends in market.

(ii) A data processing and analysing system to estimate and evaluate the sales performance in various markets.

(iii) Proper co-ordination of steps (i) and (ii) and then to place the findings before the top management for making final decisions.

**Objectives of Demand Forecasting :**

The objectives of demand forecasting can be divided in following two categories namely (i) Short term objectives, (ii) Long term objectives.

***Short Term Objectives :***

***(a) Formulation of Production Policy :*** Demand forecasts helps in formulating suitable production policy so that there may not be any gap between demand and supply of product. This can further ensure :

*(i) Regular Supply of Material :* By the determination of desired volume of production on the basis of demand forecasts,

one can evaluate the necessary raw material requirements in future so as to ensure regular and continuous supply of the material as well as controlling the size of inventory at economic level.

(ii) *Maximum Utilisation of Machines* : The operations can be so planned that the machines are utilised to its maximum capacity.

(iii) *Regular Availability of Labour* : Skilled and unskilled workers can be properly arranged to meet the production schedule requirement.

***(b) Price Policy Formulation*** : Sales forecasts enables the management to formulate some appropriate pricing mechanism, so that the level of price does not fluctuate too much in the periods of depression or inflation.

***(c) Proper Control of Sales*** : Sales forecasts are calculated region wise and then the sales targets for various territories are fixed accordingly. This later on becomes the basis to evaluate sales performance.

***(d) Arrangement of Finance*** : On the basis of demand forecast, one can determine the financial requirements of the company for the production of desired output. This can lead to minimise the cost of procuring finance.

***Long Term Objectives :***

If period of a forecast is more than a year then it is termed as long term forecast. The following are the main objectives of such forecasts :

***(i) To decide about the Production Capacity*** : The size of the plant should be such that the output conforms with sales requirements. Too small or too large size of the plant may not be in the economic interest of the company. By studying the demand pattern for the product and the forecasts for future the company can plan for a plant/output of desired capacity.

***(ii) Labour Requirements*** : Expenditure on labour is one of the most important component in cost of production. Reliable and accurate demand forecasts can help the management to assess the appropriate labour requirements. This can ensure best labour facility and no hinderances in the production process.

*(iii)* Long term production planning can help the management to arrange for long term finances.

The analysis of long term sales is more significant than short term sales. Long term sales forecast help the management to take some policy decisions of great significance and any error committed in this may be very difficult or expensive to be rectified.

Thus, the overall success of a company mainly depends on the quality and reliability of demand forecasting.

**Importance of Forecasting :**

Production and distribution are two main activities of a company. Demand forecasts tries to maintain a balance between production and distribution policies of the company. With decentralisation of functions and increase in the size of the organisations, forecasting of demand is of great value for proper control and co-ordination of various activities.

An efficient demand forecast helps the management to take suitable decisions regarding plant capacity, raw-material requirements, space and building needs and availability of labour and capital. Production schedules can be prepared in conformity with demand requirements minimising inventory, production and other related costs.

Demand forecasting also helps in evaluating the performance of sales department.

Thus, demand forecasting is a necessary and effective tool in the hands of the management of a company to have finished goods of right quality and quantity at right time with minimum cost.

**Steps in Forecasting :**

The following are the main steps in demand forecasting:

(i) Determine the objective of the forecast.

(ii) Select the period over which the forecast is to be made.

(iii) Select the technique to be used for forecasting.

(iv) Collect the information to be used.

(v) Make the forecast.

**Techniques of Forecasting :**

Implicit in forecasting is that there exist a pattern in the past demand data which can be extrapolated or generalised for the future with the desired measure of certainty. This demand pattern though not regular is found to be stable in statistical sense.

Since the only input to the forecasting system is the past history of the demand of an item, no direct information concerning the market, the industry, the economy, the sales of competeting and complementary products, price changes, advertising campaigns and so on is used.

Forecasting methods involve construction of suitable mathematical relationship to described the appropriate demand pattern.

Management experts have developed many forecasting techniques to help managers handle the increasing complexity in management decision making. It is a tricky and experimental process. No one method of forecasting can be applied to all companies. In many cases the decisions are based on a combination of several, if not all, of these approaches. Final forecast generally include the contributions of many men of varied experience. The use of particular method depends upon the nature of the company, the products manufactured, information system in use.

Forecasts may be derived by means of sophisticated analysis or they may be the result of intuition. Organisations commonly use following five approaches for demand forecasting:

A. Subjective approach :
   (i) Expert opinion or Judgemental approach.
   (ii) Survey of buyer's intention.

B. Statistical Methods :
   (i) Extension of past history.
   (ii) Association with other events.

Each of these techniques has a special use, and the more we understand the better are the chances that our forecasting efforts will be successful.

***Opinion or Judgemental forecasts :*** It is one of the most widely used and influential forecasting technique where the opinions and intuition of management is utilised. The process brings together in an organised manner, personal judgements about the process being analysed. Main reliance is on human judgement.

In this method, the executive uses his own anticipation and what he hears from others. Outside experts are also consulted and the other executive heads are also required to give their opinion in the matter. Salesmen are to provide information about customer's attitude and preferences and the activities of competitors. Thus all possible information from the opinions of various persons is combined together to change the subjective opinions into quantitative forecasts.

No doubt experts and experienced managers can be useful as guides and serve as reliable source of information, but one has to make his own decision from all the opinions. Thus in this method broad guess is made by the executive incharge of a business. There are following advantages and disadvantages of opinion technique of forecasting:

*Advantages :*

(i) simple and easy to understand.

(ii) no specialised skill is required i.e. less mathematical sophistication.

(iii) low cost.

(iv) is based on the information or opinion of the persons who are directly involved in the system.

(v) can be used when satisfactory data is not available.

*Disadvantages :*

(i) opinions and intuitions are highly subjective.

(ii) personal estimates are likely to be biased.

(iii) time required to take the decision may be more.

(iv) results can be easily distorted.

(v) lacks scientific validity.

(vi) is not based on valid facts.

(viii) the method is not useful for long term planning.

The method can be useful for many new products or new service estimator where sufficient past experience is not available.

*Consumer's Opinion Surveys :* This is a straight forward method to make short-term sales forecasts. The consumers are directly contacted by the investigators and their preferences and attitude towards the product as well as future requirements are ascertained. This information is then used to project the sales for future.

This method is appropriate when the consumers of the product are industrial producers, purchasing the item in large quantities.

This method is not suitable to make long-term forecasts for the consumer or household products, which are affected by change of attitudes and fashions.

*Extensions of Past History :* Basically all statistical approaches of forecasting, project historical information into the future. These are based on the assumption that future patterns tend to be extensions of past ones and that one can make useful predictions by studying the past behaviour, i.e., the factors which were responsible in the past will also be operative to the same extent in future.

Some companies have detailed sales record item wise as well as territory wise. These sales record can be utilised to make useful predictions. The information should be complete with respect to events, policies, quality of the product etc. from period to period. Such information in general is known as Time series data. The time series for any phenomenon is composed of three components (i) Trend (ii) Seasonal variation and (iii) Random fluctuations. Trend exhibits the general tendency of the data and is known as long period or secular trend. This can be either upward or downward, depending on the behaviour.

Seasonal components give information about the seasonal or cyclical behaviour of the phenomenon. These are repetitive in nature.

Random variations are chance variations and cannot be used for forecasting.

Mostly trend is used for forecasting in practice. There are many methods to determine trend. Some of the methods are :

(i) Graphical method.

(ii) Least square method.

(iii) Moving average method.

***(a) Graphical Method :*** In this method the period is taken on X-axis and the corresponding sales values on y-axis and the points are plotted for given data on graph paper. Then a free hand curve passing through most of the plotted points is drawn. This curve can be used to forecast the values for future. The method is explained by the following example.

***Example 1 :*** The demand for a product is continually diminishing.

Estimate the demand for 1974 with the help of following information:

| Year | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| Demand in 1000 units | 75 | 70 | 72 | 69 | 50 | 54 | 37 |

***Solution :*** Plot a graph for the given data to find the demand for 2004 see fig. 1.

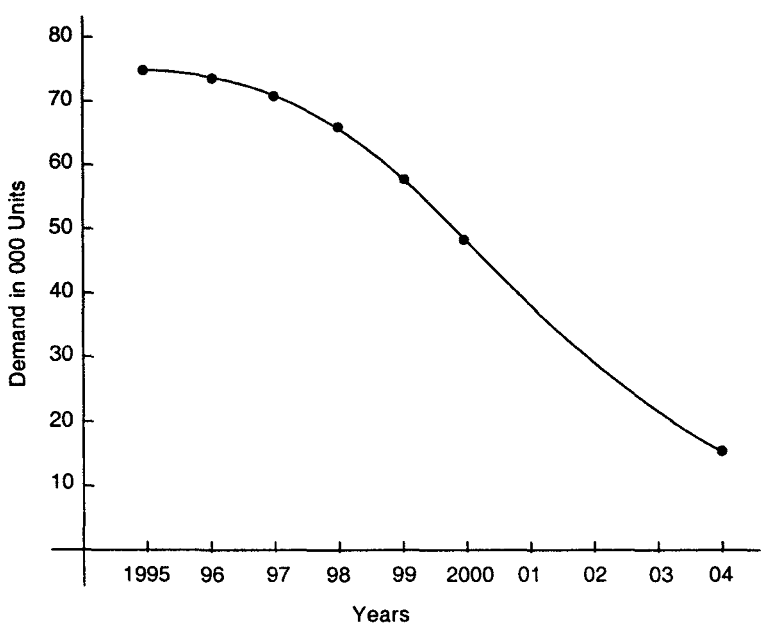



*Fig. 1*

From the graph the demand for 2013 comes out to be approximately 20,000 units.

It is an approximate method as the shape of the curve mainly depends on the choice of scale for the graph and the individual who draws the free hand curve.

*(b) **Least Squares Method :*** This is one of the best method to determine trend. In most cases, we try to fit a straight line to the given data. The line is known as 'Line of best fit' as we try to minimise the sum of the squares of deviation between the observed and the fitted values of the data. The basic assumption here is that the relationship between the various factors remains unchanged in future period also.

Let Y denote the demand and X the period for a certain commodity. Then the linear relationship between Y and X is given by

$$y = a + bx \tag{1}$$

the nature of the relationship is determined by the values of a and b. The values of a and b can be estimated with the help of the past information about Y and X. If x and y denote the deviations of X and Y from their respective means, then the least square estimates of a and b are given by

$$\hat{a} = \frac{\Sigma y}{n} \tag{2}$$

$$\hat{b} = \frac{\Sigma xy}{\Sigma x^2}$$

where n is the number of observations. The calculation of $\Sigma y$, $\Sigma xy$ and $\Sigma x^2$ can be done with the help of given data on Y and X and using the following steps.

Steps in least square calculations:

(i) Find means of Y and X say $M_y$ and $M_x$

$$M_y = \frac{\Sigma Y}{n} \qquad M_x = \frac{\Sigma X}{n} \tag{3}$$

(ii) Find deviations of X and Y from their means i.e.

$$x = X - M_x \text{ and } y = Y - M_y$$

(iii) Multiply corresponding deviations of X and Y and find their sum to get $\Sigma xy$.

(iv) Find the square of the deviations for X and take the sum to get $\Sigma x^2$.

(v) Use (2) to estimate the values of $\hat{a}$ and $\hat{b}$.

The method is illustrated by the following examples.

***Example 2 :*** Find the trend by least square method for data in Example 1, and forecast the demand for the year 2015.

***Solution :*** Let the trend line be given by

$$Y = a + bX,$$

where X denotes Time and Y the corresponding demand.

*Table 1*

| Year X | Demand in 000 units Y | Deviation of X from 1968 | $X^2$ | xy | Trend values |
|---|---|---|---|---|---|
| 2004 | 75 | -3 | 9 | -225 | 61+(-6x-3)=79 |
| 2005 | 70 | -2 | 4 | -140 | 61+(-6x-2)=73 |
| 2006 | 72 | -1 | 1 | -72 | 61+(-6x-1)=67 |
| 2007 | 69 | 0 | 0 | 0 | 61+(-6x-0)=61 |
| 2008 | 50 | 1 | 1 | 50 | 61+(-6x-1)=55 |
| 2009 | 54 | 2 | 4 | 108 | 61+(-6x2)=49 |
| 2010 | 37 | 3 | 9 | 111 | 61+(-6x3)=43 |
| n=7 | $\Sigma Y$=427 | $\Sigma x$=0 | $\Sigma x^2$=28 | $\Sigma xy$=168 | |

The by least squares method

$$\hat{a} = \frac{\Sigma y}{n} \quad \text{and} \quad \hat{b} = \frac{\Sigma xy}{\Sigma x^2}$$

The calculations can be done in the tabular form 1.

Here x = X–(some value of X in middle).

Now Y = a + bX

and if we take deviations of X from its mean, then

$$Y = \hat{b} + ax$$

where

$$\hat{a} = \frac{\Sigma y}{n} \qquad \hat{b} = \frac{\Sigma xy}{\Sigma x^2}$$

From table (1), $\Sigma y = 427$, $n = 7$, $\Sigma x^2 = 28$ and $\Sigma xy = -168$.

Hence $\hat{a} = \frac{427}{7} = 61 \qquad \hat{b} = \frac{\Sigma xy}{\Sigma x^2} = -\frac{168}{28} = -6$

So the line of best fit is

$Y = 61 - 6x$, but $x = X - M_x$

$= 61 - 6\,(X - M_x)$, $\quad Mx = \Sigma x/n = 2007$

$= 61 - 6\,(X - 2007)$

For $X = 2015$

$Y = 61 - 6\,(2015 - 2007)$

$Y = 61 - 6 \times 7 = 61 - 42 = 19 = 25000$ units

***Example 3 :*** The product group sales and product M sales are given below :

| Years | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|
| Product Group Sales (in Rs.) | 1,00,000 | 1,50,000 | 1,25,000 | 1,75,000 |
| Product M Sales (in Rs.) | 20,000 | 37,500 | 37,500 | 61,250 |

Fit a linear trend and forecast the sales (both product group and product M) for the year 2011.

***Solution :*** Let years be denoted by X and product group sales by Y. Then linear trend of year X is given by

$$Y = a + bX$$

The unknown constants 'a' and 'b' can be estimated by least square method. The calculation can be done in the following tabular form.

| Year X | x= $\frac{x-1973.5}{5}$ | $x^2$ | Product group Sales Y in Rs. '000 | xy | Product M sales in Rs. '000 | Percentage of Product M Sales w.r.t. group Sales% |
|---|---|---|---|---|---|---|
| 2007 | -3 | 9 | 100 | -300 | 20 | 20 |
| 2008 | -1 | 1 | 150 | 150 | 37.5 | 25 |
| 2009 | 1 | 1 | 125 | 125 | 37-5 | 30 |
| 2010 | 3 | 9 | 175 | 525 | 61.25 | 35 |
| n=4 | $\Sigma x=0$ | $\Sigma x^2=20$ | $\Sigma y=550$ | $\Sigma xy=200$ | 156.25 | |

Now $\hat{a} = \frac{\Sigma Y}{n} = \frac{550{,}000}{4} = 1{,}37{,}500 = 1{,}37{,}000$

$$\hat{b} = \frac{\Sigma xy}{\Sigma x^2} = \frac{200{,}000}{20} = 10{,}000$$

Hence the liner trend is

$$Y = 1{,}37{,}500 + 10{,}000 \left(\frac{X-1973.5}{.5}\right)$$

For X = 2011, forcast of Group Sales will be

$$Y = 1{,}37{,}500 + 10000 \left(\frac{2011-2008.5}{.5}\right)$$

$$= 1{,}37{,}500 + 10000\ (5)$$

$$= 1{,}87{,}500.$$

***Forecast for Product 'M' sales in 2011 :*** It can be observed from the percentages of Product 'M' sales w.r.t Group sales, that every year there is an increase of 5% from the percentage of the preceding year. Hence the percentage of Product 'M' sales in 2011 will be 40% of group sales in 2011.

i.e. $\frac{40 \times 1{,}87{,}500}{100} = \text{Rs. } 75{,}000$

***Note :*** If the pattern of change in percentage is not clear then one can take the average of the percentage of all the four years and forecast the sale for Product 'M' e.g. in this case the average percentage is (20 + 25 + 30 + 35) / 4 = 27.5 and 27.5% of 1,87,500 is Rs. 51,562.50 is the sales of Product M in 2011.

**Advantages of Least Squares Method :**

(i) There is no need to conduct any sample survey as only past information about sales is required.

(ii) Method is simple and easy to understand.

(iii) Under normal situations the method is likely to give reliable and accurate results.

**Disadvantages of Least Squares Method :**

(i) The method is based on some mathematical formulae which may not be understood by common man.

(ii) The assumption that other things remaining constant may not hold good in practice.

*Method of Moving Averages* : This method can be used to determine the trend values for given data without going into complex mathematical calculations. The calculations are based on some pre-determined period in weeks, months, years etc. The period depends on the nature of characteristics in the time series and can be determined by plotting the obsrvations on graph paper.

A moving average is an average of some fixed or pre-determined number of observations (given by the period) which moves through the series by dropping the top item of the previous averaged group and adding the net item below in each successive average.

The calculation depends upon the period to be odd or even.

In the case of odd order periods (3, 5, 7, ...) the average of the observations is calculated for the given period and the calculated value is write in front of central value of the period e.g. for a period of 5 years, the averse of the values of five years is calculated and is recorded against the third ear. Thus in case of five yearly moving averages, first two years and last two years of the data will not have any average value.

If period of observations is even e.g. four years, then the average of the our yearly observations is written between second and 3rd year values. After this centering is done by finding the average of the paired values. The method is illustrated by solving example 4.

The even order periods creates the problem of centering between the periods. Due to this generally odd order periods are preferred.

The calculated values of the moving averages became the basis for determining the expected future sales.

If the underlying demand pattern is stationary i.e. at a constant mean demand level except, of course, for the superimposed random fluctuations or node, the moving averages method provides a simple and good estimate. In the method equal weightage is assigned to all the periods chosen for averaging.

The moving average method for forecasting suffers from the following defects:

(i) Records of the demand data have to be retained over a fairly long period.

(ii) If demand series depicts trend as against the stationary level the moving average method would provide forecasts that lags the original series.

*Example 4* : The following are the annual sales in thousands of a a product during the period 2000-2010. Find the trend of the sales using (i) 3 yearly moving averages (ii) four yearly moving averages and forecast the value for the year 2012.

| Year | Sales in 000 units | Year | Sales in 000 units | Year | Sale in 000 units |
|---|---|---|---|---|---|
| 2000 | 12 | 2004 | 18 | 2008 | 22 |
| 2001 | 15 | 2005 | 17 | 2009 | 25 |
| 2002 | 14 | 2006 | 19 | 2010 | 24 |
| 2003 | 16 | 2007 | 20 | | |

*Solution* : The trend values can be calculated in the following tabular form:

(i) 3 Yearly Period :

| Year | Sale in 000 units | Three yearly moving total | 3 yearly moving average Trend Values |
|---|---|---|---|
| 2000 | 12 | | |
| 2001 | 15 | 41 | 41/3=13.7 |
| 2002 | 14 | 45 | 45/3=15 |
| 2003 | 16 | 48 | 48/3=16 |
| 2004 | 18 | 51 | 51/3=17 |
| 2005 | 17 | 54 | 54/3=18 |
| 2006 | 19 | 56 | 18.7 |
| 2007 | 20 | 61 | 20.2 |
| 2008 | 22 | 67 | 22.3 |
| 2009 | 25 | 71 | 23.7 |
| 2010 | 24 | | |

e.g. 41 = value of 2000 + value of 2011 + 2012

= 12 + 15 + 14 = 41 written at the central period 2011 of the years 2010, 2011 and 2012.

(i) Four yearly moving averages :

*Table 4*

| Year | Sale in 000 units | 4 Yearly * moving total | Moving Total** of Pairs of 4 yarly totals | 4 yearly moving average |
|---|---|---|---|---|
| 2000 | 12 | | | |
| 2001 | 15 | | | |
| 2002 | 14 | 54 | 120 | 120/8=15 |
| 2003 | 16 | 63 | 128 | 128/8=16 |
| 2004 | 18 | 65 | 135 | 135/8=16.9 |
| 2005 | 17 | 70 | 144 | 144/8=18 |
| 2006 | 19 | 74 | 152/8 | 152/8=19 |
| 2007 | 20 | 78 | 164 | 164/8=20.5 |
| 2008 | 22 | 86 | 177 | 177/8=22.1 |
| 2009 | 25 | 91 | | |
| 2010 | 24 | | | |

* 57 = Value of 2000 + value of 2002 + value of 2003

= 12 + 15 + 14 + 16

= 57 written between 2001 and 2002.

**120 = 57 + 63, 128 = 16 + 65, ..... written in the centre of 2001, 2002, 2003, i.e., 2011, 2012

*** 120 ios the total 8 years, so average is caluclated by dividing 120 from 8

To avoide the problem of centring, generally odd periods are taken for moving averages computations.

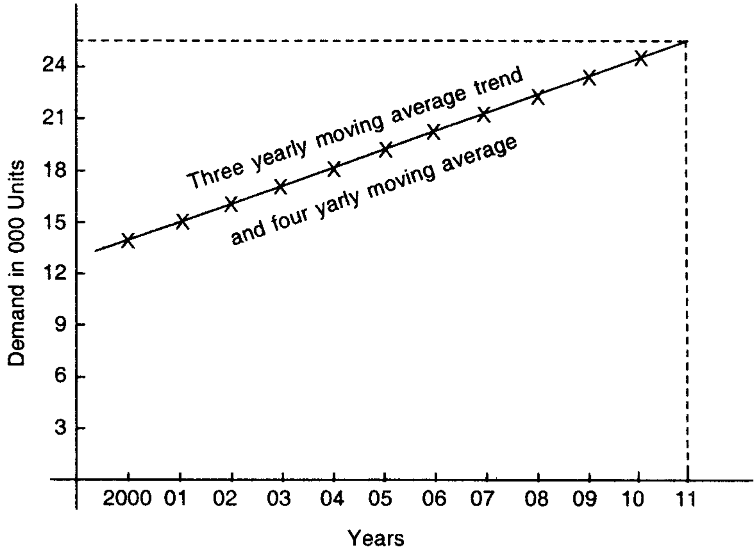



*Fig. 2*

**Forecast for the year 2012 :**

The trend values from the table 3 and 4 can be plotted on graph paper to estimate the value 2012 see fig. 2.

Sale of 2012 from three yearly moving average Trend is 25000 units.

Trend value for 3 yearly and 4 yearly moving averages is almost same.

**Merits of Moving Average Method :**

(i) The method is simple and easy to apply in practice.

(ii) It is based on mathematical calculations.

(iii) More accurate than graphical method.

**Demerits of Moving Average Method :**

(i) Choice of period of moving average is difficult.

(ii) Cannot be applied if some observations are missing.

(iii) Some trend values for the periods in the beginning as well as in the end cannot be determined.

(iv) When the period of the moving average coincides with the periodicity in the data, if any, then the trend values may not be representative.

*Association with other Events :* The sale of any commodity does not depend on time only but there are some other economic factors viz. change in population, income, size of the families, tastes of the consumer, environment etc. which can affect the demand of a product. The nature of relationship between these factors and the sales can be used to forecast future sales.

Assuming the relationship to be linear, the regression of Y on X can be defined as

$Y = a + bX$, a and b can be estimated by least square methods.

or $$Y - \overline{Y} = r\frac{\sigma y}{\sigma x}(X - \overline{X})$$

where Y and X are the means of Y and X and $\sigma y$ and $\sigma x$ are their respective standard deviations, r is the simple correlation coefficient between X and Y. The two relationships can be used to forecast the value of Y for given X.

The following are the various steps in the method :

(i) Verify whether there exists any relation between the demand of the product and the corresponding economic indicator or not.

(ii) If the relationship exists, then assuming the relationship to be linear, estimate the equation $Y = a + bX$ by least square method or find the regression equation of Yon X.

(iii) It is not necessary that the same relationship as in past may hold good in future also. Thus there is a need of proper judgement and consideration of new factors as well.

The technique appears to be easy and simple to apply in practice. But it is difficult to select the appropriate economic indicator which can affect the sales. The method requires specialised skill and in some situations there may be a necessity to change the economic indicator of past data due to changes in fashion, nature and customs.

The method is illustrated by the following example :

***Example 5 :*** The following is the demand of room coolers in five towns during the year 2010. Fit a regression line of Y on X and estimate the demand of coolers for a city of population 50 lakhs.

| Towns | A | B | C | D | E |
|---|---|---|---|---|---|
| Population in Lakhs (X) | 4 | 6 | 7 | 10 | 13 |
| Demand for room coolers (Y) | 40 | 60 | 50 | 70 | 90 |

***Solution :*** The regression equation is given by

$$Y - \overline{Y} = r\frac{\sigma y}{\sigma x}(X - \overline{X})$$

The following calculations can be made from the given data

$$\overline{Y} = \frac{\Sigma Y}{n} = \frac{310}{5} = 62 \qquad \Sigma X^2 = 370 \qquad \Sigma XY = 2740$$

$$\overline{X} = \frac{\Sigma X}{n} = \frac{40}{5} = 8 \qquad \Sigma Y^2 = 20700 \qquad n = 5$$

$$\sigma X = \sqrt{\left\{\frac{\Sigma X^2}{n} - \left(\frac{\Sigma X}{n}\right)^2\right\}}$$

$$= \sqrt{\left\{\frac{370}{5} - (8)^2\right\}}$$

$$= \sqrt{(74 - 64} = 3.16$$

$$\sigma Y = \sqrt{\left\{\frac{\Sigma Y^2}{n} - \left(\frac{\Sigma Y}{n}\right)^2\right\}}$$

$$= \sqrt{\left\{\frac{20700}{5} - (62)^2\right\}}$$

$$= \sqrt{(4140 - 3844} = 17.20$$

$$r = \frac{\Sigma XY - \left(\frac{\Sigma X \Sigma Y}{n}\right)}{n.\sigma x.\sigma y}$$

$$= \frac{2740 - 2480}{5 \times 3.16 \times 17.20} = 0.96$$

Thus the regression equation of Y on X is

$$(Y - 62) = 0.96 \frac{17.20}{3.16}(X - 8)$$

$= 5.22$ (X-8)

i.e. $Y = 62 + 5.22$ (X-8)

For X=50 lakhs, the estimated demand for cooler will be

$Y = 62+5.22\ (50 - 8)$

$= 281.24$ coolers.

**Some Other Methods of Demand Forecasting :**

There are some other forecasting methods used by various enterprises in different situations.

Each method has its own advantages and disadvantages. Some of these methods are :

(i) Market Research Method

(ii) Exponential Smoothing Method and Box Jenkins Method.

(iii) Method of Simulation.

(iv) Markovian Process Method.

***Market Research Method*** **:** This method is generally used by big companies. A separate marketing research cell is established in the organisation which collects the required information both from internal and external sources for sales forecasting. Field surveys are also conducted to get direct information from the potential consumers and the retailers. The collected information is processed and analysed by the department of the company using statistical techniques like time series analysis, correlation analysis etc.

The following are the advantages and disadvantages of this method :

*Advantages of Market Research Method :*

(i) Helps in quick decision making by supplying regular and systematic information.

The accuracy of the results can be tested by statistical methods. detailed study of the problem is possible.

*Disadvantages of Market Research Method :*

(i) Method is expensive and can be afforded by big organisations only.

(ii) the results should be regularly reviewed and adjusted to changing conditions.

***Exponential Smoothing Method :*** This method is an improvement over moving average method of forecasting. It tries to overcome the limitations of moving averages and eliminates the necessity of keeping extensive records of past data. It also tries to screen out the irregularities in the demand pattern. The method allows for trend and takes into consideration the short term fluctuations in the determination of the forecast.

Exponential Smoothing is also a weightage average of the observations. Here the most recent observation is assigned the highest weightage and it decreases in geometric progression as we move towards the older observations. It is considered to be more realistic than moving average where past observations carries just as much weight as latest. In fact the later figures will tend to reflect the more upto date average of the series and it would be better if they could be given more weight than the earlier figures in the calculation. Exponential weighting is, however, a neater and easier method of achieving a progressive from of weighting. Here all one does each period is to suitably weight and then add together the current figure and the previous period's moving average.

The fundamental concept of exponential smoothing method is that: New estimate = old estimate of latest actual demand

+ $\alpha$ (Latest actual demand

– old estimate of latest actual demand).

$F_t = D_t + (1-\alpha)\, F_{t-1} = F_{t-1} + \alpha\, e_t$

where $F_t$ is the Forecast at time t

$D_t$ is the actual demand at time t

$F_{t-1}$ is the forecast at time (t–1)

$\alpha$ is the smoothing coefficient, $e_t = (D_t - F_t - 1)$

The computational procedure is summarised below:

(i) Find error by subtracting the recent average from the latest incoming observation.

(ii) Multiply error $e_t$ by $\alpha$. This is the correction to be applied to the past average,

(iii) Add correction ($\alpha$ $e_t$) to the past average, $F_{t-1}$. This gives new average $F_t$ as the forecast for the next period.

The performance of this method depends on the value of the smoothing co-efficient a and the initial forecast $F_{t-1}$).

The selection of a value for a gives the selector a measure of control over the degree of smoothing induced in the series and its choice depends on how much weight is desired to be given to later periods relative to earlier periods. A low value of a gives more weightage to the past figures and less consideration to incoming observation. Low values of the smoothing coefficient are used where the series is rather stable and high values where the series is fluctuating. Thus the size of a will depend on the speed with which one wishes to respond to real changes in demand. This has to be weighed against the risk of making forecasts errors. The value of a lies between 0 and 1.

Although a high smoothing constant keeps the average more closely alligned to the actual figures but it do not necessarily contribute to better forecasts and is unduly influenced by random variations. If cyclical fluctuations are predominant in forecast then one should take low value of a and in case long term fluctuations are more dominant then take high value of a. Two main factors should be considered in selection of a

(i) distribution of random errors.

(ii) costs associated with forecasting errors.

In practice a is generally chosen between 0.1 and 0.3.

The choice of initial forecast $F_{t-1}$ is either based on subjective estimates or as simple arithmetic average of the past few periods. Here one may have some inaccuracy in earlier forecasts but may take quite a few periods for the forecasting model to wash out the effects of this approximation.

The method is illustrated by the following example :

***Example 6 :*** Forecast the demand for the following series by exponential smoothing method :

| Period | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Actual | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| demand | 10 | 12 | 8 | 11 | 9 | 10 | 15 | 14 | 16 | 15 | 14 | 15 |

***Solution :*** The forecasts for various periods can be calculated in the following tabular form. Here we consider $\alpha = 0.1$ and then compare the forecasts for $\alpha = 0.7$.

The initial forecast is taken to be 10 for period 1 :

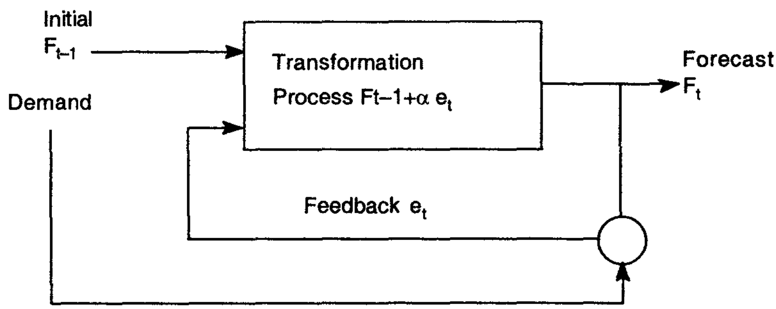
| Period | Actual Demand | $F_{t-1}$ | $\alpha$=0.1 $F_t$ | $e_t$ | $F_{t-1}$ | $\alpha$=0.7 $F_t$ | $e_t$ |
|---|---|---|---|---|---|---|---|
| 0 | | | 10 | | | 10 | |
| 1 | 10 | 10.00 | 10 | 0.0 | 10 | 10 | 0.0 |
| 2 | 12 | 10.00 | 10.20 | 0.2 | 10 | 11.40 | 2.0 |
| 3 | 8 | 10.20 | 9.98 | -2.20 | 11.40 | 9.02 | -3.40 |
| 4 | 11 | 9.98 | 10.08 | 1.02 | 9.02 | 10.41 | 1.98 |
| 5 | 9 | 10.08 | 9.97 | -1.08 | 10.41 | 9.42 | -1.41 |
| 6 | 10 | 9.97 | 9.97 | 0.03 | 9.42 | 9.83 | 0.58 |
| 7 | 15 | 9.97 | 10.47 | 5.03 | 9.83 | 13.45 | 5.17 |
| 8 | 14 | 10.47 | 10.82 | 3.53 | 13.45 | 13.84 | 0.55 |
| 9 | 16 | 10.82 | 11.34 | 5.18 | 13.84 | 15.35 | 2.16 |
| 10 | 15 | 11.34 | 11.71 | 3.66 | 15.35 | 15.11 | -0.35 |
| 11 | 14 | 11.71 | 11.94 | 2.29 | 15.11 | 14.33 | -1.11 |
| 12 | 15 | 11.94 | 12.25 | 3.06 | 14.33 | 14.80 | 0.67 |

$$\text{Now we calculate MDA} = \frac{\Sigma|e_t|}{12}$$

$= 2.42$ for $\alpha = 0.1$ and $1.62$ for $\alpha = 0.7$

since MAD for $\alpha = 0.7$ is lesser than MAD for $\alpha = 0.1$, $\alpha = 0.7$ gives better forecast.

*Exponential Smoothing Forecasting System*




Exponential smoothing provides a convenient, systematic and recursive method for revising the forecast for the next period whenever discrepancy exists between the previously forecast demand for current period and the actual demand for current period. The amount of adjustment is determined by the selected smoothing coefficient-the greater the coefficient the greater is the adjustment and vice-versa.

**Box - Jenkins Method :**

This forecasting approach has been borrowed from the control theory. In a control system, there is a target which has to be tracked where the target itself is moving or changing its value or position. The control mechanism measures the difference between the target and actual output. Analogous to the target is the demand in the forecasting system that is sought to be tracked by the forecasting. Any error is used alongwith its derivatives and integrals for improving the forecast for the next period and so on.

The basic equation is

New Forecast = Old forecast + the direct term : A (error in old forecast) + time derivative term : B (change in error between last time and time immediately before) + the integral term : C (sum of the errors so far)

$$F_t = F_{t-1} + (r-1)(e_{t-1} - e_{t-2}) + r_e(e_t - 1) + r_1 \sum^{t-1} e_t$$

***Method of Simulation :*** There are many problems experienced in every day life which cannot be satisfactorily represented by some mathematical model or sometimes the model becomes so much complicated that its solution by analytical method is not possible. In such situations Simulation or Monte-Carlo methods are found to be useful.

The name Monte-Carlo has been generally used for a method where distribution functions are determined with the help of random numbers. Pioneers in the field are Von Neumann, Ulam and Fermi.

A simulation model is an image of reality which allows the solution of a problem by trial and error approach. Dr. A.S. Householder defines Monte-Carlo technique as the device for studying an artificial stochastic model of a physical or mathematical process. Simulation methods are combinations of probability and sampling methods, providing solutions to complicated problems. It is particularly useful in situations where it is not possible to gain practical experience because one has to deal a problem which has not yet arisen. A good simulation model should be (i) accurate, (ii) acceptable to the problem and (iii) quick to generate.

General simulation method is based on the selection of random numbers from random number tables and these numbers are considered to be the probabilities of desired characteristic understudy drawn from the parent population. The random numbers are recorded from the random number tables in a systematic way i.e. once recording of the numbers is done from any arbitrary place in the table then the successive numbers are to be recorded from the chosen point till required observations are drawn It is assumed that the characteristics of the observations in the sample as well as the population are same.

Following are the important steps in Simulation method of forecasting:

(i) Past behaviour of the system is determined by conducting some preliminary survey. Generally this is done with the past data available in records,

(ii) Some appropriate model is selected for the system with the help of sample observations obtained in step (i).

(iii) The model in Step (ii) is used to determine the probability distribution of the characteristic under study. The probability distribution can be easily changed into cumulative distribution function.

(iv) Random numbers are chosen from random number tables and are then used to find the sequence of values of the variable of interest,

(v) Some standard mathematical function is fitted to the values obtained in step (iv).

The application of simulation method for demand forecasting is explained with the help of the following example.

***Example 7 :*** A fish market owner wishes to generate a series of Friday's demand for mullet. It has been determined from past demand data that the demand is normally distributed with mean values 175 kg. and standard deviation 25 kg.

***Solution :*** It is well known that 99.7% of the observations in standard normal population lies in $M \pm 3\sigma$ limits, where M and $\sigma$ are respectively the mean and standard deviation of the normal population.

Here also the demand of mullet is given to be normally distributed with mean 175 and standard deviation 25. Thus 99.7% of the demand will be between 1 75±3 (25) i.e. 1 00 and 250 limits.

So we take some values between 100 to 250. Convert these into standard normal variant by the formula

$$Z = \frac{X - M}{\sigma}$$

and then read the cumulative probabilities from standard normal tables. The calculations can be recorded in the tabular form. (Table 5 )

*Table 5*

| Demand X | M = 175, $\sigma$ = 25 Standard normal variate $Z=(X-M)/\sigma$ | Cumulative Probabilities Px |
|---|---|---|
| 100 | - 3 | 0.0013 |
| 125 | - 2 | 0.0228 |
| 150 | - 1 | 0.1587 |
| 175 | 0 | 0.5000 |
| 200 | 1 | 0.8417 |
| 225 | 2 | 0.9772 |
| 250 | 3 | 0.9987 |

Table 5 provides the fitted distribution of demand for meat. These values are then plotted on the graph paper taking demand X on X-axis and the corresponding probabilities on Y-axis to get the graph in Fig. 3.

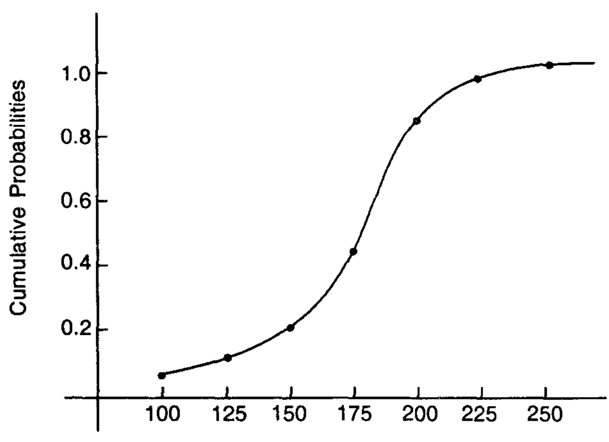



*Fig. 3*

Now to generate the Friday demand, random numbers are recorded from random number tables. Let the numbers be 22,36, 84....... The demand for each number can be read from the graph in fig. 3 e.g. the number 84 in terms of probability can be taken as 0.84 and the demand for p(x) = 0.84 from graph 3 is approximately equal to 200 kg. Similarly demand for other random numbers can be estimated.

*Example 8 :* A bakery has collected the following data on week end demands for cakes.

| ***No. of cakes in hundreds*** | ***Frequency*** |
|---|---|
| 12 | 1 |
| 13 | 3 |
| 14 | 9 |
| 15 | 11 |
| 16 | 15 |
| 17 | 13 |
| 18 | 17 |
| 19 | 14 |
| 20 | 12 |
| 21 | 3 |
| 22 | 2 |

Simulate requirements for 10 week ends.

***Solution :*** Here first of all the probability distribution from the given data is determined by preparing the following table.

*Table 6*

| ***Demand*** | ***Frequency*** | ***Cumulative frequency*** | ***Random No. Interval*** |
|---|---|---|---|
| 12 | 1 | 1 | 00-01 |
| 13 | 3 | 4 | 02-04 |
| 14 | 9 | 13 | 05-13 |
| 15 | 11 | 24 | 14-24 |
| 16 | 15 | 39 | 25-39 |
| 17 | 13 | 52 | 40-52 |
| 18 | 17 | 69 | 53-69 |
| 19 | 14 | 83 | 70-83 |
| 20 | 12 | 95 | 84-95 |
| 21 | 3 | 98 | 96-98 |
| 22 | 2 | 100 | 99-100 |

Now for simulating the demand for 10 weekends read the 10 random numbers from the random number tables.

| Day | Random No. | Random No. Interval | Simulated demand |
|---|---|---|---|
| 1 | 9 | 05-13 | 14 |
| 2 | 73 | 70-83 | 19 |
| 3 | 25 | 25-39 | 16 |
| 4 | 33 | 25-39 | 16 |
| 5 | 76 | 70-83 | 19 |
| 6 | 53 | 53-69 | 18 |
| 7 | 01 | 00-01 | 12 |
| 8 | 35 | 25-39 | 16 |
| 9 | 86 | 84-95 | 20 |
| 10 | 34 | 25-39 | 16 |

*Markovian Process Method* : Any stochastic process which develops with time according to some law of probability is known as Markov process. At every point of time the process is exactly in one of its possible states. The possible states of a Markovian process are the list of all possible outcomes at some point of time.

A Markov process is characterised by its transitional matrix which is a set of initial and transitional probabilities. The transitional matrix gives the step by step transitional probabilities of a Markov, process. The matrix have following properties:

(i) each element of the matrix should be some probability.

(ii) the sum of the elements of each row in the matrix should be equal to one i.e. the process at some point of time should be in any one of the states.

The concept can be explained with the help of the following example.

*Example 9* : Three manufacturers A, B and C are competing with each other. The following matrix gives the transitional probabilities that customers will move from one manufacturer to the other in any month. Interpret the matrix in terms of (a) retention and loss (b) retention and gain.

| | To | | |
|---|---|---|---|
| **Form** | **A** | **B** | **C** |
| A | 0.7 | 0.1 | 0.2 |
| B | 0.1 | 0.8 | 0.1 |
| C | 0.2 | 0.1 | 0.7 |

***Solution :*** Each element of the matrix has a value between 0 and 1 and the sum of elements in each row is exactly one. Thus the given matrix is transition matrix.

Each row of the matrix can be used to interpret the monthly retention and loss by each manufacturer.

Row I : It is observed that A retains 70% of its customers but looses 10% to B and 20% to C.

Row II : B retains 80% of its customers but looses 10% to A and 10% to C.

Row III : C retains 70% of its customers but looses 20% to A and 10%toB.

Now suppose in the beginning there were 1000 customers with A, 2000 with B and 3000 with C, what will be the number of customers with each one of them after one month?

Using the above transition matrix, the following will be the number of customers with each manufacturer:

| | *To* | | |
|---|---|---|---|
| ***From*** | ***A*** | ***B*** | ***C Total*** |
| A | 0.7X1000=700 | 0.1X1000=100 | 0.2X1000=200 1000 |
| B | 0.1X2000=200 | 0.8X2000=1600 | 0.1X2000=200 2000 |
| C | 0.2X3000=600 | 0.1X3000=300 | 0.7X3000=2100 3000 |
| ***Total*** | ***1500*** | ***2000*** | ***2500 6000*** |

Thus A gains 500 customers, B have the same number of customers, whereas C looses 500 customers.

***Example 10 :*** Suppose an experiment is conducted and it is found that the system is stable and is of Markovian Type. The market system is divided into two categories at any time 't', Non-customers and customers. It is observed that over some specified interval of time, 40% of the Non-customers change to customer in the market whereas 30% of the customers leave the market. The information is collected for 200 people. The information can be expressed in the following matrix form:

| | *Time t+1* | |
|---|---|---|
| ***Time: t*** | ***Non-customers*** | ***Customers*** |
| | $NC_2$ | $C_2$ |
| Non-customers $NC_1$ | 60 | 40 |
| Customers $C_1$ | 30 | 70 |

These figures can be converted into transitional probabilities by dividing each row from 100. So the matrix of transitional probabilities will be

| | Time t + 1 | |
|---|---|---|
| Time | $NC_2$ | $C_2$ |
| $NC_1$ | 0.6 | 0.4 |
| $C_1$ | 0.3 | 0.7 |

Let there be 10,000 people at time t=1, then from the above transitional matrix we can find the Non-customers and customers at time $t_2$, using the relations.

Non-customers at time $t_2$ i.e. $NCt_2 = 0.6\ NCt_1 + 0.3\ Ct_1$

Customer at time $t_2$, i.e., $Ct_2 = 0.4\ NCt_1 + 0.7Ct_1$

In the beginning at time t = 1 all people are Non-customers. Thus at t=1, $NCt_1$ =10,000 and $Ct_1$ =0.

Hence

$$NCt_2 = 0.6(10{,}000) + 0.3(0) = 6000$$

$$Ct_2 = 0.4\ (10{,}000) + 0.7(0) = 4000$$

Assuming the behaviour of the customers and Non-customers to be uniform at different time periods, we can calculate the Non-customers and customers and different time periods, using the information of the preceding period e.g.

$$NCt_3 = 0.6\ NCt_2 + 0.3Ct_2$$

$$Ct_3 = 0.4\ NCt_2 + 0.7Ct2$$

i.e. $NCt_3 = 0.6\ (6000) + 0.3\ (4000) = 4800$

$$Ct_3 = 0.4\ (6000) + 0.7\ (4000) = 15200$$

Similarly

$$NCt_4 = 0.6\ (4800) + 0.3\ (5200) = 4440$$

$$Ct_4 = 0.4\ (4800) + 0.7\ (5200) = 5560$$

The process is continued till there is very little difference between the values of Non-customers or customers at two successive periods of time.

**Demand Forecasting for New Products :**

In the methods explained above it is assumed that information regarding the past behaviour of demand for the product is available and additional information is supplemented by conducting some market surveys. In the case of new products the situation is entirely different. No past information about the consumers attitude and requirement towards the product can be available. Evidently demand forecasting in such cases is quite difficult. The following steps can be followed in such cases:

(a) Opinion surveys are conducted to assess their requirements and preferences about the new product.

(b) Samples are distributed to know the perspective demand.

(c) Market research operations can be used to decide about the quality and quantity of the new product.

(d) To study the demand pattern of existing substitute products.

**Criteria for a Good Demand Forecasting Method :**

There are many forecasting methods each having its own advantages and disadvantages. The suitability of any method basically depends on the nature of the product and its potential consumer. The quality and quantity of information also plays an important role in the choice of appropriate forecasting method. In general a good forecasting method should possess the following characteristics:

*(i) Simplicity :* The method should be simple and easy to apply in practice. It should not be too much mathematical or beyond the understanding of a common individual.

*(ii)* Information required should be easily and quickly available from reliable sources.

*(iii) Accuracy :* Whole production planning strategy of an company mainly depends on demand forecasts. In case of discrepancy or too much error in demand forecasts the organisation is likely to suffer with heavy losses. Thus the method should be able to provide sufficiently accurate estimates.

*(iv)* The method should be economic with respect to expenses.

□□□

# 14

# FORM OF MARKET STRUCTURE

The price-output decisions which are taken by a company or by an industry (the group of companies) are very much influenced by the form and structure of the market for goods and services. The structure of the market, commodity market as well as factor market, is fixed by the nature and pattern of competition which prevails. The economists have standard classification of the market based on the nature of competitive conditions :

(i) ***Pure and Perfect Competition*** : The market is said to be charecterised by *pure* competition, if *(a)* there is a large number of transactors (buyers and sellers) in the market such that no single transactor can influence, by its own individual action, the price-output decisions in the market; *(b)* the transaction unit is homogeneous, the goods and/or the services traded are so standardised and identical that no illogical buyers' preference can emerge; *(c)* the transactors enjoy freedom of entry and exit, no transport cost is involved. A company can enter profitable industry or can leave a loosing industry just as a consumer can freely move in or out of the market and *(d)* there is independent decision-making, no restriction or compulsion is involved in the process of decision-making. In addition to these conditions, if perfect knowledge prevails such that there are zero information costs and if goods and resources are perfectly mobile and divisible, then competition is designated *as perfect*. In a perfectly competitive market, a single price rules the market.

*(ii) Pure Monopoly :* A market where a single seller takes the price-output decisions and rules the. market, is said to be characterised by monopoly power. Here one company constitutes the industry; it is the sole producer of the commodity for which there are no close substitutes and, therefore, it faces no threat of competitors.

*(iii) Discriminating Monopoly :* This situation has reference to a market where the monopolist can charge different prices from different buyers for the same commodity or service supplied.

*(iv) Duopoly :* The industry is composed of two selling companies which can act independently or jointly.

*(v) Oligopoly :* Here is a market where a few companies together take the price-output decisions such that their industry enjoys the largest market share. Duopoly is a special case of oligopoly.

*(vi) Monopsony :* It is a market where there is a single buyer. Here is a buyer's monoply.

*(vii)Duopsony :* It is a market structure where there are two buyers who can influence market price and output because of their individual or joint action.

*(viii) Oligopsony :* It is a market ruled by a few organised buyers. Sometimes they may be organised into a cooperative to act as "countervailing power" to oligopolistic cartels.

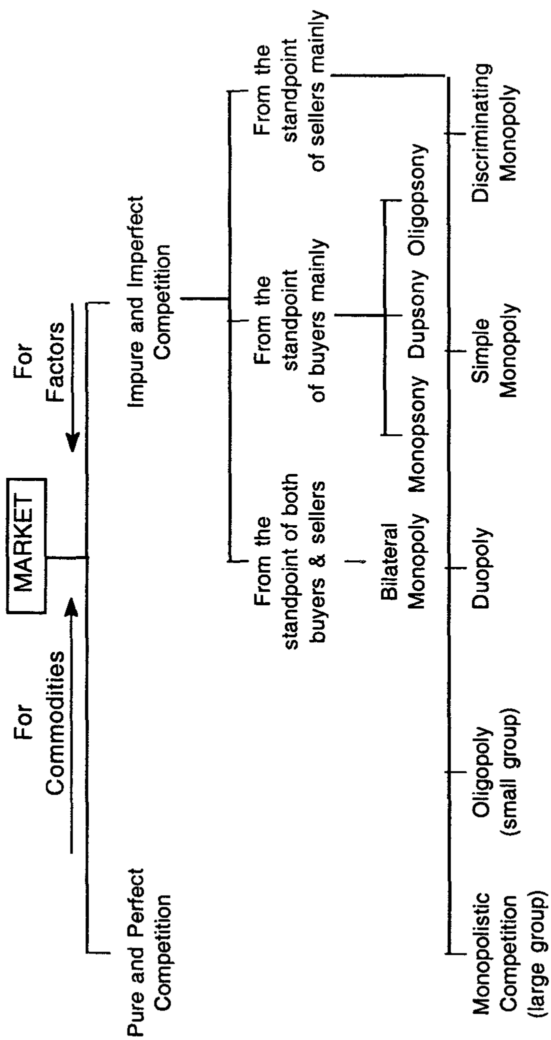
*(ix) Bilateral Monopoly :* Here is a market situation where a monopolist and a monopsonist meet together, and it is the individual and collective bargaining strength which exercise a decisive influence on market data.

*(x) Monopolistic Competition :* This is perhaps the less restrictive and more realistic market situation. This is a market arrangement very similar to pure competition except for the feature of homogeneous product. Product? differentiation is attempted in terms of various measures like quality differences, quantity discount, attractive wrapping, location of the shop, gift coupons, better service etc. As a result, a large number of close substitutes of the product flood the market. Advertisement becomes an essential expenditure to retain or capture market. Each producer becomes a monopolist of

his own brand of product, yet each is subject to competition from the other. Thus the market is ruled by "competing monopolists."

Following chart is presented to have an overview of the different forms of market structure.

***Market Structure Chart***



# 15

# PERFECT COMPETITION

The economists' theory suggests that two important conditions must be fulfilled if there is to be equilibrium in a perfectly competitive industry : First, each and every company must be in equilibrium i.e., MR=MC. Second, the industry as a whole must be in equilibrium i.e., AR=AC. These equilibrium conditions of perfect competition should be studied, keeping in mind, the time-perspective, concepts, short-period and long-period.

**Short-Period Equilibrium :**

Short-period equilibrium refers to the equilibrium of the company and the industry in a period when there is enough time for the variable factors of production to change; but during which the fixed factors cannot be altered in amount.

For the analysis of this short-run equilibrium condition, it is useful to be explicit about the cost conditions of various companies. If costs differ between companies, the equilibrium position of the industry will not be the same as it would be if all companies have identical cost curves. To avoid such confusions, three different situations are to be assumed.

*(1) AH Factors of Production are Homogeneous :* Here all companies will have identical factor prices and hence identical cost curves, as each and every factor is a perfect substitute of the other. Let us assume now that in a hypothetical company the situation is like this :

Let OP be the price given. Every company including this has to take this price OP and will adjust their output so as to maximise their profits. If profit is maximised i.e., if the marginal revenue is equal to the marginal cost, the company will be in equilibrium. Now when OP is the price, PL is the demand curve. As it is perfect competition, this demand curve—average revenue curve— is perfectly elastic, it is horizontal to the X-axis and this is also the marginal revenue curve. If at this price OP, the company produces OM output, it will maximise its profit. Here MR is the average cost so that the total costs of production = MR times OM. But the total revenue earned=ML times OM. So the supernormal profit = RLPP; it is the maximum profit and at L, marginal revenue — marginal cost so that the company is in equilibrium.

The fact remains that as every company has identical cost conditions, each company will be in equilibrium, when it produces the output OM (equilibrium output) and sells it at a perfectly competitive price OP.

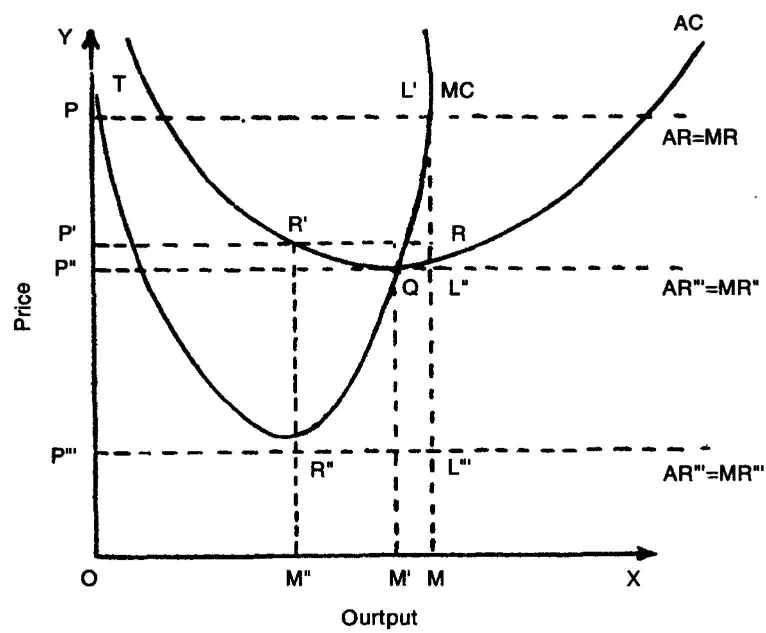



*Fig. 1*

When the price is OP", the company will be in equilibrium producing OM' output, where marginal revenue = marginal cost. Here the average cost of production is also equal to the average revenue earned; the company is earning 'normal profit'—the profit just sufficient to induce it to stay in industry; in fact, in this situation, there is no gain, no loss.

When the price falls below OP" in a perfectly competitive industry and the cost conditions remain the same, all companies may still satisfy the equilibrium condition (marginal revenue = marginal cost), but will incur loss or what is called 'subnormal profit' (because average cost > average revenue). As it is short-run, the company will not go out of the industry, the short-run does not allow that. However the company is at liberty to do either of the two things at this serious position : It may continue to produce the equilibrium output. Or it may cease producing any equilibrium

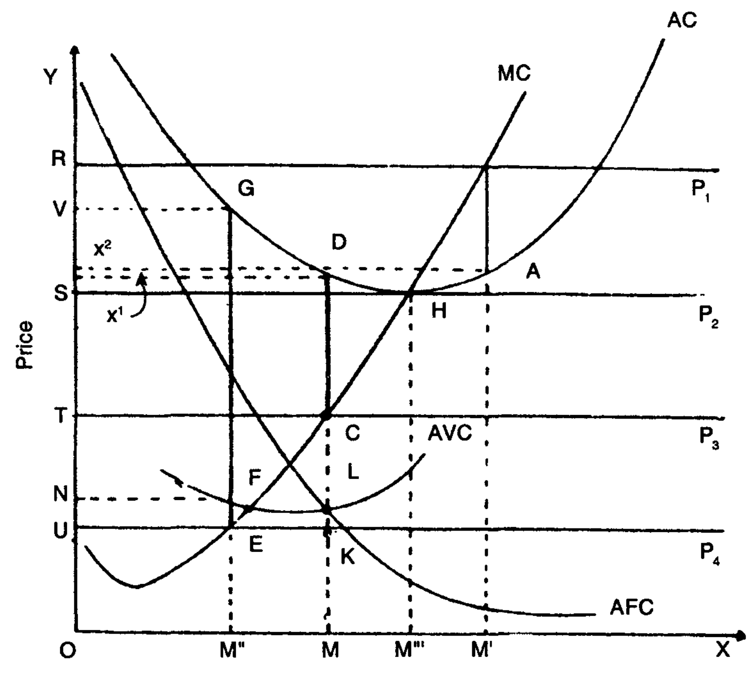



*Fig. 2*

output. The question arises : when does the company stop producing the equilibrium output?

The company will produce so long the losses are few, so long as these abnormal losses are capable of being covered up in the long-run. Here is a dicision problem : if or not the losses are bearable.

In this diagram, when the price is OR, the company is in equilibrium producing OM′ output, here the company is maximising its profit, earning a supernormal profit. Similarly at price OS, the company is earning a normal profit and is in equilibrium. Similarly at short-run equilibrium price OT, the company is in equilibrium, producing TC output, here the company is getting a subnormal profit—CD per unit of output Now if the company faces price OU and produces UE output at that equilibrium price, the company will be earning a maximum loss of GE per unit of output. The company will not produce at this price, as GE is greater than CD (amount of loss). The company at OT price is able to cover its variable cost and that is why it will produce at this. The reasoning behind this is t e fact that in the short-period, the fixed capital of the company cannot be altered. Since the fixed costs are to be met even if the company closes, it will pay the entrepreneur to remain in production, if by doing so he earns anything which will help him to cover his fixed costs. It will, therefore pay entrepreneurs to employ variable factors only if they can pay for those and still have something left over to meet fixed costs. At $P_3$ average revenue curve, the market price OT exceeds the variable cost and remainder is still available to meet the fixed costs, even when the variable costs have been covered. The company is now loosing CD per unit. But had the market price been OU, the company in equilibrium had to loose more, FE was to prove an unavoidable loss there, FE lies below AVC. So the company will produce at OT where it has to bear minimum losses—subnormal profit.

So far as the short-run industry-equilibrium is concerned, the industry will be in equilibrium, when the companies are earning normal profits. In the previous diagram, the industry will be in equilibrium when the market price is OS. Had the market price been OR, the industry would have earned 'supernormal profit'. In the long-run, new companies will enter the industry and having identical costs with the existing company will compete away the 'supernormal profits' and will bring about a normal situation. Similarly when the market price is OT, in the long-run some companies will leave the industry, as they are facing loss and the remaining companies will just earn normal profits. The fact remains that the industry will be in equilibrium at the market price OS, earning normàl profit (average re venue=average cost), and here there is no tendency for the existing companies to leave the industry and the new companies to enter the industry. The industry is in equilibrium.

Thus when all factors of production are identical, cost conditions and hence equilibrium condition of the company will be identical with that of another. Here the company may be in equilibrium, earning 'normal profits' or 'subnormal' profit'—abnormal loss—or 'supernormal profii.', whereas the industry will be in equilibrium in the short-run, when all the companies are earning normal profits.

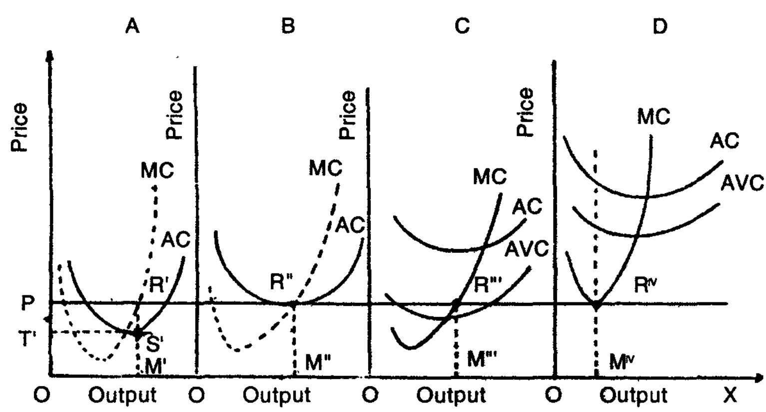



*Fig. 2*

*(2)* ***Entrepreneurs are heterogeneous, but all the other factors of production are homogeneous :*** As the entrepreneurs are not identical in efficiency, the cost conditions will differ between various companies. The more efficient entrepreneur will be able to produce more efficiently than others. There will be different equilibrium positions for different companies. The situation will be :

It is clear from the above diagram that here different companies will be producing different levels of outputs at different costs, even though all companies make the same product and sell it at the same price. At price OP, Company A, producing its equilibrium output OM' is able to attain supernormal profit which no other company obtains. Company B, with a somewhat less efficient entrepreneur produces an equilibrium output OM" and earns only 'normal profits'. Company C has a still less efficient entrepreneur and loses money. But since the company is able to cover its variable costs of production, it pays to produce more and thereby losses are minimised. Company D has the least efficient entrepreneur of the four companies and even in the short-run, it cannot cover variable costs at any output. It pays it to close down. Thus different companies are at different equilibrium position.

The industry as a whole is unlikely to be in equilibrium. As cost conditions differ, different companies have a tendency to move from one industry to another so as to acquire the full benefit of different cost situation.

The fact remains that in short-run in a perfectly competitive industry, having all factors except entrepreneur homogeneous, some entrepreneurs will be making huge profit; while others, less profit. In each case, the company will be in equilibrium earning maximum profit by equating marginal cost aid marginal revenue. But the

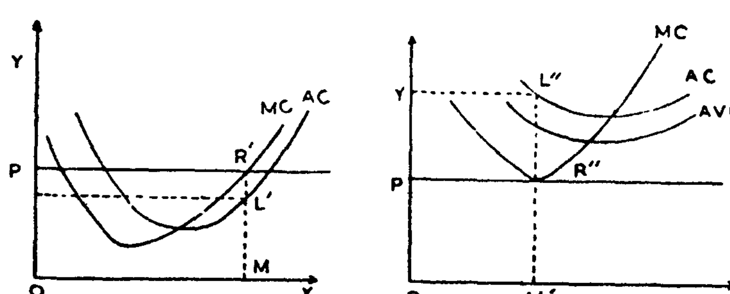



*Fig. 3*

industry's a whole is unlikely to be in 'full' equilibrium in the short-run.

*(3) Alt factors of production are heterogeneous :* In this situation, the cost difference between companies will be even greater, because all factors will be of differing efficiencies and not merely entrepreneurs.

As shown here, some companies will earn supernormal profits at their equilibrium positions and others might face subnormal profits. The more efficient are the factors a company is using, the greater will be its profits compared with those earned by other companies.

There is no reason why the industry as a whole should be in equilibrium in this short-run. Only in the long-run, the industry-equilibrium is likely to come about. As a whole, the same condition will appear, as it did under the second assumed situation.

**Long-Period Equilibrium :**

Long period equilibrium refers to the equilibrium of the company and the industry in the long-run-a period when there is enough time for the various factors—both fixed and variable—to undergo

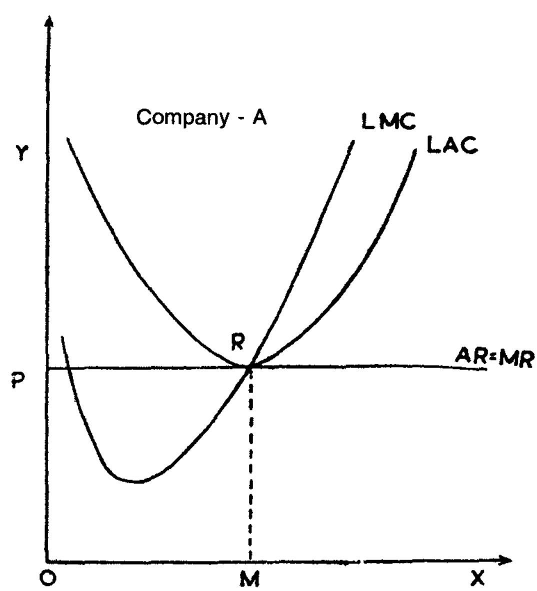



*Fig.4*

alteration. Following the previous approach, this analysis may be undertaken again under three main heads of assumed situation :

*(1) All factors of production are homogeneous* : Where all factors of production are homogeneous and each factor has a given and uniform price, it is not very difficult to see that the industry will be in "full" equilibrium. Each company will adjust its output so as to equate marginal revenue with marginal cost. In the long-run each company will be in the position shown in this Fig. 4 where the (long-run) average cost, average revenue, marginal cost and marginal revenue ace all equal to each other and to price. This is the 'full equilibrium' position. It will be reached since all companies have identical cost curves and since there is free entry and perfect

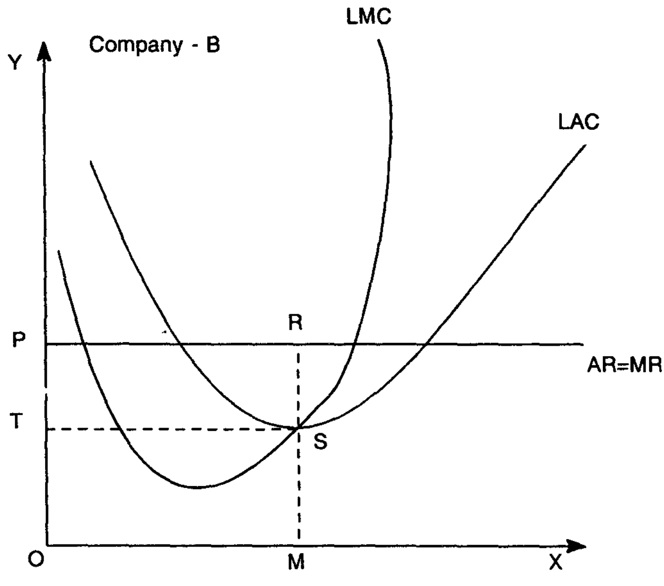



*Fig. 5*

mobility; companies will enter or leave the industry until all are earning profits which are described as 'normal profits'. And as costs are identical, if any one company is earning normal profits, all companies will be and the industry as a whole' will be in full equilibrium where marginal revenue = marginal cost— average cost = average revenue.

(2) ***All the factors of production except entrepreneurs, are homogenous :*** Due to the difference in the entrepreneurial ability, some companies even in the long-run will earn 'normal profits'

Previously referred Company A is such a company; while other farms like the just illustrated Company B will earn 'supernormal profits'; it means that this company has a more efficient entrepreneur than A company. It is assumed that Company A in the long-run is just efficient enough to remain in the industry and to earn normal profits. We could describe it as a marginal company. It is 'on the margin of profitability', as any fall in the price would, in the long-run, send it out of the industry. And since in the long-run the company B can earn the supernormal profit of PRST, the company might be described as the infra-marginal company. The only way in which Company B could be made compelled to earn normal profits in the long-run would be for there to be an influx of efficient producers able to compete more efficiently with Company B. This eventuality, though a possible one, is not necessarily a likely one.

(3) ***All factors of production are heterogeneous :*** Here also the result will be same as before. Being in equilibrium, the intra-marginal companies will earn the 'supernormal profit', while the marginal company will earn the 'normal profit'.

Let us now take some problems to illustrate the equilibrium solution of decision variables of the competitive companies. Consider the short-run situation. Let us assume that there are three companies. Company 1, Company 2 and Company 3, each producing the same commodity Q, but facing respectively three types of total cost function :

$C_1 = 10 + 2Q$ .........(for Company I)

$C_2 = 10 + 2Q + 0.2\,Q^2$ .........(for Company 2)

$C_3 = 10 + 10Q - 2.5\,Q^2 + \frac{Q^3}{3}$ .........(for Company 3)

The assumption is also made that none of these companies can produce more than 10 units of Q. And by definition of the situation of pure competition, all the three companies are price-taker rattier than price maker. As such their revenue functions are such that average revenue (AR) equals marginal revenue (MR). If the market price varies, the equality between AR and MR is left undisturbed, though the level of [AR=MR] changes. For example, consider three different total revenue functions and the corresponding AR and MR.

$$\text{If } R' = 4Q, \text{ then } AR' = \frac{R'}{Q} = 4 = MR' = \frac{dR'}{dQ}$$

$$\text{If } R'' = 6Q, \text{ then } AR'' = \frac{R''}{Q} = 6 = MR'' = \frac{dR''}{dQ}$$

$$\text{If } R''' = 10Q, \text{ then } AR''' = \frac{R'''}{Q} = 10 = MR''' = \frac{dR'''}{dQ}$$

We have noted earlier that the profit maximising decision rule for the company is the equality between marginal revenue and marginal cost. We find that if R′ condition is obtained in the market, then price =AR=MR=4. In this situation, company 1 can produce at a profit and, therefore, it will produce the capacity output 10 units. company 2 will produce 5 units of Q, because

$$MR'' = MC_2$$

$$4 = 2 + 0.4\,Q$$

$$\text{or} \quad Q = 5$$

Let us assume that company 2 will produce, because it can still cover its- shutdown costs. Now consider the case of Company 3.

For company 3, the price of Rs. 4 only (exceeds marginal cost over a small range of output, from 2 to 3 units. Under these conditions, it is possible that the company will shut down and find a more profitable outlet for its productive capacity. This means that at a price of Rs. 4 ruling in the market, the total supply of Q in the market will be 15 units (i.e., 10 units from Company I and 5 units from company 2).

Now suppose the revenue conditions change to R″ situation, in this new situation, the companies will take price in the market to be Rs. 6. At this price, the Company 1 will find that it can still produce the capacity output 10 units, making morel profit than before; it can earn a total profit of Rs. 30 now compared to Rs. 10 before. The Company 2, by setting MR″=$MC_2$, finds that it can also produce 10 units and can now earn a total profit of Rs. 10; earlier it was incurring a loss of Rs. 10. The best output for Company 3 is now 4 units. At this output (Q=4), the company will incur a loss of Rs. 7.3. Let us assume that this amount of loss is too high to permit the company to cover even its variable costs. Note, if the company produces 4 units of Q, the average variable costs exceed the price by Rs. 15.3 and so the company decides not to produce at a price of Rs. 6. This means that the aggregate supply of Q to the market will now be 20 units, both companies 1 and 2 supplying 10 units each.

If the revenue condition obtained in the market is that of R‴, then AR‴=Price in the market will be Rs. 10. At this price Company 1 and Company 2 will still produce at maximum capacity as before, because their profits will now increase further. The company 3 will also now start producing for the market.

$$MR'' = MC_2$$

$$10 = 10 + 5Q + Q^2$$

or $Q = 5 \text{ or } O$

By producing 5 units of Q, the Company 3 now earns a total revenue

of Rs. 50 ( = 10×5), but it incurs an expenditure of Rs. 29.1

$(=10+(10\times5)-(2.5\times5^2)\times\frac{5^3}{3})$ and thus it can make a total profit of Rs. 10.9. The market supply of Q will now be 25 units.

It is now possible to make some observation on the supply

*Table 1*

| Price (Rs) | Individual supply Company 1 | Company 2 | Company 3 | Market supply | Elasticity of market supply |
|---|---|---|---|---|---|
| 4 | 10 | 5 | – | 15 | – |
| 5 | 10 | 10 | – | 20 | 0 71 |
| 10 | 10 | 10 | 5 | 25 | 0 44 |

function. Supply is dependent on the market price. Normally the supply curve is upward-sloping implying a direct relation between supply and price.

$$S = s(P)$$

$$\frac{dS}{dP} > O$$

Market supply and market price move in the same direction. The proportion of change in supply can be expressed by the concept of elasticity of supply, point or arc. In the example that we have used, we find that as price increases, supply also increases. This becomes possible in two ways : by an increase in the output of existing companies and by an entry of new companies. As shown below, when the price changes from Rs. 4 to Rs. 6, the Company 2 revises its output from 5 units to 10 units. Similarly when the price changes from Rs. 6 to Rs. 10, the Company 3 enters the industry and start producing for the market. The supply situation is thus be shown as a schedule. The example that we have used is one of short-run when the companies incur both fixed and variable costs. In the short-run, the market supply function is, in effect, the marginal cost functions of all the companies in the industry.

Let us now considers the long-run when all costs are variable seen that the company faces :

$$C = 10Q - 2.5Q^2 + \frac{Q^3}{3}$$

If the demand condition that the company faces is stated by the total revenue function R= 6Q, then the company finds, by setting MR= MC, that

$$6 = 10 - 5Q + Q^2$$

or $Q^2 - 5Q + 4 = 0$

$$(Q-4)(Q-1) = O$$

$$Q = 4 \text{ or } 1$$

By deciding to produce 4 units of Q, the companies will make a total profit of Rs. 2.7 each. As a result, new companies will be attracted into the industry and this profit will vanish. . On the other hand, if the companies face R=4Q, then

$$MR = MC$$

$$4 = 10 - 5Q + Q^2$$

$$\text{or} \quad Q^2 - 5Q + 6 = O$$

$$(Q-3)(Q-2) = O$$

$$\therefore Q = 3 \text{ or } 2$$

By deciding to produce 3 units of Q, the companies will incur a loss of Rs. 3.5 each; and this will induce some companies to leave the industry so that the loss vanishes. Let us suppose that ultimately, the demand condition settles at R=5.31 Q. This means that now

$$MR = MC$$

$$5.31 = 10 - 5Q + Q^2$$

$$\text{or} \quad Q^2 - 5Q + 4.69 = 0$$

$$\therefore Q = 3.75$$

By deciding to produce 3.75 units of Q each, the companies will now be earning normal profits (because total revenue= total costs= Rs. 19.91). In this situation where AR=AC, the entry or exist of companies will stop, the industry will be in equilibrium. Note that at the output, Q=3.75, not only MR=MC but also AR=MR=MC=AC. In other words, the companies' as well as the industry's equilibrium conditions are satisfied. The output level Q=3.75 can, therefore, be defined as optimum output for the long-run competitive situation that we are analysing.

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# 16

# IMPLICATIONS OF A CHANGE IN DEMAND FOR COMMODITY UNDER COMPETITION

A change in the demand for a commodity is generally followed by various adjustments—price adjustment, output adjustment, input adjustment, cost adjustment etc. These adjustments take place at two levels—at the company's level and at the industry's level. An increase in the demand for an industry's product leads to an increase in the (short-period) market price of the product, existing companies start making profits, new companies enter the industry, industry's supply of output to the market increases and this changes the (long-run) normal price of the commodity, depending upon the cost condition of the industry. The companies' cost condition is also affected depending upon the technology, the intensity of demand for factors and the elasticity of supply of factors which the companies use in their productive process.

In order to make a detailed analysis of the mechanism and the character of such changes, we are to start with a clear statement of our assumptions, we make four important assumptions :

1. *Competitive Industry* : Our industry is composed of many (not one or a few) companies.

2. *Competitive (perfect) Product Market* : Each company treats product price as a given datum, the demand curve as seen by each company is perfectly elastic.

3. ***Competitive (perfect) Factor Market :*** Any one company cannot influence factor price, the supply curve as seen by each company is perfectly elastic.

Each company is buying factors and selling goods under competitive conditions. This does not mean that their aggregated action (which shapes the industry's demand and supply) does not affect the output-price and the input-price.

4. ***Constant Returns-to-scale :*** Here is an important assumption concerning the company's technology. Mathematically, this is described as linear homogenous production function of degree one. If the inputs L, K are increased by a given proportion $\lambda$ so that L/K ratio is unchanged the output Q which is produced by L-K combination, is also increased by $\lambda$. Thus, in this case, the sum of output elasticities of all inputs, i.e., function coefficient is unitary. It must be noted that this case of constant returns does not contradict the law of variable proportion and that we may have constant returns throughout the scale or at a given size of the plant.

The above scale-assumption has important implications for long-run cost conditions and output adjustment at the company's level. For the moment let us consider the implications of industry's cost conditions. When the demand for the good Q increases, the price of Q immediately increases, because the supply of Q cannot be instantaneously adjusted. In the long-run, supply is always adjusted such that the output Q placed in the market always increases, but if or not the long-run supply price of Q increases or decreases or remains unchanged, depends on the industry's cost conditions. If the industry is an increasing-cost one, the input-prices increase, when more input is used to produce more output to meet the increased demand. If the industry is a decreasing-cost one, the input-prices decrease and we have a downward falling industry-supply curve. If the industry is a constant-cost one, input prices remain unaffected, even when the demand for their extensive use increases. Let us explain these cases with reference to diagrams.

**Case 1 : Increasing-cost Industry :**

The interaction of market forces of demand and supply establishes the initial equilibrium point E, OY is supplied at OP

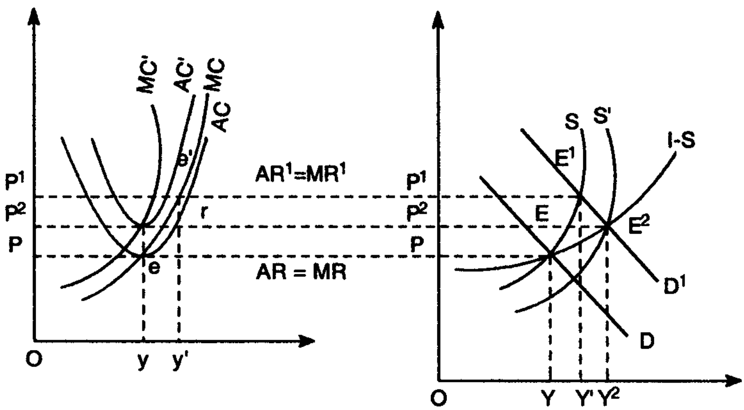


*Fig. 1*

price, correspondingly each company (assuming identical cost structure of all companies) faces AR=MR, the company's equilibrium point is e, at which AR=MR=MC=AC, each company is supplying OY to the industry by using optimum scale of plant.

Now suppose, due to change in taste or any other exogeneous factors, market demand for Q increases, D curve shifts to D', price OP rises to OP'. Company's equilibrium point shifts to e' at which new AR' = MR'=old MC. Each company starts earning e'R' rate of profit per unit of output. In the long-run, this profit induces the existing companies to produce more and attract new companies into the industry. Now a two way squeez is put on the profit. On the one hand, the demand for inputs to produce more output of Q increases and this excess demand increases input prices. If all input prices increase proportionately, the relative price structure is unaffected, cost schedules shift straight up. This is due to "pecuniary diseconomies," external to the company; it is due to the increase in the size of the industry. On the other hand, as more companies start producing, more output is produced. Thus the supply curve shifts to S', bringing price down to $OP_2$, establishing a stable equilibrium at $E_2$. Accordingly, all companies adjust themselves to $AR_2$=$MR_2$ and establish new equilibrium at $e_2$, at which "normal profits" (price= minimum average cost) prevail. Thus increase in cost and decrease in price cause the temporary profits to vanish, entry of companies to stop. Note, long-run normal price $OP_2$ is lower than the short run market price $OP^1$ but higher than OP. Similarly the final production is $OY^2 > OY' > OY$. I-S is industry's long-run supply price curve.

**Case 2 : Decreasing-cost Industry :**

Here also the same mechanism and the same short-run effects are involved, though the long-run effect on the supply price is different from the previous case. As D shifts to D', the price OP shifts to $OP^1$, existing companies start earning profit, new

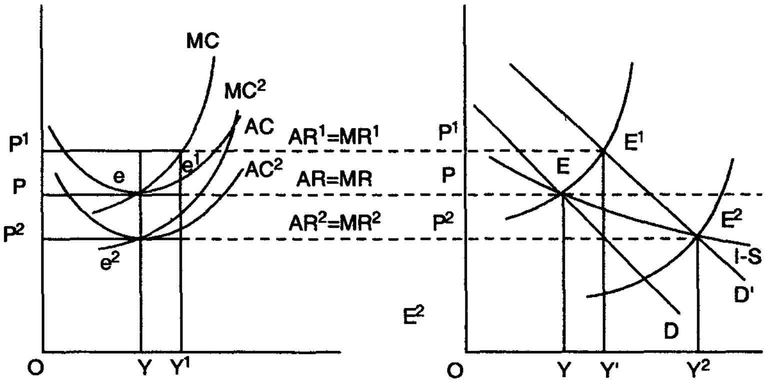


*Fig. 2*

companies enter to squeez the profit. Increased production by old and new companies brings down the price to $OP^2$. This is typical of increasing returns industries. Here an increase in the utilisation of resources causes some 'pecuniary external economies' and therefore, resource prices decline, as more is demanded and utilised; cost schedules shift downward. Asbefo re, we have assumed all input prices change exactly proportionately, thus relative price structure is unchanged and we have a parallel cost-shift downward. Eventually the companies' equilibrium is finally established at $e^2$, and the market equilibrium at E2. Note, final level of production $OY^2 > OY' > OY$, whereas final equilibrium price $OP^2 < OP < OP^1$. IS is industry's long-run supply price curve.

In the last two cases, we have assumed that all input prices charge in the same proportion but the input substitution does not

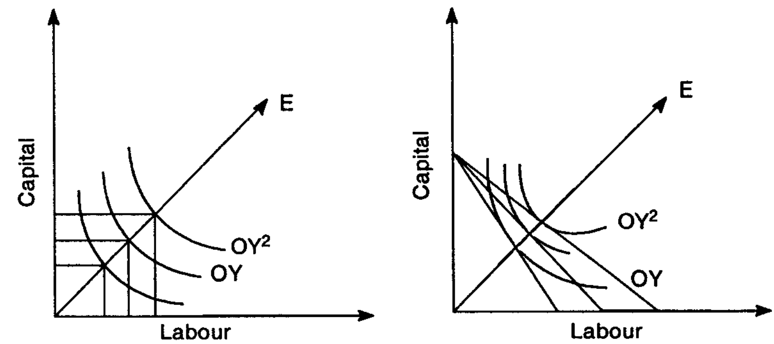


*Fig. 3*

result. Even if input price-ratio changes, the companies cannot substitute between cheaper and dearer factors, because by our assumption, the technological input-output relation is fixed for each company; constant returns to scale means a linear expansion path OE. When output increases from OY to $OY^2$, more of both L and K is used, these inputs are combined in fixed proportion. Elasticity of substitution between factors is zero. More output means more costs—total cost function of the companies is linear. Input price ratio may remain unchanged not because all input prices have changed in the same direction and in the same proportion, but because the original set of input prices have not changed at all, even when the demand for inputs have increased following an increase in the market price of the commodity due to an increase in the demand for commodity. This is precisely the following case.

**Case 3: Constant-cost Industry :**

The pattern of analysis is the same as before. Short-run effects are the same-as D shifts to D′, E shifts to E′, OP shifts to OP′, the companies start making e′r′ rate of profit; existing companies supply more by y-y′ so that market production increases by Y-Y′. Long-run effects start with the same entry of few companies—increased supply—price reduction from OP′ to OP. This new final price is the same as the initial price. Production $OY^2 > OY'$, but the long run supply price, stable equilibrium price $OP = OP^2 < OP'$. Each old company and the new company adjusts themselves to the previous optimum scale of output. Companies's cost schedule has not

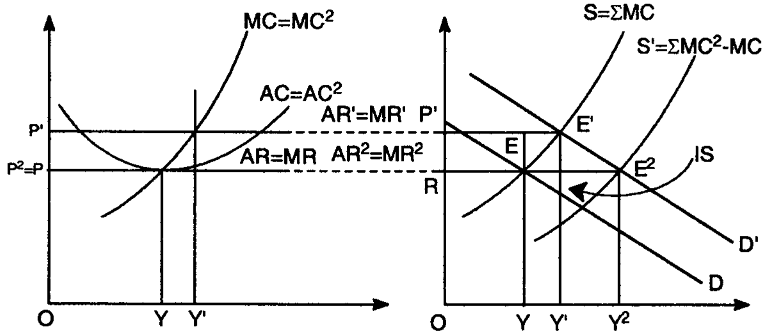


*Fig. 4*

changed at all, because input prices are constant. This may be due to the fact that the inputs are unspecialised, or that the industry is using a small fraction of a given large factor endowment so much so that increased utilisation of these inputs does not affect input price at all. That is why even when the demand for the good has changed the companiess' minimum cost level has not changed, the industry's long-run supply curve is horizontal at the level of minimum long-run average costs.

An interesting question has been raised by the theorists in this context. When input prices are constant and the technology exhibits constant returns to scale, is the equilibrium solution of company's output level a determinate one? Constant costs mean LAC= LMC. There are three possibilities :

(i) Price is everywhere greater than marginal cost. AR= MR lies above $LAC_1=LMC_1$. It will pay the company to expand indefinitely until competition ceases to exist.

(ii) Price is everywhere below the marginal cost. AR=MR lies below $LAC_2=LMC_2$; no output will be produced.

(iii) Price is identically equal to marginal cost. AR=MR coincides with LAC=LMC. Company's output is indeterminate.

Alternatively, we can have algebric demonstration.

Profit = Revenue – Cost

Cost function: C=aq, Revenue function : R=Pq

where a = average = marginal cost

P=Price, q=Output, $\pi$= Profit

Thus, $\pi=r—C=Pq—aq$

The first order condition requires the companies equate the two constants, P–a=O. Under our assumption, this is a difficult task. The company can affect neither P nor a through changes in its output. If P>a, the company's level of output tends to infinity. If P<a, the company goes out of business. If P=a, the company's output is indeterminate.

Though the size of the industry- (allocation of output among the constituent companies) will be indeterminate, yet the total production of the industry, total amount of inputs used by the industry, input-price, product-price—all these are determinate. Does it sound like a paradox? Our industry is an aggregate of companies. Can the aggregate of undefined levels of (companies') output yield a defined, determined level of (industry's) output? For if many companies expand output under this case, there is no danger of imperfection of market. This is because, demand curve for any company=(Dem-and curve of the industry—Supply curve of remaining companies). Under uniform constant costs, the demand curve of a company is horizontal even if it supplies most of the total output of the market. Geometrically, the long-run supply curve of potential rivals is horizontal curve subtracted laterally from any curve must always yield a horizontal curve. This means, pure competition is not inconsistent with constant returns.

We started with the concept of long-run equilibrium in a purely competitive industry. We introduced a disturbing force— an upward shift in demand to analyse long-run adjustments within the industry. In this adjustment process, we considered both short-run and long-run effects. Short-run adjustments are more on product price, but less on production. Long-run adjustments fall less on product price, but more on production and hence resource-use. Resource utilisation affects input-prices depending upon the cost situation under which the industry operates. Even when input-prices are constant and constant returns to scale prevails, industry's level of output is determinate, though the companies' optimum scale of output is undefined.

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# 17

# COMPETITIVE MARKET MODEL

If a large number of transactors, enjoying economic sovereignty, deals in homogeneous transaction-unit, a single price for the goods comes to rule the market. This price is established on the basis of the interplay of the market forces of demand and supply. Price is a freely fluctuating regulator equating the demand and supply sides of the general market. This is illustrated in the following diagram :

Given the industry's demand curve $d_0$-$Q^D$ and the industry's supply curve $s_0$-$Q^S$, the OQ level of output will be transacted in the

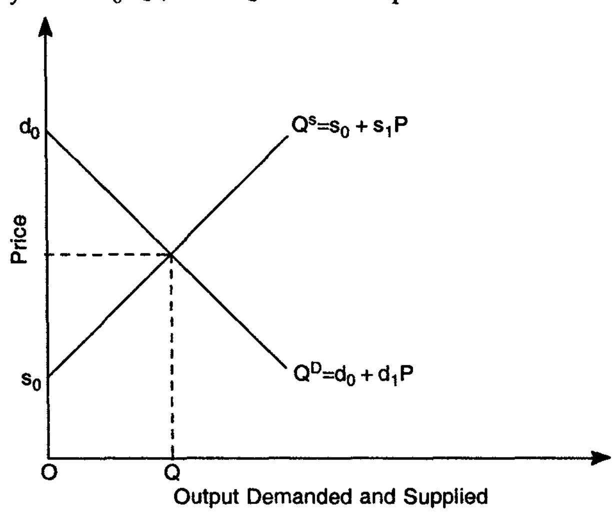



*Fig. 1*

market at the market price, OP. A market price higher than the equilibrium price OP will get depressed because of excess supply; and a price lower than OP will get pushed upward because of excess demand. Thus the paremetric adjustments at which excess supply = excess demand = zero will decide the equilibrium price at OP and the equilibrium output at OQ.

We can construct a simple competitive market model to illustrate the solution with respect to the decision variables: market price and market output. Let us have a model consisting of two behavioural equations and one equilibrium condition.

$$Q^D = Q^S \qquad \text{(i)}$$

$$Q^D = d_0 - d_1P \qquad \text{(ii)}$$

$$Q^S = s_0 + s_1P \qquad \text{(iii)}$$

The equation (i) states the equilibrium condition for the market. The equation (ii) states the demand function, and the equation (iii), the supply function, where,

$P$ = Price prevailing in the market

$Q^D$ = output demanded in the market

$Q^S$ = output supplied in the market

$d_0$, $s_0$ = Intercept terms for the demand curve and supply curve respectively

$d_1$, $S_1$ = Slope coefficients of the demand and supply curves respectively

Certain properties of the model may be noted. First, we have got linear functions for convenience. Second, as per the economist's law of demand which postulates an inverse relation between demand and price, we have $[d_1 < O]$ i.e., $\frac{dQ^D}{dP} < O$. Third, as per the economist's law of supply, we have $[s_1 < O]$ i.e., $\frac{dQ^S}{dP} < O$ which suggest a direct relation between price and supply. Fourth, a restriction is imposed: $d_0 > s_0$. This is illustrated in the diagram. Now, the reduced form solution is in order. A solution exists, because we have a system of three equations, to solve for three endogeneous decision variables P, $Q^D$.$Q^S$.

Substituting the equation (ii) and (iii) in (i), we have,

$$[d_0-d_1P] = [s_0+s_1P]$$

$$[s_1P+d_1P]=d_0-s_0$$

$$P = \frac{d_0 - s_0}{s_1 + d_1} \tag{a}$$

Putting this solution (a) in (ii) and (iii), we have.

$$Q^D = d_0-d_1\left[\frac{d_0 - s_0}{d_1 + s_1}\right] \tag{b}$$

$$Q^S = s_0+s_1\left[\frac{d_0 - s_0}{d_1 + s_1}\right] \tag{c}$$

If we assume $d_0$=10, $s_0$=5, $s_1$=O.5, and $d_1$=O.5, then plugging in these values in the above solutions (a)–(c), we have,

$$P = 5.O$$

$$Q^D=7.5$$

$$Q^S=7.7$$

Let us now introduce the impact of exogenously determined fiscal instruments like taxes (T) and subsidies (S) into our competitive market model. Suppose the price which our producer receives P*; this is the after-tax price which the consumers pay, i.e., P* = P–T.

The structure of the model now changes.

$$Q^D = Q^S \tag{i}$$

$$Q^D = d_0 - d_1 P \tag{ii}$$

$$Q^S = s_0 + s_1 P^* \tag{iii}$$

$$P^* = P - \overline{T} \tag{iv}$$

Here is a system of four equations, with four endo geneous variables $Q^D$, $Q^S$, P* and P and, therefore, a solution exists.

Now

$$P = \frac{d_0 - s_0 + s_1\overline{T}}{d_1 + s_1} \qquad \text{(a)}$$

$$Q^D = d_0 - d_1 \left[\frac{d_0 - s_0 + s_1\overline{T}}{d_1 + s_1}\right] \qquad \text{(b)}$$

$$Q^S = s_0 + s_1 \left[\frac{d_0 - s_0 + s_1\overline{T}}{d_1 + s_1}\right] \qquad \text{(c)}$$

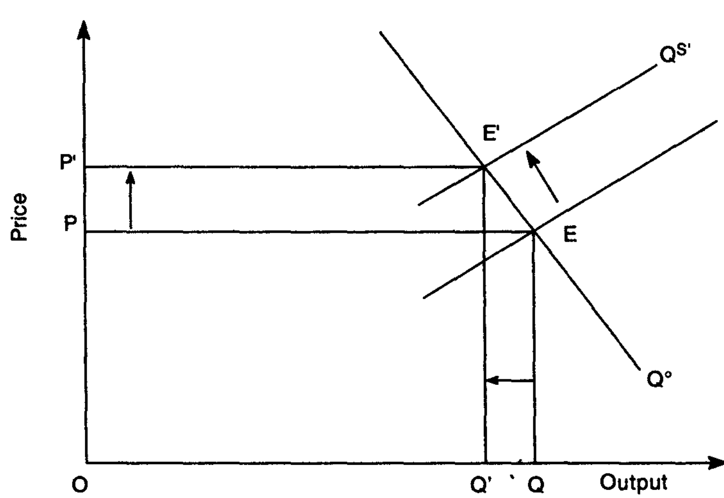
If we assume $\overline{T}$ =4 and other value—coefficients remain same as before, then under the now situation

$P = 7$

$Q^D = 6.5$

$Q^S = 6.5$

With the imposition of tax, the equilibrium price has increased; the equilibrium level of output demanded and sold in the market has fallen. In terms of the diagram 2, this means a leftward shift in the supply curve from $Q^S$ to $Q^{S'}$, a rise in price by P–P′ and a fall in output by Q–Q′.




Output Demanded and Supplied

*Fig. 2*

Exactly opposite would have been the case, had a subsidy been paid to producers. Then the producers. Then the producer price, $P^*=P+\bar{S}$ so that

$$P = \frac{d_0 - s_0 - s_1\bar{S}}{d_1 + s_1} \tag{a}$$

$$Q^D = d_0 - d_1\left[\frac{d_0 - s_0 - s_1\bar{S}}{d_1 + s_1}\right] \tag{b}$$

$$Q^S = s_0 + s_1\left[\frac{d_0 - s_0 - s_1\bar{S}}{d_1 + s_1}\right] \tag{c}$$

The negative sign for the last term in the numeraire suggests that as a result of the payment of subsidy, the market price falls but the market output goes up. The case is illustrated in the diagram 3.

In either case (tax or subsidy), relative elasticities of demand and supply are of special significance in determining the magnitude

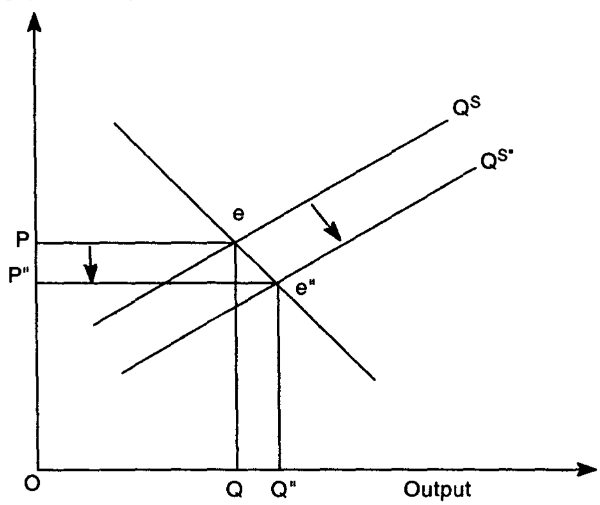



*Fig. 3*

of changes in market price and output. More inelastic (elastic) the demand, the price-changes will be larger (smaller) than the output-changes.

We have analysed the effects of a change in supply on market data under a situation of pure competition. To complete the analysis of the comparative static properties of the model, let us now refer to the Impact of changes in demand on market price and output, assuming different supply situations, appropriate to different time-perspectives. This is illustrated in Diagram 4, 5 and 6. The concept of Marshallian time perspective is of special re-levence in this analysis. The effect of a change in demand on market data differs depending upon the time perspective. In the temporary period when the supply is fixed, an increase (decrease) in demand will increase (decrease) price, market output being unaffected. In the short-run, when the Supply is relative elastic, an increase (decrease) in demand will increase (decrease) price and output both. In me long-run when supply is sufficiently elastic, an increase (decrease) in demand will increase (decrease) output with no or little change in price. The flat long-run supply curve case corresponds to the situation of constant costs. If the long-run increase in output to adjust itself to an increase in demand involves increasing costs per unit (upward sloping supply curve), then output and price-changes correspond more closely to case 2 in diagram 4. With decreasing costs and the consequent downward sloping supply curve, increased (decreased) demand will mean more (less) output at a lower (higher) price.

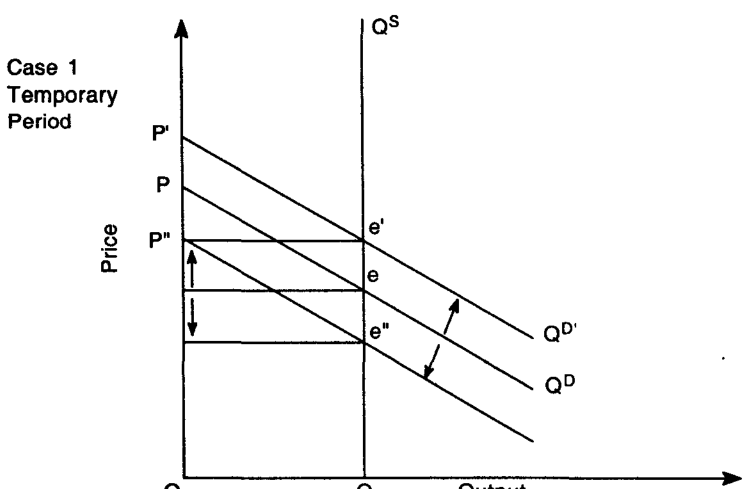



*Fig. 4*

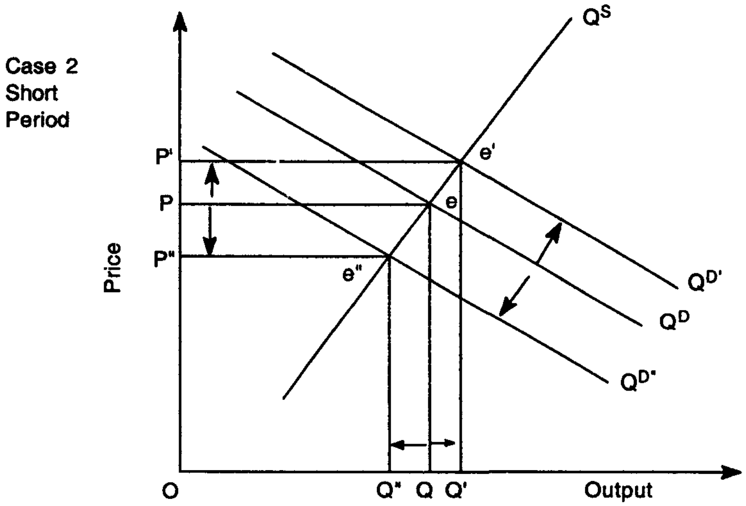



*Fig. 5*

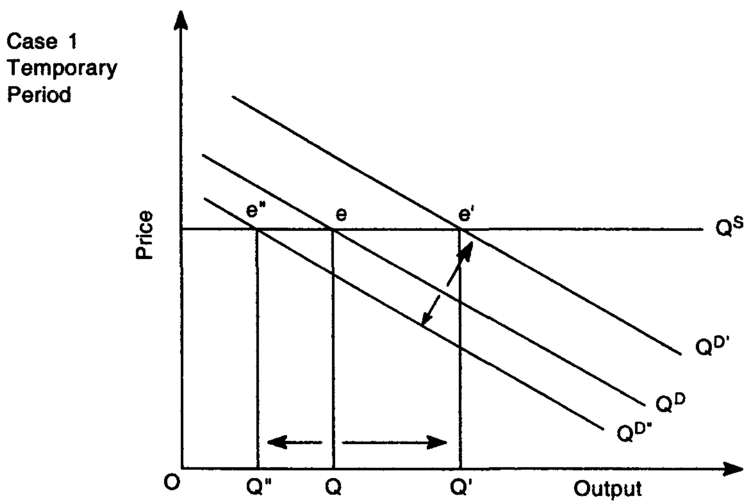



*Fig. 6*

Let us construct a problem to analyse the effect of time on supply and its implications for the industry's price-output decisions. Assume that a commodity has a demand function.

$$Q^D = 150 - P$$

and that it has three supply functions.

| | | |
|---|---|---|
| Temporary-period | $Q_t^S = 50$ | Case 1 |
| Short-period | $Q_s^S = -50 + P$ | Case 2 |
| Long-period | $Q_l^S = 250 - 2P$ | Case 3 |

The market is in equilibrium with 50 units produced and sold at a price 100.

Setting $Q^D = Q_t^S$ we have

$$\left.\begin{aligned} &150-P = 50 \\ &P = 150-50 = 100 \\ &Q^D = 150-100 = 50 = Q_t^S \end{aligned}\right\}\text{Case 1}$$

Setting $Q^D = Q_s^S$, we have

$$\left.\begin{aligned} &150-P = -50 + P \\ &2P = 150 + 50 = 200 \\ &Q^D = 150-100 = 50 = Q_s^S\text{, we have} \end{aligned}\right\}\text{Case 2}$$

Similarly, setting $Q^D = Q_l^S$, we have

$$150-P = 250 - 2P$$

$$2P-P = 250-150$$

$$\left.\begin{aligned} &P = 100 \\ &Q^D = 150-100 = 50 = Q_l^S \end{aligned}\right\}\text{Case 3}$$

Now suppose that there is a sudden shift in the demand function to

$$Q^{D1} = 190-P$$

With the supply being fixed in the temporary period, the price will rise immediately to figure determined by equating $Q^{D1}$ and $Q_t^S$

$$Q^{D1} = Q_t^S$$

$$190-P = 50$$

$$\left.\begin{aligned} &P = 190-50 = 140 \\ &Q^{D1} = 190-140 = 50 = Q_t^S \end{aligned}\right\}\text{Case 1}$$

In the short period, production rises in response to the higher price offered.

$$Q^{D1} = Q_s^S$$

$$\left.\begin{aligned}&190-P = -50+P\\&2P = 190+50 = 240\\&P = 120\\&Q^{D1} = 190-120 = 70 = Q_s^S\end{aligned}\right\}\text{Case 2}$$

In the long period with a downward falling supply curve, the price drops and output increases in response to an increase in demand.

$$\left.\begin{aligned}&Q^{D1} = Q_l^S\\&190-P = 250-2P\\&2P-P = 250-190 = 60\\&P = 60\\&Q^{D1} = 190-60 = 130 = Q_l^S\end{aligned}\right\}\text{Case 3}$$

Combining all the three cases. We can use a summary diagram 7.

To sum up, both demand and supply are important in determining market price and output. The relative importance of these market forces depends on the time-perspective characterising the market environment.

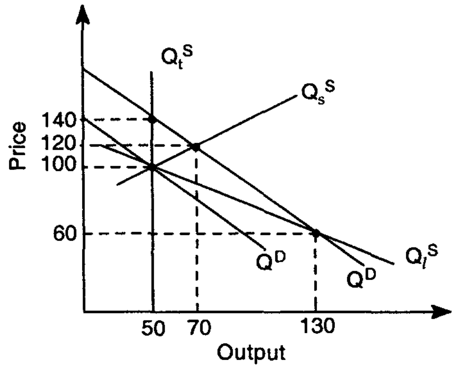



*Fig. 7*

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# 18

# DYNAMICS OF SUPPLY : THE COBWEB PHENOMENA

This chapter is a diagression from the comparative static analysis. Here, we are interested to demonstrate how the demand-supply technique can be used in dynamic situation. In a fully dynamic system, the supply in a given period may here related to the price is some earlier period. Such a situation usually occurs when there is a stable time-lag between a price-movement and the producer's ability to adjust output in response to a price-change e.g. supply of agricultural commodities. The stable time-lag depends on factors like the gestation period of the product. The impact of such lagged adjustments on market data can be explained by working with dated demand-supply equations.

Old demand curve : $Q_t^D = 150 - P_t$

New demand curve : $Q_t^{D1} = 190 - P_t$

Where $P_t$ is the price obtained in period t, and $Q_t^D$ or $Q_t^{D1}$ is the quantity demanded, old or new, in period t.

The quantity supplied in period t, $Q_t^S$ is a function of the price of preceeding period, $P_{t-1}$. Thus assuming one period lag on the supply side, let us have

$$Q_t^S = -50 + P_{t-1}$$

$$Q^S_{t+1} = -50 + P_t$$

As the demand function changes from $Q_t^D$ to $Q_t^{D1}$ then there will be no increase in supply in the temporary period, and so the price will go up to adjust demand and supply, This is our case 1.

$$Q_t^{D1} = [190 - P_t] = 50 = Q_t^S$$

$$P_t = 140 \qquad \text{(rather than the earlier level, 100)}$$

In the next period, the supply increases in response to higher price

$$Q_{t+1}^S = -50 + P_t$$

$$Q_{t+1}^S = -50 + 140 = 90$$

$$Q_{t+1}^S > Q_t^S \text{ by } 40 = (90 - 50)$$

But the market will not take this quantity at a price of 140.

$$\left\{Q_{t+1}^{D1} = \left[190 - P_t\right]\right\} = \left\{90 = Q_{t+1}^S\right\}$$

$$\therefore P_t = 100$$

At this price, the supply will be reduced

$$Q_{t+2}^S = -50 + P_{t+1}$$

$$= -50 + 100$$

$$= 50$$

The reduction in supply relative to new demand will mean demand-pull rise in price.

$$\left\{Q_{t+2}^{D1} = \left[190 - P_{t+2}\right]\right\} = \left\{50 = Q_{t+2}^S\right\}$$

$$\therefore P_{t+2} = 140$$

In this way the price-output oscillations will occur. The oscillations may be of various kinds. In the present example, where we have assumed that the elasticity-of-demand is equal to the elasticity-of-supply, we have what is called "continuous cycles"—amplitude of fluctuations remains same, i.e., price—output cycles proceed on the same track but they never reach the equilibrium ed = es : Continuous cycle

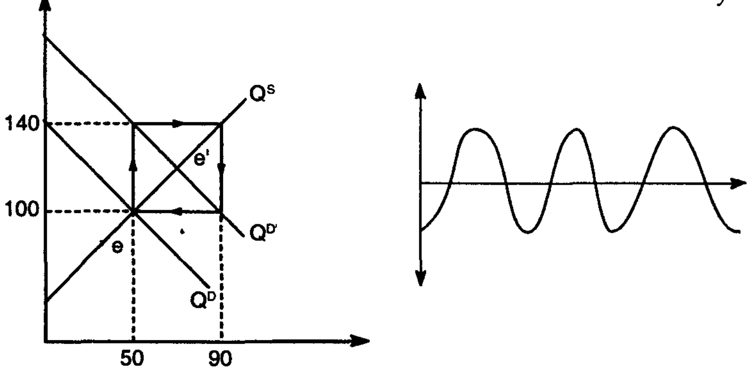


*Fig. 1*

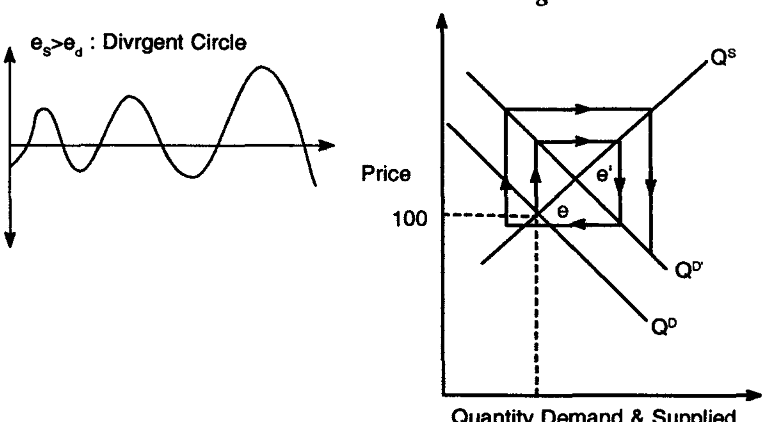


*Fig. 2*

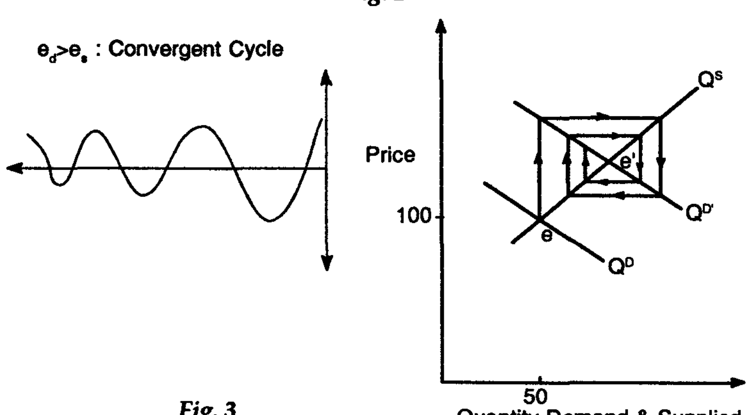


*Fig. 3*

point e as illustrated in diagram 1. If the elasticity of supply is greater than the elasticity of demand, amplitude of fluctuations increases i.e., we will have "divergent cycles" or explosive price—output fluctuations away from the equilibrium point e, as illustrated in diagram 2. If the elasticity of demand is assumed greater than the elasticity of supply, amplitude of fluctuations decreases i.e., we will have "convergent cycles", price-output-fluctuations converge towards the point e. This is damped fluctuations of diagram 3. These figures explain the various forms of agricultural business cycles, typical of agro-based under developed countries.

□□□

# 19

# PURE MONOPOLY

Pure monopoly, in contrast to pure competition, is the other extreme on the market structure continuum. Monopoly is the case of single producer of a goods or service that has no close or perfect substitutes. Under this case, the industry consists of only one company. In real world of business, monopoly rarely exists. Even the public utility services owned and controlled by the Government do not constitute pure state monopolies. For example, electricity supplier may face strong competition from gas and oil suppliers. Though pure monopoly is a theoretical abstraction, it is still worthy of careful examination. Many of the economic precepts found under monopoly can be used to estimate optimal company behaviour in the less precise, but more prevalent, partly competitive and partly monopolistic market structure that dominate the real world business scene. Additionally, an understanding of monopoly market relationship provides the background necessary to examine the economics of government ownership, control and regulation of business, a subject which is of prime importance to business managers.

A monopolistic company uses the same profit-maximising rule as a company in a competitive industry does. The equimarginal principle, MR = MC, furnishes the optimum decision rule. The monopolist operates at the output where marginal revenue, MR, equals marginal costs, MC. So long as the addition made to total revenue exceeds the addition made to costs, it pays the monopolist to produce more. When the additional costs exceed the additional revenue, it pays the monopolist to cut back production. Thus equilibrium output and price are decided at level corresponding to MR=MC condition. The demand curve, facing the monopolist company, however, is not horizontal or perfectly elastic, as typical of a competitive company. In monopoly, the industry demand curve is identical to the demand curve of the company, and because industry demand curves typically are downward sloping, monopolist also faces downward sloping demand curves, i.e., the average revenue curve under monopoly is negatively inclined. Depending upon the relation between average revenue, its elasticity and marginal revenue, a relationship which we have examined in the context of demand decisions, it follows that marginal revenue is always less than average revenue under monopoly.

When the monopolistic company equates MR with MC, it simultaneously determines its output level and the market price for its product. This decision is illustrated in diagram assuming three cases: (a) Increasing costs, (b) Constant costs and (c) Decreasing

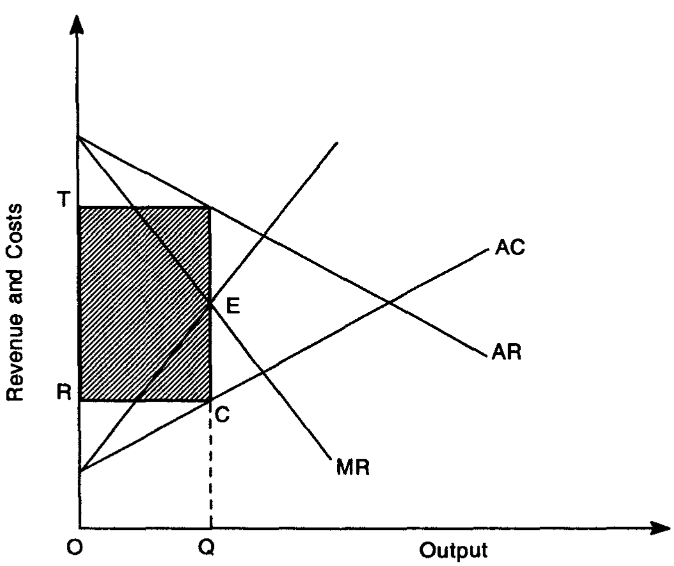


*Fig. 1*

costs. Corresponding to the equilibrium point E, where the equi-marginal condition of optimum decision (MR=MC) is satisfied, the equilibrium level of output for the monopolist is decided to be OQ.

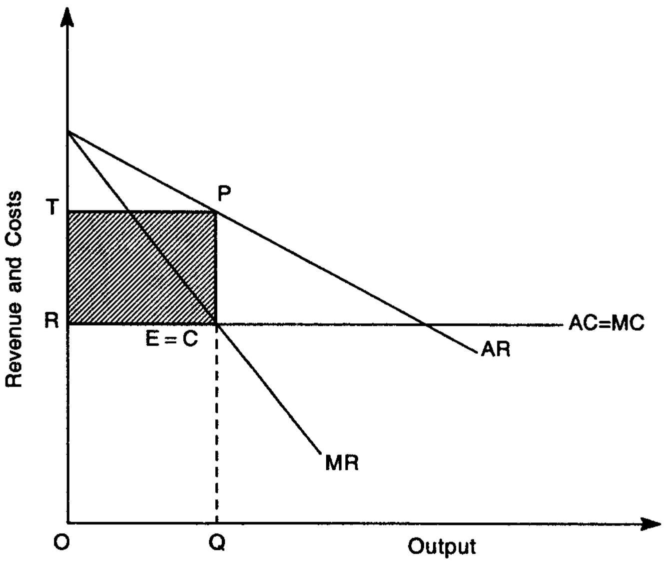


*Fig. 2 :* Constant Costs

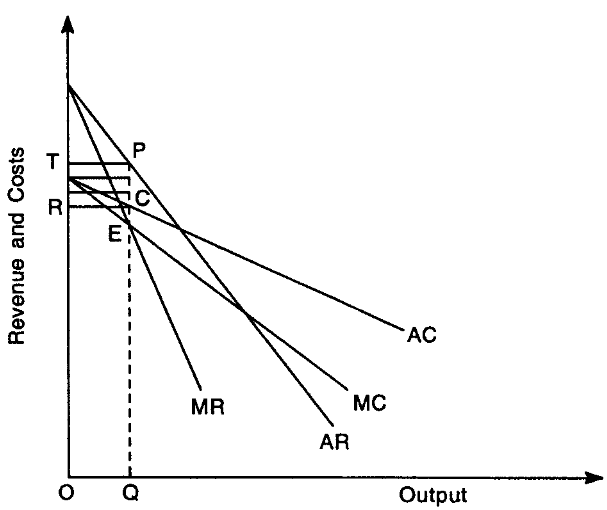


*Fig. 3 :* Decreasing Costs

This level of output is produced at a cost of QC per unit, but sold at a price of QP per unit This leaves PC as the profit per unit of output produced and sold by the monopolist. This rate of profit and the total quantity of output sold decide the total profits, PCRT earned by the monopolist. This is the maximum profit which he can earn. As and when the monopolist chooses OQ, QP and PCRT as solutions to his decision variables-output, price and profits respectively, he makes optimal decisions, because two conditions are satisfied simultaneously :

1. First-order equilibrium condition :

$$\frac{d\pi}{dQ} = 0 \quad \text{i.e.,} \left[\frac{dR}{dQ} = \frac{dC}{dQ}\right]$$

2. Second-order stability condition :

$$\frac{d^2\pi}{dQ^2} < 0 \quad \text{i.e.,} \left[\frac{d^2R}{dQ^2} = \frac{d^2C}{dQ^2}\right] < 0$$

We can now take some examples to illustrate the optimal price-output decisions by a monopoly producer.

***Example 1 :***

Let us suppose that our monopolist faces the following conditions :

Demand function :

$$p = p(Q) = 100 - 10Q$$

Average cost function :

$$c = c\,(Q) = \frac{100 + 20Q}{Q}$$

From these, the total revenue (R) and the total cost (C) functions can be derived.

$$R = p.Q = 100\,Q - Q^2$$

$$C = c.Q = 100 + 20\,Q$$

Then $\quad MR = \dfrac{dR}{dQ} = 100 - 20\,Q$

and $\quad MC = \dfrac{dC}{dQ} = 20$

For setting $\dfrac{d\pi}{dQ} = 0$, we set

$$\frac{dR}{dQ} = \frac{dC}{dQ}$$

$$100 - 20\,Q = 20$$

$$20\,Q = 80$$

or $\quad Q = 4,\quad$ at which $\dfrac{d^2\pi}{dQ^2} = -20$.

Substituting this value, Q = 4 in the relevant, equations, we get

$$P = 60$$

$$R = 240$$

$$C = 180$$

$$\pi = 60$$

***Example 2 :***

Suppose, the marginal cost is not constant but rising. Let us have the total cost function as

$$C = 10 + 22Q + 3Q^2$$

In addition, let us suppose that the demand condition remains unchanged such that

$$R = 100\,Q - Q^2$$

In this case,

$$\frac{dR}{dQ} = 100 - 20\,Q$$

$$\frac{dC}{dQ} = 22 + 6Q$$

Satisfying the first-order condition for a profit maximum, we have,

$$100 - 20Q = 22 + 6Q$$

$$26Q = 78$$

$$Q = 3 \qquad \text{at which} \quad \frac{d^2\pi}{dQ^2} = -20$$

Now $p = 70$

$$R = 210$$

$$C = 103$$

$$\pi = 107$$

*Example 3 :*

Assume that a monopolist has the demand condition :

$$Q = 300 - 2P$$

and the average cost condition

$$C = \frac{100}{Q} + 3 + 7Q$$

and that a subsidy is paid of 3 per unit.

Let us find the profit maximising price and output.

First let us get the R and C functions.

$$R = PQ$$

From the demand equation

$$Q = 300 - 2P$$

We have $P = 150 - 0.5Q$

$$R = 150\,Q - 0.5Q^2$$

Additionally

$$C = c.Q$$

$$= 100 + 3Q + 7Q^2$$

Now

$$\pi = R - C$$
$$= 150Q - 0.5Q^2 - 100 - 3Q - 7Q^2$$
$$= 147Q - 7.5Q^2 - 100$$

Now adding 3 Q, the subsidy, we have

$$\pi = 150Q - 7.8Q^2 - 100$$

which is maximised by satisfying the equilibrium and stability conditions when

$$Q = 10, P = 145 \text{ and } \pi = 650$$

It is interesting to ask if or not anything would be produced in the absence of the subsidy.

From the cost equation

$$C = 100 + 3Q + 7Q^2$$

We get the average variable cost

$$AVC = 3 + 7Q$$

This means that in the short-run, it pays the monopolist to produce at any price above 3. From the demand curve, it is obvious that this can be done without a subsidy. At what price, it pays the monopolist to stay in business, i.e., at what price the fixed costs of 100 is covered, is another question. Still another issue, with reference to this problem, may be to find the rates of change of equilibrium price and quantity with respect to the subsidy per unit, S. We may proceed as follows.

$$\pi = -7.5Q^2 + 147Q - 100 + SQ$$

The first-order condition gives

$$Q = \frac{147}{15} + \frac{1}{15}S$$

From this, we find

$$\frac{dQ}{dS} = \frac{1}{15},$$

From the demand equation

$$P = 150 - 0.5Q$$

We find $$\frac{dP}{dQ} = -0.5$$

$$\therefore \frac{dP}{dQ} \cdot \frac{dQ}{dS} = -(0.5)\frac{1}{15} = -\frac{1}{30}$$

These results indicate that by paying subsidy to the monopolist producer, the fiscal authority can stimulate the level of production and can effectuate a reduction in price. Thus the payment of subsidy is socially desirable provided it does not yield resource misallocation effects. We can attempt to illustrate this with the help of diagram as well. For example, consider the constant cost diagram (Note, the problem solved above does not correspond to this, but we are using this for simplicity of analysis). The payment of subsidy shifts the

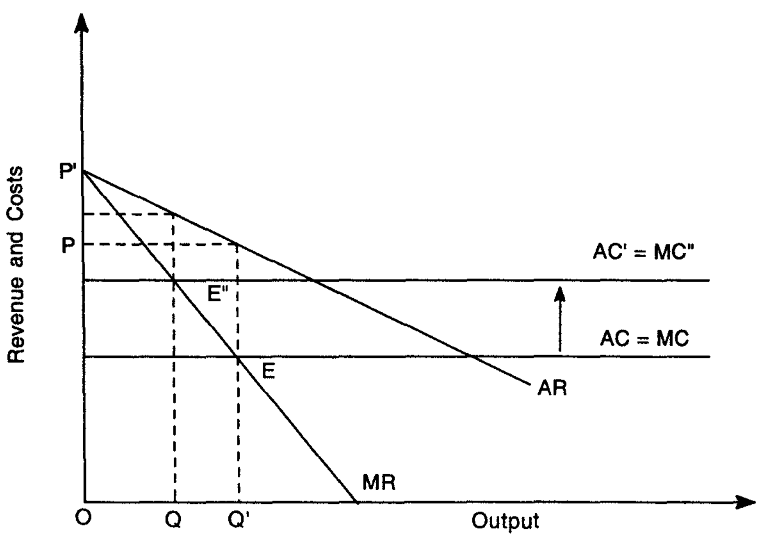


*Fig. 4*

cost curve down ; revenue conditions remaining unchanged, this brings about a rise in output by QQ″ and a fall in price per unit by P″P, as shown in diagram 4.

It is understandable that just opposite will be the effect of a tax per unit of output on the monopolist. The imposition of a tax per unit is illustrated in the diagram 5. Again assuming constant-cost

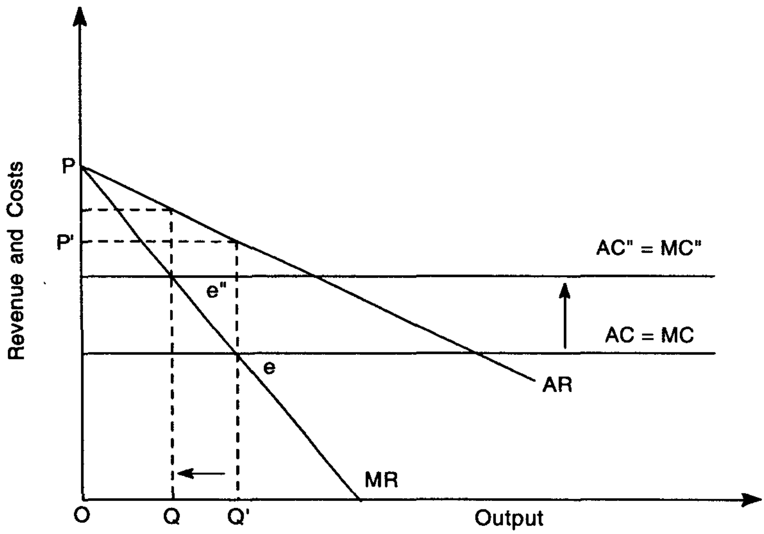


*Fig. 5*

case, the reduction in output is illustrated to be Q'Q and the rise in price. P'P

Let us take another problem— example to illustrate the effect of tax on the monopolist. Let us assume that a monopolist is facing the demand curve :

$$Q = 42 - \tfrac{1}{2} P$$

The average and marginal costs of production per unit of output is

$$c = 60$$

Note, the producer is facing constant cost conditions such that $c = \frac{C}{Q} = \frac{dC}{dQ} = 60$. This means that the total cost function is $C = 60\,Q$.

The demand condition may be restated in view of the decision variable, Q in which we are interested.

$$Q = 42 - ½P$$

or $$P = 84 - 2Q$$

$$R = P.Q. = 54\,Q - 2Q^2$$

Thus we have

$$R = P.Q = 84Q - 2Q^2$$

$$C = c.Q = 60\,Q$$

$$\pi = 24Q - 2Q^2$$

The first order and the second order conditions for a maxmiam are satisfied at

$$Q = 6$$

$$P = 72$$

$$\pi = 72$$

Now if a tax is imposed of 4 per unit of output then

$$Q = 5$$

$$P = 74$$

$$\pi = 50$$

Thus as a result of the tax, the price has increased and the output sold by the monopolist as well as his profits have decreased. This is exactly the result we have got in our Fig. 5.

The immediate effects of fiscal instruments like taxes and subsidies are on the price-output decisions of the monopolist; but their ultimate effects operate on resource allocation, efficiency, incentive, research and development activities of the monopolist. The social welfare effects of government control and regulation of monopolies must consider these immediate and remote effects.

One of the useful concepts in the analysis of welfare economics of monopoly is the concept of dead-weight loss under monopoly. Consider the diagram 6. Had competition prevailed, corresponding to the normal profit (AR = AC) condition, OQ′ would have got produced and sold at a unit price Q′P′. At the competitive optimum, the community will enjoy Marshallian consumer-surplus RKP″. When the situation develops into monopoly, corresponding to the

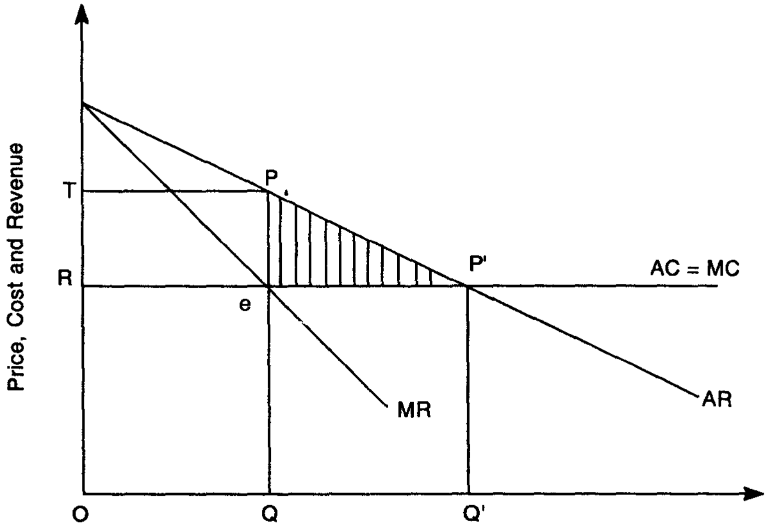


*Fig. 5*

equilibrium level output OQ sold at a price of QP per unit, the consumer loses to the monopolist that part of his consumer surplus represented by the profit area RTPe and is left with TKP. The area Pe P′ measures the "dead-weight loss" due to monopoly. Even if the entire profit of the monopolist is taken away by a lumpsum tax and is redistributed back to the consumers through welfare expenditures, the consumers would still be losing to the devil of inefficiency and misallocation, the deadweight triangle that accrues to nobody in the society.

Another important concept which is of crucial significance in the welfare analysis and policy prescription for the market structure is that of degree of monopoly. Various devices have been suggested from time to time to measure the degree of monopoly power.

One index of the degree of monopoly power is the inverse of the number of sellers, which would give values ranging from unity (in the case of complete monopoly) to zero (in the case of a large number of sellers typical of perfect competition). This is not a very satisfactory measure. Companies are not of equal size. One company may have a large market share, while a large number of companies together may have a small market share. So large number does not necessarily mean zero degree of monopoly. As such, sometimes, attempt is made to measure the degree to which production is concentrated in a few hands in the industry by calculating the percentage of the total physical or value product that is produced by the largest producers. The concentration of control in the industry may also be measured by the company's value of assets, productive capacity, sales revenue etc. Such measures involve a lot of statistical data work.

Another measure is suggested by the Lerner index, where

$$\text{Monopoly index} = \frac{P - MC}{P}$$

where P = price of the product and MC = marginal costs of production. Under perfect competition, where P = MC, the numerator will be zero and, therefore, the monopoly index will be zero. The index will approach unity as the relative gap between P and MC increases. But it could reach unity only when either p = 8888 or MC = 0. Thus the Lerner monopoly index shows the degree of monopoly as a relative deviation from pure competition.

The Lerner formula appears like the inverse of price elasticity of demand formula, which is

$$e_P \frac{A}{AR - MR} = \frac{P}{P - MR}$$

where AR = Average revenue and MR = Marginal revenue. The point of difference between the Lerner formula and the elasticity of demand formula is that the item MC in the former is replaced by MR in the latter. But under equilibrium, MC = MR, so that the Lerner index works out to be the inverse of price elasticity of demand formula.

Lerner index is subject to a number of limitations. First, Price may deviate from marginal costs for reasons other than monopoly. Or price may be close to marginal costs, despite considerable monopoly power. The cause may lie in governmental interference.

Second, if the essence of monopoly lies in output-restriction rather than price-increase, then Lerner index may not be a perfect guide; the deviation of selling price from marginal costs may not reflect the gap between competitive output and monopoly output. Third, there is ambiguity in the concept of marginal costs. Should one use the short-run or the long-run MC? Lerner regards short-run MC as the appropriate figure.

Another measure of the degree of market inperfection is to use a form of cross elasticity of demand. Let there be two profit maximising companies, i and j such that we can relate the price charged by the i-th company, P», to the quantity of output supplied by the j-th company, Qj. Suppose the i-th company sets the price P,, what quantity must j-th company sell to maximise profit ? If j can sell any quantity, regardless of the price set by i, that is,

$$\frac{\partial Q_j}{\partial P_i} \cdot \frac{P_j}{Q_i} = 0,$$

then we have pure competition. If, however regardless of i's price, j can sell only a certain amount then we have pure monopoly. It i's price rises and j's sales rise, then we have oligopoly or large group monopolistic competition. This measure is toe theoretical to have any practical use in real world. However, this measure is comparable to the Lerner index. Lerner index emphasizes the cost side, whereas this measure emphasizes the demand side of the oblem.

Another attempt at the measurement of degree of monopoly has been made by Rothschild. His formula seeks to measure the monopoly control of an individual company within the industry to which it belongs. For this purpose, the individual companies' ("species") demand curve has to be compared with the industry ("genus") demand curve. If the two curves coincide, i.e., the slope ratio is 1:1, then the company is controlling the output of the entire industry. This means complete monopoly control. On the other hand, if the company controls very little of the industry's output and if its product is not differentiated from the industry's product, then the slope of the company's demand curve will be zero. This means pure completion. Rothschild measure is also not very satisfactory. Companies will hardly ever make estimates of the sort required by the Rothschild measure which is highly hypothetical.

Kalecki suggests that the degree of monopoly can be measured by the ratio of gross profits, tt, to total turnover of the company. I Gross profits are composed of capitalist's income, Ye, the salaries of the executives Se, and depreciation, d. Thus Kalecki formula can be stated as

$$\frac{\pi}{T} = \frac{Y_c + S_e + d}{T}$$

Higher the ratio p/T, higher is the degree of monopoly and vice versa. If data on p and T are available from all individual companies, then the average degree of monoply for the industry can be measured. Similarly, if relevant data are available from all sectors, the average degree of monopoly for the whole economy can be estimated.

Of all the methods discussed above, Lerner index is the least imperfect one. In fact, Kalecki himself uses Lerner index in his theory of profits. Rothschild also speaks of appropriateness of Lerner's index in estimating social costs of monopoly. Most of the measures assume that profits (or net revenue) is the most obvious and most logical measure of monopoly power, but it is difficult to get accurate data on profit. The data on selling price and marginal costs of production may be more easily available, and such data may be more useful to deal with problems like resource allocation, capacity utilisation and consumer protection — the problems which arise from market imperfection.

□□□

# 20

# DISCRIMINATING MONOPOLY

As against simple monopoly, the market may sometimes be ruled by situation of discriminating monopoly or what is called "price discrimination." This has reference to the act of selling the same goods or service produced under a single control, at different prices to different buyers. For example, the doctor may quote different consultation fees to different patients, rich and poor. An exporting company can charge less abroad than what it charges for its product at home. Such a case of selling cheap in the foreign market in contrast to selling dear in the home market is technically described as "dumping." The local municipal authority charges two different rates or taxes for building consumption—one for domestic residential use and the other for commercial use. Such examples can be multiplied. The real world around us reveals that there are a number of methods of price discrimination. The most effective methods are those which have legal sanction and those which are imposed by government monopolies. The bases of price discrimination are many : age, sex, time, place, quality, customer category, quantity discounts etc. These bases and methods of price discrimination used in practice are so varied that their implementation presents different problems in market strategy and that their formal analysis may not always be sufficient to conceptualize the complexity involved. With this caution in mind, we will briefly touch upon three specific issues of discriminating monoply—possibility, profitability and morality/ethics/social desirability.

Price discrimination is possible if there is no "seepage" between different markets. In order that a monopolist can practice price discrimination, he must first create separated markets such that no unit of supply, placed at one market can be transferred to another market. For example, if the high-fee patient are not distinctly separate from the low-fee patient, the doctor cannot charge two different fees. Similarly, dumping is possible because reimporting and resale of the products are prohibited by commercial policies. This suggests that transportation costs, information costs etc. are relevant conditions for market segmentation and price discrimiation. In other words, "if there is some degree of market imperfection, there can be some degree of price discrimination" (Mrs. Robinson).

It has become conventional, since the days of Pigou to distinguish different degrees of price discrimination. The first degree discrimination exists, if the monopolist is able to charge a separate price for each unit of his product sold to each separate buyer such that no buyer is left with any Marshallian consumer-surplus. The second degree discrimination exists, if a monopolist were able to make n-separate prices such that all units with demand price higher than $P_1$ are sold at a price $P_1$? all units with a demand price lower than $P_1$ and higher than $P_1$, at a price $P_2$, and so on, thus leaving some consumer surplus. The third degree price discrimination is found when n-different prices are charged from n-classes of customers, leaving it to the customers to choose their class (such as railway fare).

If it is physically possible for a monopolist to class his customers into separate markets and thereby to practice price discrimination, then it is a profitable business tactics. Since separate markets are created, separate demand (revenue) conditions are faced by the discriminating monopolist. The basic decision rule for profit maximization in this case is that marginal revenue must be same in all markets in which the monopolist sells. For if marginal revenue

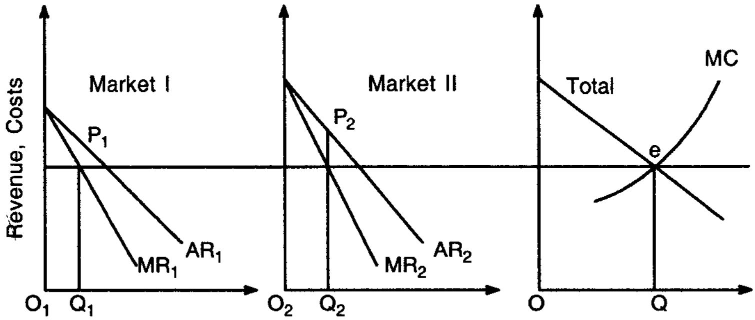


*Fig. 1*

is higher in market I than in II, the monoplist can increase his profits by decreasing his volume of sales in market II and increasing his sales correspondingly in market I. Only when this transfer process raises the price in market II and lowers it in 1 to a point where marginal revenues in two markets are equal will the monopolist have arrived at an optimum allocation of his goods between two markets. The average revenues in two separate markets indicate two separate prices, the total output sold in these two markets is determined by setting the aggregate marginal revenue equal to marginal cost. This is illustrated in the proceeding diagram.

The aggregate marginal revenue (AMR) is derived by a horizontal aggregation of the marginal revenue curves for the monopolist's separated submarkets. The aggregate marginal revenue being equal to the marginal cost determines OQ as the equilibrium level of output. This quantity is divided between the markets into amounts $O_1Q_1$ and $O_2Q_2$ at which the marginal revenues are equal in both markets to the marginal costs, as required for profit maximization. It may be noted that the equilibrium condition (optimum decision rule) is a mere restatement of the fundamental concept of equi-marginalism.

$$MR_1 = MR_2 = \dots MR_n = MC$$

That is $\dfrac{dR_1}{dQ_1} = \dfrac{dR_2}{dQ_2} = \dots\dots \dfrac{dR_n}{dQ_n} = \dfrac{dC}{dQ}$

It may also be noted that $O_1Q_1$ will be sold at a price per unit, whereas $O_2Q_2$ at $Q_2P_2$. This suggests that the monopolist charges a lower price where demand is relatively elastic and that he charges a higher price in the market where demand is relatively more inelastic. This is but a profit-maximizing tactics. In fact, the profitability of price discrimination depends on price elasticity of demand in the markets. Price discrimination presupposes different demand-elasticities in different markets. Price discrimination is feasible and profitable provided the price-elasticities of demand in separate market are not equal.

Price discrimination is a standard practice. A number of factors must be considered before one could pass any judgment on the social desirability of this practice. Unless it is of the first degree type (which exists more in theory than in practice), price discrimination does not involve exploitation of consumer-surplus. Price discrimination may be designed on the ability-to-pay principle. It may be a means to make certain production feasible. High prices, may impoverish the rich, and low prices may enrich the poor. Larger revenue from one market may be utilised to subsidies lower revenue from the other market. Price discrimination may therefore, ultimately reduce the social costs of production or enhance the social benefits Such externality effects of price discrimination are, of course, not always quantifiable and measurable. But sometimes, the net external economies of price discrimination become too obvious. For example, dumping may be a policy which enables the economy to avoid market-glut at home and to earn foreign exchange from aborad.

The analytical significance of the price discrimation model is great. The optimum decision rule for a multi-plant monopolist who faces separate cost conditions, appropriate to each plant which produces a given output to be sold in one market is a simple reformulation of the optimising principle that we have stated earlier. Here

$$MC_1 = MC_2 = \ldots\ldots = MC_n = AMC = MR$$

$$\text{or} \quad \frac{dC_1}{dQ_1} = \frac{dC_2}{dQ_2} = \ldots\ldots \frac{dC_n}{dQ_n} = \frac{dC}{dQ} = \frac{dR}{dQ}$$

In the same way, the optimum decision rule with regard to product-line pricing can also be derived by a mere application of the equi-marginal principle of the discriminating monopolist. In this case, the monopolist produces a vector of products, $Q = (Q_1, Q_2, Q_3, \ldots\ldots\ldots, Q_n)$. For different verities of his product, $Q_1$ through $Q_n$, he may be facing different revenue (market demand) conditions, $R_1$ through $R_n$. As such, he is able to calculate $\frac{dR_1}{dQ_1}$ through $\frac{dR_n}{dQ_n}$ Assuming that his product, $Q_1$ through $Q_n$ have input requirements of same quality (though different quantity), we can talk of $C=C(Q)$ where $Q = \sum_{i=1}^{n} Q_i$. Thus product line pricing decision i.e., pricing different products at different rates, turns out to be a mere application of the rule : $MR_1 = MR_2 = MR_n = MC_i$. If different products produced are subject to different demand conditions and different cost conditions, then the case boils down to that of a simple monopolist who should follow separately,

$$MR_1 = MC_1, MR_2 = MC_2, \ldots\ldots\ldots \text{ and, } MR_n = MC_n.$$

We may now formulate a problem to illustrate the calculus of price discrimination. Suppose that a discriminating monoplist sells his output, $Q_n$ and $Q_s$, in two isolated markets, northern and southern. The demard conditions obtained in these two markets are stated as

$$p_n = 2 - Q_n$$

$$p_s = 9 - 6Q_s$$

where $P_n$ and $P_s$ represent commodity price per unit of output sold in the northern and southern markets respectively. And suppose that the monopolist's total cost situation is estimated to be,

$$C = Q_n + Q_s$$

We are interested to know the profit maximising market data for the monopolist under this situation.

The total profit in the two markets together will be,

$$\pi = [P_nQ_n + P_sQ_s] - C$$

$$= 2Q_n - Q_n^2 + 9Q_s - 6Q_s^2 - Q_n - Q_s$$
$$= Q_n - Q_n^2 + 8Q_s - 6Q_s^2$$

For satisfying the first order equilibrium condition, we have,

$$\frac{\partial \pi}{\partial Q_n} = [1 - 2Q_n] = O \qquad \text{or } Q_n = 1/2$$

$$\frac{\partial \pi}{\partial Q_s} = [1 - 2Q_n] = O \qquad \text{or } Q_s = 2/3$$

Also note that the second order stability condition for a maxima are satisfied.

$$\frac{\partial \pi^2}{\partial Q_n^2} = -2 \text{ and } \frac{\partial \pi^2}{\partial Q_s} = -12$$

Hence substituting the equilibrium values of $Q_n$ and $Q_s$ into the demand and profit functions, we get,

$$Pn = 1½, P_s = 5 \text{ and } p = 2\frac{11}{12}$$

Also $\quad MR_n = MR_s = 1$, where $MR_n = \dfrac{\partial P_n Q_n}{\partial Q_n}$

and $MR_s = \dfrac{\partial P_s Q_s}{\partial Q_s}$

Further, it may be noted that $P_s > P_n$ because the demand is relatively more inelastic in the southern market, i.e., $e_s < e_n$ or $e_n > e_s$, This may be checked.

$$e_n = \frac{AR_n}{AR_n - MR_n} = \frac{3/2}{3/2} = 3$$

$$e_n = \frac{AR_S}{AR_S - MR_S} = \frac{5}{5-1} = 1\frac{1}{4}$$

Lei us now suppose that the government announces, in view of consumer protection, that henceforth such price discrimination would be illegal. In our technical term, this means that our monopolist has now to maximize profit, subject to the constraint imposed by the government, $P_n=P_s$, i.e., $[2-Q_n] = [9-6Q_s]$. Using the same profit function as before, we have the Lagrangian expression.

$$\pi = Q_n - Q_n^2 + 8Q_s - 6Q_S^2 + \lambda\,[7-6Q_s + Q_n]$$

so that we require

$$\frac{\partial \pi}{\partial Q_n} = [1-2Q_n + \lambda] = 0$$

$$\frac{\partial \pi}{\partial Q_s} = \left[8-12Q_s + \lambda^6\right] = 0$$

$$\frac{\partial \pi}{\partial \lambda} = [7-6Q_s + Q_n] = 0$$

Solving simultaneously, we have $Q_n=0$, $Q_s=1\frac{1}{6}$. Substituting these values in the relevant equations, we have $P_n=P_s=2$, $\pi=3/2$, $MR_n= 2$ and $MR_S= -5$. In this case $e_n=\alpha$ and $e_s= 2/7$.

It may be noted that monopoly profits were larger (and size of output sold smaller) under discrimination than under no-discrimination case. As price discrimination is made illegal, $P_n=P_s$, one of the prices rises, and the other price, $P_s$ falls; total output now sold increases though the sale in the northern market has fallen to zero. Marginal revenues from southern market have become nagative.

When there was price discrimination, $P_s \neq P_n$ because $e_s \neq e_n$. From the equilibrium condition, we have

$$MR_s = MR_n = MC$$

Equi-marginal revenue means

$$MR_s = MR_n$$

or $$P_s\left(1-\frac{1}{e_s}\right) = P_n\left(1-\frac{1}{e_n}\right)$$

or $$\frac{P_s}{P_n} = \frac{\left(1 - \frac{1}{e_n}\right)}{\left(1 - \frac{1}{e_s}\right)}$$

Since $e_n > e_s$, we got

$$\frac{P_s}{P_n} > 1$$

Under no-discrimination enforced by legistation

$$\frac{P_s}{P_n} > 1, \text{ thouogh } e_s \neq e_n$$

An interesting case is in order by way of implication. Under no-discrimination situation, we have $e_n = \infty$. This means $\frac{1}{e_n} = 0$, and $\left(1 - \frac{1}{e_n}\right) = 1$. Thus the condition of profit maximization here becomes :

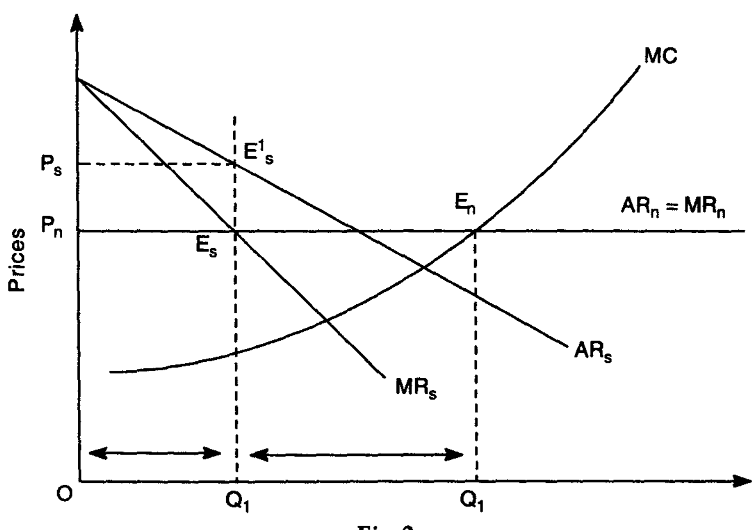


*Fig. 2*

$P_n = P_s\left(1 - \frac{1}{e_n}\right)$. This still means that $MR_n = MR_s$. Assuming free market operations (i.e., no legislative interference by the government), this means that the producer is selling in two markets, one of which (North) is perfectly competitive, while in the other (South) he has a monopoly. It is clear that in equilibrium $P_n < P_s$; competitive prices are lower than monopoly prices. The output sold in the northern (competitive) market will be larger than the output sold in the southern (monopoly) market, $Q_n > Q_s$. Thus the producer can continue price-discrimination, despite infinite elasticity in one of his markets. This case is illustrated in the above diagram. Here MC represents trie rrarginal costs of production; $E_n$ and $E_s$ are profit maximising equilibrium points in the northern and the southern markets respectively.

$$MC = MR_n = MR_s$$

Satisfying this condition, the producer is selling $OQ_s$ at price $OP_s$ in the southern market and $Q_sQ_n$ at price $OP_n$ in the northern market The total output sold in the two markets is $OQ_n = [OQ_s+Q_s Q_n]$.

If the competitive price in the northern market falls, the total output vill fall also, for En will be shifted downward to the left and $Q_n$ will move to the left, MC will be lowered. The output in southern market will be increased, for Es will move downward to the right and $Q_s$ will move to the right, price in southern market will be lowered. The output sold in the northern market will decline. If the competitive price in the northern market falls below the level at which $MR_s$ cuts the MC, no output will be sold in the competitive northern market characterised by infinite elasticity of demand. This is the situation our producer has been driven to by government legislation allowing nc-discrimination in the numerical problem we have solved earlier.

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# 21

# BILATERAL MONOPOLY

This is a market situation where a monopolist faces a monopsonist. The tug of war between one seller and one buyer decides the value coefficients of the market variables like price, output and profit. Many economists argue that such a situation may not yield any determinate solution of the market data. F.Y. Edgeworth used the concept of "contract curve" in explaining the market behaviour under bilateral monopoly. Basic to the contract curve analysis of the bilateral monopoly problem, is the indifference curve technique. In the present context, indifference curve may be interpreted as an iso-profit curve. We can conceive of two sets (maps) of iso-profit curves—one for the buyer and the other for the seller. Let us assume that both buyer and seller are exchanging two commodities—money (M) and an input item (I). The buyer is anin put-purchasers, and the seller is an input-supplier. The two indifference maps are illustrated in Fig. 1 and Fig. 2.

Study the buyer's map. The buyer starts off with Rs. 500 in money to purchase some units of the input. Any point on the buyer's indifference curve, say $\pi_1^B$ suggests different combination of the input purchased and the stock of money left, yielding the same level of profit. Each such buyer's iso-profit curve is a locus of money-input purchase combinations which are equally preferable. Higher iso-profit curve represents a higher level of profits such that $\pi_3^B > \pi_2^B > \pi_1^B$. In interpreting the buyers' iso-profit map, we should

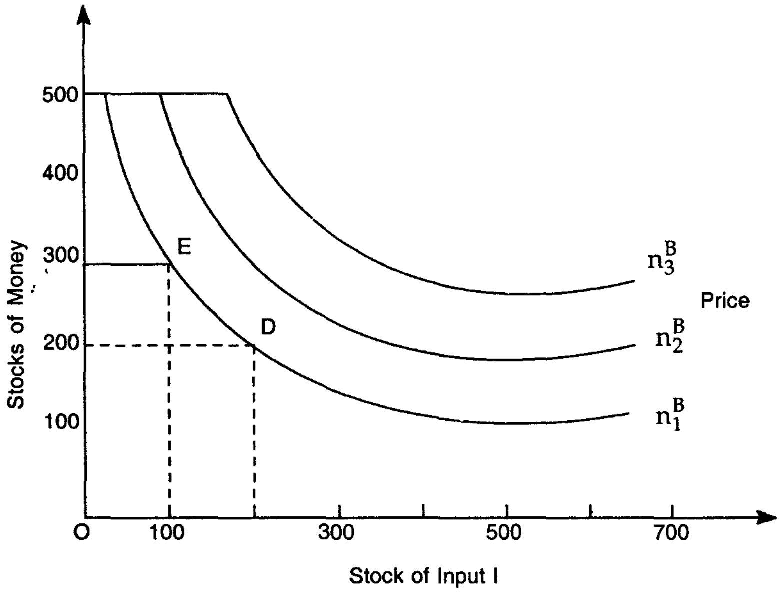


*Fig. 1 : Buyer's case*

read down towards the origin to determine, on the Y-axis, the amount the buyer pays out. For example, at point E, the buyer ends up with 100 units of the input I and Rs. 300 of his original supply of money (M = Rs 500) ; this means that he must have spent Rs. 200 (= Rs. 500 – Rs. 300) for 100 units of the input. Since E and D lie on the same indifference curve, one can read that (100 I + 300 M) and (200 I + 200 M) are equally profitable combinations.

A similar figure can be drawn to represent the situation of the seller. Consider the seller's map in Fig. 2. This seller's iso-profit curve, $\pi_1^S$ is the locus of all combinations of quantities of input supplied and revenue which yield him a fixed level of profit. Here the seller starts with a capacity of 800 units of input which can be supplied to earn some revenue. If the buyer, as per our proceeding example, obtains a combination of 100 inputs and Rs. 300, then it means that our seller ends up with a combination of unused input capacity of 700 (-800 I – 100 I) and a revenue of Rs. 200(=500M – 300M). This combination is represented by the point K. The combination K and T are equally profitable, because they are on the same curve $\pi_1^S$. Here $\pi_3^S > \pi_2^S > \pi_1^S$.

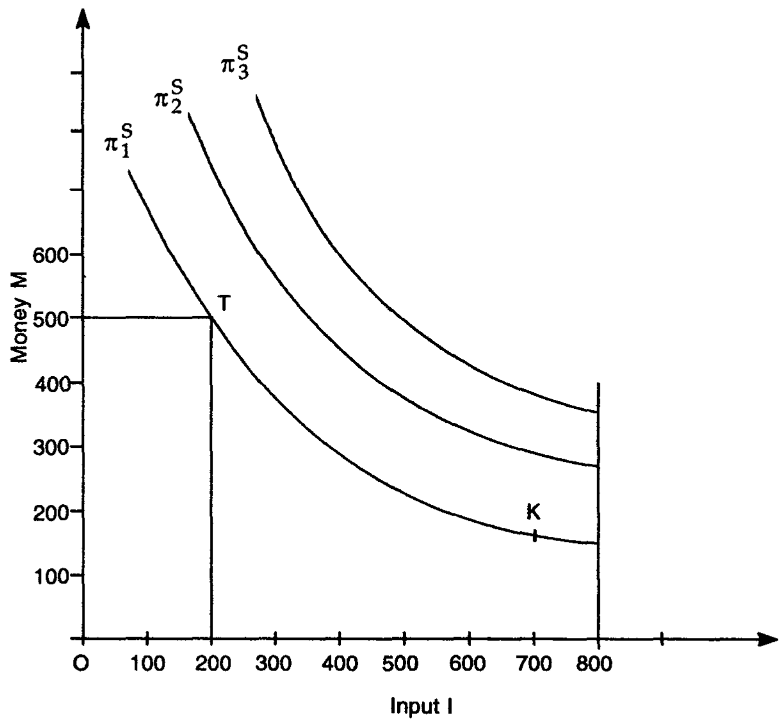


*Fig. 2 : Seller's case*

Now we can introduce a single box diagram, incorporating both buyer's and seller's iso-profit map. In this diagram, the sellers iso-profit map is turned upside down and the ends of the axes joined. The buyer's total money supply (M =Rs. 500) determines the length of the vertical axis, and the fixed input supply capacity (I = 800) of the seller determines the length of the horizontal axis. This figure 3 shows simultaneously the position of both of the bilateral monopolists. For example, consider the point E. It shows that the buyer gets a combination of 100 I and 300M; this means that the seller has a combination of 200 M and 700 I. Since the size of the box is determined by fixed money of the buyer and fixed input capacity of the seller, both combinations of the buyer and the Seller together must exhaust the given quantities of M and I. Whatever does not remain with the buyer must go to the seller, or then setting each of the results equal to Zero, we obtain.

$$\frac{\partial \pi^*}{\partial M^B} = \left[\frac{\partial f^*}{\partial M^B} + \lambda_2^*\right] = 0$$

$$\frac{\partial \pi^*}{\partial M^S} = \left[\lambda_1^* \frac{\partial f^S}{\partial M^S} + \lambda_2^*\right] = 0$$

$$\frac{\partial \pi^*}{\partial I^B} = \left[\frac{\partial f^B}{\partial I^B} + \lambda_3^*\right] = 0$$

$$\frac{\partial \pi^*}{\partial I^S} = \left[\lambda_1^* \frac{\partial f^S}{I^S} + \lambda_3^*\right] = 0$$

The term $\frac{\partial f^B}{\partial M^B}$ can be interpreted as the marginal profit from money to the buyer. Similar $\frac{\partial f^S}{\partial I^S}$, the marginal profit from input to the seller. Solving the prceeding equations for these marginal terms, we have

$$\frac{\partial f^B}{\partial M^B} = -\lambda_2^*$$

$$\frac{\partial f^S}{\partial M^S} = -\frac{\lambda_2^*}{\lambda_1^*}$$

$$\frac{\partial f^B}{\partial I^B} = -\lambda_3^*$$

$$\frac{\partial f^S}{\partial I^S} = -\frac{\lambda_3^*}{\lambda_1^*}$$

Thus by straight forward division,

$$\frac{\partial f^B / \partial M^B}{\partial f^B / \partial I^B} = \frac{\partial f^S / \partial M^S}{\partial f^S / \partial I^S} = \frac{\lambda_3^*}{\lambda_3^*}$$

This reads that for two items, money and input, and two individuals, buyer and seller, the buyer's marginal rate of substitution of money for input is the same as that of seller. This rule provides us with the equation of the contract curve. It may be noted that along the contract curve, at all points, the slope of the buyer's iso-profit curve is equal to the slope of the seller's iso-profit curve. This means that the solution (of the bilateral monopoly problem), if it exists on the contract curve, satisfies the fundamental concept of equi-marginal principle.

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# 22

# MONOPOLISTIC COMPETITION

Prof. Chamberlin is the builder of the theory of monoplistic competition. He suggests that "to consider the theory of monopolistic competition vaguely as a theory of imperfect competition is to confuse the issues". At best the monopolistic competition may be regarded as a leading type of imperfect competition.

Chamberlin observes that economic literature affords a curious mixture, confusion and separation, of the ideas of competition and monopoly. On the one hand, analysis has revealed the analytical differences between them and has lead to the perfection and refinement of a separate body of theory for each. Although the two forces are complexly interwoven, with a variety of design, throughout the price system, the fabric has been undone and refashioned into two each more simple than the original and bearing to it only a partial resemblance. Furthermore, it has, in the main, been assumed that the price system is like this—that all the phenomena to be explained are either competitive or monopolistic, and therefore that the expedient of two purified and extreme types of theory is adequate.

On the other hand, the facts of intermixture in real life have subtly worked against the complete theoretical distinction between competition and monopoly, which is essential to a clear understanding of either. The actual facts do not conform to the established theory and hence led to the false conclusions about the facts; it has belied and observed the theory as well. This is more serious because the mixture of the two forces is a chemical process and not merely a matter of addition. The question arises how this intermixture comes about. To answer this question, the first step should be (in the formulation of a theory of prices) in providing a clear *definition* of the two fundamental forces of competition and monopolistic competition. Under monopolistic competition, however, his market being separate to a degree from those of his rivals, his sales are limited and defined by three new factors : (1) his price (2) the nature of his product, and (3) his advertising outlays. Thus three distinct problems crop up.

The first among this list is the problem of *price adjustment* : The demand curve in monoplistic competition is a downward sloping one, as compared with the demand curve of a perfectly competitive industry, which is a straight line, horizontal to the x-axis. This divergence, on the part of the demand curve, from the pure competition model imposes upon the seller a price problem, which is absent under pure competition. Depending upon the elasticity of the demand curve and upon its position relative to the cost curve for its product, profits may be increased, perhaps by raising the price and selling less, perhaps by lowering it and selling more. That price figure will be sought which will render the total profit a maximum.

The second is the problem of *product adjustment* : This problem is present in pure competition. But there it can hardly be regarded as a problem. There the seller has only to find what type of product he is to produce—whether bread or butter. This is no doubt a simple choice problem. But in monopolistic competition, this product adjustment is a new problem imposed upon the seller by the fact of differentiation. The volume of his sales depends in part upon the manner in which his product differs from that of his competitors. Here 'product' is used in its broad sense. Its 'variation' may refer to an alteration in the quality of the product itself—technical changes, a new design or better materials; it may mean a new package or container; it may mean more prompt and courteous service, a different way of doing business or perhaps a different location. In some cases an alteration is specific and definite—the adoption of a new design, for instance. In others such as a change in the quality of service, it may be gradual, perhaps unconscious. In pure competition, a product may, of course, shift from one field of activity to another, but his volume of sales never depends, as in monopolistic competition, upon the product or the variety of product he chooses, for he is always a part of a market in which many others are producing the identical goods. Just as his sales may, in pure competition, be varied over a wide range without alteration in his price, so they may be as large or as small as he pleases without the necessity of altering his product. Where the possibility of differentiation exists, however sales depend upon the skill with which the good is distinguished from others and made to appeal to a particular group of buyers. The 'product' may be improved, deteriorated, or merely changed, with or without a readjustment of price.

The third problem is the problem of *advertisements and selling costs :* The seller may influence the volume of his sales by making expenditures, of which advertising may be taken as typical, which are directed specifically to that purpose. Such expenditures increase both the demand for his product and his costs; (advertisements increases the short-run costs and in the long-run, sometimes and generally, the revenue too) and their amount will be adjusted, as are prices and 'products' so as to render the profits of the enterprise a maximum. The gains from this service are possible because of (a) imperfect knowledge on the part of the buyers as to the means whereby, wants may be most effectively satisfied, and (b) the possibility of altering wants by advertising or selling appeal. Chamberlin distinguishes *selling costs* (which include advertisement costs) from *production costs.* The costs that must be incurred to make a product, transport it and have it available to the consumer with *given* wants are production costs. The costs of *changing* consumers wants thorough advertisement or any kind of promotional activity are selling costs. It is to be noted that this selling cost factor is peculiar to monopolistic competition, since advertising would be without purpose under conditions of pure competition, where any producer can sell as much as he pleases without it. These three major problems constitute the basic characteristic features of monopolistic competition.

The theory of equilibrium under monopolistic competition can now be studied in two parts. (1) Individual equilibrium, and (2) Group equilibrium.

**Individual Equilibrium :**

Individual equilibrium refers to the equilibrium position of a particular company. Chamberlin makes some assumptions to formulate his theory: (1) It is assumed there that only the production costs are included, whereas the advertising and selling costs are excluded. Let P-P′ be this production cost curve in the following diagram. Secondly, it is assumed that conditions with respect to all *svbstitutes,* both as to their nature and as to their prices, are given. This is because of the fact that in regard to a particular company, disturbance may arise, if the other companies vary the brands of their product or the price of their brand, as the elasticity of the demand curve will undergo changes. (3) Thirdly and lastly, though not the least, it is assumed that the *'product'* is given and constant. In fact, given the first two assumptions, the theory of individual equilibrium is left with the task of describing the adjustment of price and of 'product' which will render maximum profits for the individual seller. The seller may, in fact, adjust both together or either one separately, depending upon circumstance. If his price is set by circumstance, he is free to vary only his 'product'. On the other hand, if his product is set by its very nature or by a previous decision, then the only variable left, is his price. If both may be

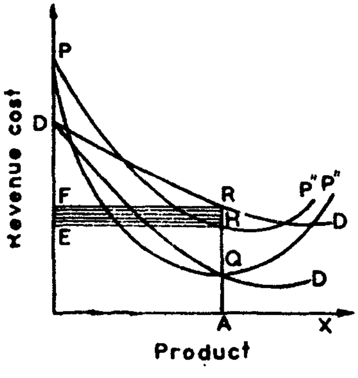


*Fig. 1*

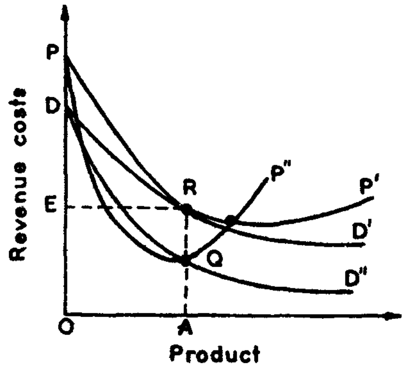


*Fig. 2*

varied, the equilibrium adjustment must involve both So the better method is to consider each in turn and finally to combine them. This method is really advantageous where each isolated problem may have its own value. So let us assume that there is no problem of product adjustment. Having made these heroic assumptions, Chamberlin proceeds to formulate his theory. There he uses the above two diagrams.

In these two figures, D-D′ represents the demand curve, rigidly defined by the fixity of all products and of all other prices, P-P′ is the curve of cost of production. D-D′ cannot lie under P-P′ throughout its length, also D-D′ must intersect P-P′ in two places as in Fig. VE9a or it may run tangentially to P-P′. as seen in Fig. 2. It is bound to cut aceros P-P′ in the manner indicated, i.e., lying below it at either extremity, by the nature of the two curves. It lies below it to the left because, whereas the demand will characteristically become zero at a finite price, and a fairly low one on account of substitutes, the necessity of covering overhead or supplementary costs (including the minimum profit of the entrepreneur), no matter how small the production is, define the cost curve as meeting the y-axis at infinity. D-D′ lies below P-P′ to the right again because the demand curve must fall gradually to zero, whereas the cost curve can never fall to zero, but must turn upwards again after the most efficient scale of production has been reached.

Now supposing Fig. 1, the conditions of demand and of cost are given, the price determined upon will evidently be AR, the profit area, EHRF being a maximum one-(the cost curve, P-P′ includes at all points the minimum profit necessary to secure the entrepreneur's services, therefore, his total profit will be a maximum, if the excess HR over this per unit, multiplied by the number of unit, OA, is a maximum). The amount sold is OA. If D-D′ is tangent to P-P′ as in the other figure, there is only one price which will minimise the loss—and it is AR, for the output OA. Equilibrium here involves no profits above the necessary minimum: yet since these are covered, the adjustment is perfectly stable and so profits are truly maximized as in the former case, where an excess exists.

This point of maximum profit may also be defined with reference to curves of marginal costs and marginal revenues. In the previous diagrams, D-D" represents the marginal revenue curve, being derived from D-D' the average revenue or the demand curve whereas P-P" represents the marginal (production) cost curve, being derived from the P-P', the average production cost curve. As production increases upto the point of intersection at Q, profits are continually increased, since each additional unit adds more to revenue than to costs. Beyond Q, the converse is true, and total profits will accordingly be a maximum when output is adjusted to OA. The price per unit at which this amount will be sold is not AQ, however, but AR, as revealed by the demand curve D-D' (Average revenue curve). It may now be seen that the effect of monopoly elements on the individual's adjustment is characteristically to render his price higher and his scale of production smaller than under pure competition. This is the result of the sloping demand curve as compared to the perfectly horizontal one of pure competition. No matter where the demand curve is drawn, its negative slope will define maximum profits at a point further to left than if it were horizontal as under pure competition. This means, in general, higher production costs and higher prices.

Now, let the price be held constant while the product adjustment is examined. The entrepreneur may be regarded as accepting a price generally prevalent, one established by tradition or trade practice, or one determined upon by an earlier decision, and to which his customers have become habituated. He now chooses his product or whatever phases of it are subject to variation. A peculiarity in this product variation is that unlike variation in price, it may and ordinarily does involve changes in the production cost curve. Qualitative changes in the product alter the cost of producing it. They also, of course, alter the demand for it. The problem becomes that of selecting the product whose cost and whose market allow the largest total profit, price being given. Another peculiarity is that product variations are in their essence qualitative, rather than quantitative, they cannot therefore, he measured along an axis and displayed in a single diagram.1 Resort must be had, instead, to the somewhat clumsy expedient of imagining a series of diagrams one for each variety of 'product. In figure 3, let OE be the fixed price. For simplicity only two varieties of a product—A, B — are illustrated,

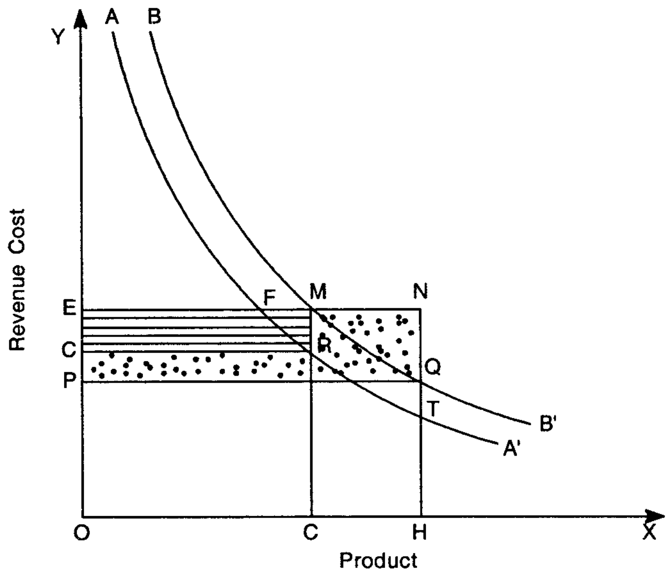


*Fig. 3*

superimposed in the same group. The cost curve for product A, is A–A′ and for B, it is B-B′. As regard the product A, the cost curve being A–A′, the amount demanded is OC. Total profits are RMEC and for product B, the cost curve being B–B′, the amount demanded is OH, total profits are PQNE; total cost, OHQP. It is now evident that product B is to be preferred to A. By making similar comparisons between the costs and demands for all possible varieties, the seller may choose the one which seems to him most advantageous. It must be remarked that the product settled is not necessarily that whose cost of production is the lowest nor it is necessarily the one whose demand is the greatest, for cost of production must be taken into account.

The adjustment of both price and product have now been considered in isolation, and it remains to combine them in order to describe the general case where the seller is free to vary both. If constructions such as Fig. 1 and Fig. 2 are drawn for every possible variety of 'product', then combination of "products" and price may easily be chosen which offers the largest total profit. Or if construction such as Fig. 3 were drawn for all possible combinations of product and price, the optimum combination of the two would again be revealed. The clumsiness of representing product variation graphically makes it impossible to summarize the whole adjustment in a single diagram.

**Group Equilibrium :**

Chamberlin's 'Monopolistic Competition' represents a market structure where the forces of monopoly as well as competition are "blended." Hence Monopolistic Competition "concerns itself not only with the problem of an 'individual equilibrium' (the ordinary theory of monopoly), but also with that of a 'group equilibrium' (the adjustments of economic forces within a group of competing monopolists, ordinarily regarded merely as a group of competitors)."

The 'group' contemplated is one which has ordinarily been regarded as composing one imperfectly competitive market e.g., a number of automobile manufacturers, of magazine publishers, or of retail shoe dealers. Each producer within the group is a monopolist of his 'product', yet he is subject to competition, for his goods are fairly close substitutes of others in the market. 'Group equilibrium' analysis is an attempt to determine the adjustment of 'prices and products' of such a number of competing monopoly producers.

One difficulty encountered at the very beginning of describing the 'group equilibrium', is that widest variation may exist in all respects between the different component companies. Each 'product' by definition, has distinctive features; and is adapted to the tastes and needs of a particular sector of buyer. Such qualitative differences lead to wide divergences in cost curves; and illogical buyers' preferences account for a corresponding variety in the shape (elasticity), and position of the demand curves. The result is heterogeneity of market prices, variation in outputs (scales of production), wide differences in the quantum of profit. In other words, the problem here is that "the imperfection of competition is not uniform"; product differentiation "is not uniformly spaced, so to speak"

In order to facilitate the exposition of 'Group theory', this so-called *'group problem'* is assumed to be non-existent. This is what Chamberlin styles as the "heroic assumption." In definite terms, this 'heroic assumption' means that "both demand and cost curves for all the 'products' are uniform through out the group"—cost revenue conditions remain same within the group. It should be remarked that diversity of 'product' is not entirely eliminated under this assumption. It is required only that consumer's preferences be evenly distributed among the different varieties, and that differences between them be not such as to give rise to differences in costs.

Another complication in the *group problem* arises in connection with the number of competitors included within the group and the manner in which they "overlap." Hence it is assumed that any adjustment of price or of 'product' by a single producer spreads its influence over so many of his competitors that the impact felt by any one is negligible and does not lead him to make any readjustment of his own situation.

Under these 'heroic' assumption Chamberlin proceeds to analyse group problem.' As in the case of Individual Equilibrium' attention is first focused on price adjustment by assuming that there is no problem of product - adjustment, i.e., 'products' are static.

Here by supposition, 'product' is fixed and price is the only variable. If the original demand and cost curves for 'the product of

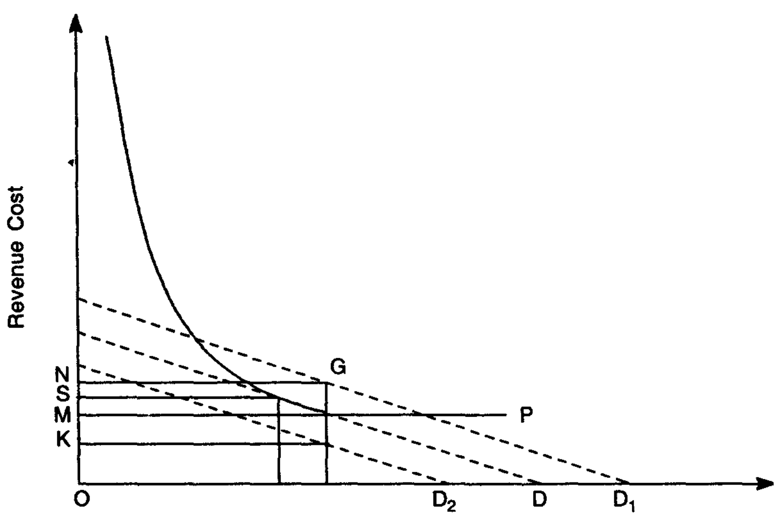


*Fig. 4*

each of the competing monopolists in the Group are $D_1$, and P respectively in the figure 4, each seller will at once set his price ON, since his profits LMNG, at that price are maximum This extra profit, however, will attract new competitors into the field. The tendency will be for a price fall, Hence ON cannot be regarded as a stable price. Similarly if the original demand and cost curves were respectively $D_2$ and P in the figure, then ON could not be regarded as an equilibrium price, since the loss KMLR would have resulted in an exodus of companies. The tendency would be for a price rise. As a consequence of these *disturbing* tendencies (either entry of new companies, or exit of the existing company), there may be shift in both or either of the demand and cost curves. For the moment, let it be assumed that there is no effect on the cost curve. With each shift in the demand curve, (if it is $D_1$), the profit area will be eliminated or the loss area will be eliminated (if it is $D_2$). The process will continue until the demand curve is tangent to the cost curve. The ultimate demand curve, therefore, becomes D, the price is now OS; at this price there in neither abnormal profit nor subnormal losses but normal profit for all the competing monopolists. Here is a position of equilibrium, price equals costs of production; and any seller will lose by either raising or lowering it, it is, therefore, stable.

Now about the cost curve. There is every reason for the cost curve to be affected, if new resources flow in or out of the market. For example, when there is an inflow of resources, the cost curve may shift upward, because the factor-prices of production rise; or the cost curve may shift downward, because external economies are reaped due to better organisation of large group; or the cost curve may remain the same, owing to the absence of both of these tendencies, or their cancellation of one against the other These three possibilities correspond to the familiar increasing, decreasing and constant costs of competitive theory. So far the maladjustment (presence, of profit or loss) was corrected by the variation in the number of companies. It is now supposed that the number of companies corresponding to the equilibrium adjustment will remain "unchanged", while a ruling price higher (or lower) than the equilibrium one is corrected. Graphic representation of this situation requires the introduction of a new type of demand curve.

The analysis of the behaviour of an individual seller within the Group should be proceeded by the introduction of a distinction between two types of demand conditions as in Fig. 5 :

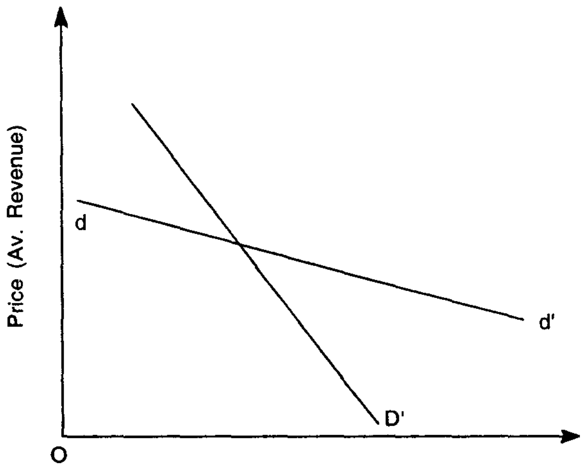


*Fig. 5*

(1) The D–$D_1$ line is drawn on the assumption that each seller is charging an identical price in the market. This curve shows the demand for the product of anyone seller at various prices on the assumption that his competitors prices are always identical with his.

(2) The d–d′ line does not consider such rival's reaction. This curve describes the market for the product of any one seller, when all other ('products' and) prices are given for the other members of the Group. This curve is drawn on the assumption that if one seller, changes his price, the other sellers within the group do not change their prices.

Thus D–D′ represents the market line; and d–d′, the individual line. Evidently D–D′ will be less elastic than d–d′, since the concurrent movement of all prices eliminates incursions by one seller through a price-cut, upon the markets of others.

In Fig. 6, let D be the market demand line and let the price quoted by all producers for the moment be BQ, the sales of each being OB; and the profit of each being FEQH. Now let d, the

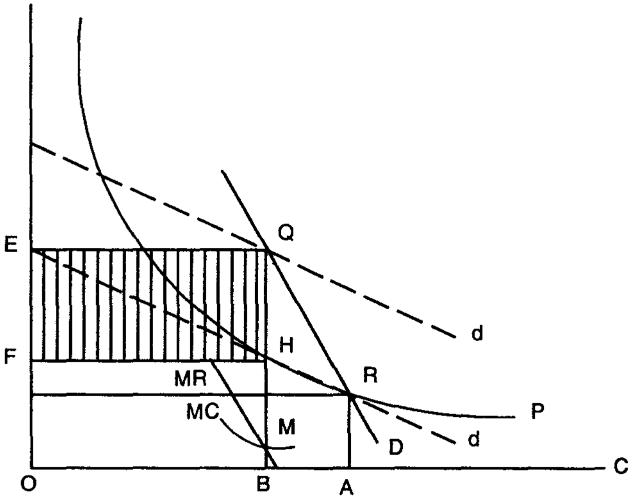


*Fig. 6*

individual demand curve be drawn through Q, showing the increased sales which any one producer may enjoy by lowering his price, provided others hold their prices at BQ. Evidently profits may be increased for any individual seller by moving to the right along this demand line. The same profit incentive which induces one seller to reduce his price, leads the others to do like wise. The d curve then explains why each seller is led to reduce his price; the curve D shows his actual sales as the general downward movement takes place. The former curve "slides" downwards along the later, as prices are lowered and the movement comes to a stop at a price AR; here the individual demand line d, is tangent to the cost curve p at R. Evidently it will pay no one to cut price beyond this point; for the cost of producing the larger output would exceed the price at which it would be sold.

Secondly, it is now the turn for considering the other variable-'product'. Here it is assumed that there is no problem of price adjustment. As seen in Fig. 8, the price given is OE Let P-P' represent the cost of production for such an optimum variation of the 'product.' The demand for it, is OA. The total cost of producing this is OAHF and the total profit obtained is EFHR. The elimination of this profit,

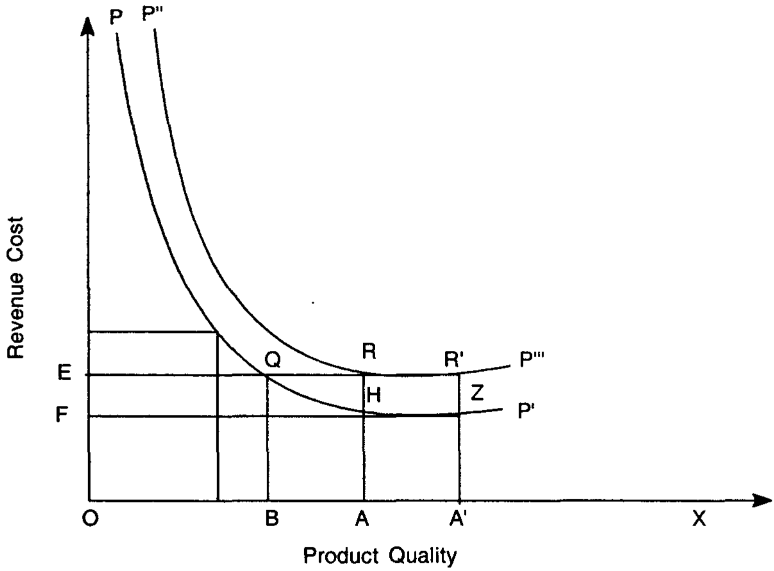


*Fig. 7*

which is essential to an equilibrium adjustment, may take place in several ways. Since by definition, it is the optimum variation for each seller, there will be no further 'product adjustment'. The extra profit will, however, attract new competitors to the field and reduce the sales of each until they reach OB, where cost being equal to price, there will be no further movement. Similarly, if the number of competitors were so great that the market of each was reduced below OB, losses would drive them from the field until those remaining had markets equal to OB, and were again meeting their costs. If any seller can increase his profits by improving his 'product', while the products of his competitors remain unaltered, he will do so. Such an improvement would shift his cost curve to the position of p″–P‴ and would result in a OA′ demand for it where cost is equal to price. It would seem that the most that can be said about equalibrium is that it will be characterized by (i) the equality of cost and price, and (ii) the impossibility of a product adjustment by anyone which would increase his profits. It will involve either the intersection of the price line with the cost curve or its tangency to it.

It now remains to consider 'Group Equilibrium' when both product and price are variable. When both product and price are variable, an equilibrium adjustment will be reached. Each seller will choose that combination of price and product for himself which will maximize his profit. For each variety of product there will be a price which will render his profit a maximum relative to that 'product'. From these relative maxima, he will choose the largest of all. Readjustments will be necessary as his competitors do the same thing, until finally, a point is reached for each variable in isolation, where no one can better his position by a further move. At the same time resources will flow into the field in order to reduce profits which are higher than the competitive minimum so that the number of producers finally occupying the field will be such as to leave the costs of each exactly covered and no more.

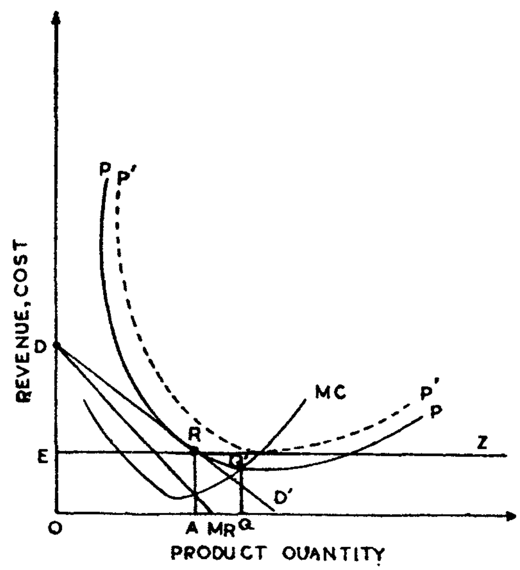


*Fig. 8*

A graphic summary of this comprehensive equilibrium is attempted in the Fig. 8. Let P–P be regarded as the cost curve of the optimum product' and D–D' as the demand curve for it. The equilibrium price is AR, R being the point at which D–D' and P–P are tangent to each other. It is evident that either a higher or lower price would give unit costs in excess of price. A better product would, by raising the cost curve, move its intersection with EZ to the left by a shorter distance than it would decrease the demand. The total output in the field under these conditions of equilibrium will be OA multiplied by the number of producers.

The conclusion seems to be warranted that just as, for a given 'product', price is inevitably higher under monopolistic than under pure competition so for a given (product's) price, 'product' is inevitably somewhat inferior. In fact, the impossibility of selling all one pleases at the going price creates this tendency not only towards higher price, but also towards inferior product.

Further in concluding this section, we would like to emphasize that the fundamental observation about monopolistic competition is that it involves both *price competition and non-price competition.* Price competition directly operates on the revenue situation, whereas non-price competition operates on the revenue as well as the cost situations. The non-price competition takes primarily two main forms—product variation (quality competition) and advertisement (sales promotion). Thus in seeking maximum profits, a monopolistically competitive company can review either its price policy or its policy on the quality of the product or its policy of advertisement and other sales effort. Thus three adjustments grouped under two forms of competition constitute the basic feature of monopolistic competition.

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# 23

# MARKET IMPERFECTION AND EXCESS CAPACITY

Of all the doctorioes emerging from the work on the economics of imperfect competition, none appears more intellectually striking or more significant from a practical view point than the doctorine of 'excess capacity'. It is "intellectually striking", because it admits possibilities which the traditional 'laws of economies' seem to have excluded, e.g. that an increase in supply may be followed by a rise in price. And it is "practically significant", because if the main theme of the theory emerges correct, there is some scope for state-interference with the free play of competition.

This theory envisages a system of 'imperfect' market structure where the 'competitive' characteristic of free entry (free flow of resources) into the industry will drive each producer to a situation in which it is not using its resources to the best advantage; and it will thus lead to a reduction of physical productivity of resources all round. In a sense, it thus reverses the old argument about 'increasing returns and monopoly'—it not only says that falling costs will lead to monopoly; but a monopolistic rather a pseudo-monopolistic situation will automatically lead each-firm to a position where it is faced with falling average costs. Tailing average costs, if they are to be regarded as a criterion of 'excess capacity', should be interpreted clearly. If costs are falling in a state of long-period equilibrium this] implies that variable costs' are falling (since in the long-run there are no 'fixed costs'). And since in a state of 'full equilibrium', short-run cost curves must be tangential to the long-run cost curve falling long-period costs also imply that the short-run costs are falling. But the converse is not necessarily true. Falling short-run total costs need not involve falling long-run costs for the same output; and consequently falling costs are "no safe criterion" for the prevalence of 'excess capacity.

This theory of excess capacity is put forward in.some refined version in the works of Chamberlin and Joan Robinson. Joan Robinson includes in her "cost curves" such profits which are not competed away by the entry of new producers; and under these circumstances, her statement that "demand curves will be tangential to cost curves" and that firms will be of "less than their optimum size" is merely a statement of tautology. It does not imply excess capacity or anything of that sort. Chamberlin's statement of the theory is perhaps a better "systematic exposition",

Chamberlia's theory is based on following four important assumptions :

(1) It is assumed that each competing monopolist within the group sales a slightly differentiated product. The phrase "slightly different" implies that a producer, by lowering his price relatively to his rivals' price, will attract away some, but not all customers; or alternatively, that he will lose some, but not all of his own customers, if he raises his price relatively to the rest. In technical terms, this means that the consumers' 'elasticity of substitution' between different sellers' 'products' is large, but not infinite, cross elasticities of demand for one 'product' with respect to another 'product' are considerable, but not infinite.

(2) It is assumed that consumers' preferences are evenly distributed among the different varieties, and that differences between them are not such as to give rise to differences in cost. Such even distribution of consumers' choices means that the cross elasticity of demand for the product of any producer is of the same order of magnitude with respect to the price of any of his competitors. And

since there is a 'large group', any adjustment of price or of 'product' by a single producer spreads his influence over so many of his competitors that the impact felt by anyone is negligibly and does not lead him to any readjustment of his own situation. Thus given the prices of all others, a demand curve can be drawn with respect to each.

(3) It is assumed that no producer possesses an "institutional monopoly" of one's 'product', since they are close substitutes"; and thus the entry of new producers into the field in general and every position of it in particular is free and unimpeded.

(4) Since Chamberlin's cost curves are U-shaped, upto a certain point average costs of the long-run are falling— there are 'economies of scale' upto a certain return. The elasticities of the cost and demand curves are also assumed to be the same. In the final equilibrium, the demand curve will be tangential to the cost curve.

There can be little doubt that given these assumptions, the theory of excess capacity is unassailable. Any criticism must be, therefore, directed against the usefulness and consistency of these assumptions selected.

**A Critical Appraisal :**

The first is concerned with the assumption made about the interrelations of the demand for the 'products' of various producers. Undoubtedly the 'products' not being "perfect substitutes", the slightest price difference would eliminate all demand for the "products for the higher price producers. The reasons for such market imperfection may either be slightest 'product differentiation' or differences in geographical location of the producers or buyers' inertia. Whatever may be the cause, the effect from the analytical point of view, will be the same : the cross elasticity of demand will have a positive finite value.

But there is no justification for the further assumption that these cross-elasticities will also be of the same order of magnitude with respect to prices of any group of rival products. Of course, if there is market imperfections mainly due to buyers' inertia and nothing else, one can invoke the law of large number and say that buyers' preferences are evenly distributed. But buyers' inertia is not the single cause of market imperfection. It is in this case that different 'products' will not possess the same degree of substitutability in relation to any particular product. As such a seller should be able to class his rivals, from his own point of view in a certain order, according to the influence of their prices upon his own demand. This is clear in the case where market imperfection is due to either product differentiation or differences in geographical location.

"Pseudo monopolists"—distinguished from the old fashioned "real monopolists" merely by the fact that cross elasticities of demand for their product is large—cannot be grouped together in a lump, but can at best be placed into a series. Each product can be conceived as occupying a certain position on a "scale", the scale being so constructed that those 'products' are neighbouring each other between which the consumer's elasticity of substitution is the greatest. Each producer then is placed on each side with its nearest rivals. New entrants must also occupy a position on that "scale", and will thus make the chain of substitutes "tighter".

It follows from this, firstly, even when it is a large group, it cannot be assumed that the effect of a single producers' action will be negligible. The real demand for a single producer's product is thus indeterminate; his price and 'product' cannot be assumed as "given". Secondly, it may be assumed that the 'new products' will stand in the same or similar relation with all existing products. A new product must necessarily be placed in between two existing products. Thus a producer, if farsighted, will take the effect of his own actions not merely on his existing rivals into consideration, but also on his "potential competitors". This 'fore sight' may prevent him from being driven to a state of excess capacity in the long-run.

Moreover, it can be shown that even if none of the producers takes the indirect effects of his own policy into consideration, "potential competition" will never succeed in making the individual demand and cost curve tangential, if economies of scale exists, while the possibility of "product differentiation" will by itself never prevent the establishment of 'perfect competition' if the economies of scale are absent. Demand curve and cost curves will only become necessarily tangential to each other, when demand curves have also become horizontal. As a result of absence of 'economies of scale' due to perfect divisibility, perfect competition must necessarily establish itself and will remain intact so long as indivisibilities' and 'institutional monopoly' are completely absent. These "indivisibilities, which prevent competition from becoming 'perfect', will also prevent the complete elimination of profits.

Chamberlin seems to be aware of these two shortcomings. That he is aware of the first, is clear from his remarks in the analysis of chain relationship. That he is aware of the second, is clear from his remarks in connection with spatial competition. Hence "it would be most unfair to criticise him on a point of logic—since the logic of his analysis is indeed excellent—what he does not seem to be aware of is the degree of unreality involved in his initial assumptions; and the extent to which his main conclusions are depended on these assumptions."

However the most frequent and conspicuous objection against the 'excess capacity' theory is that it assumes "identical cost and demand curves" for the different producers within a group. Kaldor, of course, regards it as no "valid criticism" of Chamberlin's analysis. This is because the identity of demand curves merely assumes that the prices of different producers will be identical. And the identity of cost conditions only means that there is no "institutional monopoly".

The extent to which 'excess capacity' may be generated as a result of "free competition" (under the assumption that the existence of indivisibilities and economies of scale will prevent competition from turning perfect) will depend on following :

(1) on the degree of short sightedness or foresightedness of producers (how far they take potential competition into their account in determining long-run price—output policy,

(2) on the extent to which "institutional monopolies" are present (This will tend to prevent the generation of excess capacity if it leaves the scale of differentiation unaffected;

but will have an uncertain effect, if it increases the scale of differentiation)

(3) on the extent to which the market structure resembles "a chain relationship"—(the extent to which 'cross-elasticities' of demand differ in the order of magnitude. Only in some special cases, when they are of the same order of magnitude that Chamberlin's conclusion—tangency between the demand and cost curves—follows).

At the same time there is a presumption that some degree of 'excess capacity' will be generated even if profits are not completely competed away, since 'indivisibilities' by themselves, will not offer a strong enough shield to prevent some rise in costs as a result of the intrusion of new competitors. Many of the objection which can be brought against the theory, if put forward in its "rigid form" (demand curves tend to become tangential to the cost curve) do not affect the fundamental proposition that the effect of the competition of new "entrants" and the consequent reduction of the level of profits earned may take the form of a rise in costs rather than a reduction in prices.

Another abstract assumption of Chamberlin need to be considered. Chamberlin assumes that each producer produces a single 'product'. But Kaldor argues that actually (in the sense of 'slightly differentiated' articles and therefore "close substitutes") in reality the majority of producers produce a series of 'products'. Hence if there is a fall in demand for some 'product' in an 'optimum scale,' the producer may still utilise his plants fully by producing two or more of other products. In this way indivisibilities will be overcome and 'excess capacity' will not make its appearance either. The effect of a "competition from outside" will be to induce producers to produce a larger series of products rather than to reduce the scale of output as a whole.

But Kaldor regards this line of reasoning as inaccurate, for even if it is admitted that varying the number of different kinds of products produced, provides one line of adjustment for the entrepreneur, this does not imply that the essential consequences of this type of situation (that increased competition will lead to an increase in costs) can thereby be avoided. Whether they will or will not, depend on the "nature of the cost-functions of the jointly produced products".

Thus, it is observed that in all cases where 'economies of scale' are present over certain ranges of output and where market imperfection exists (in the sense that highly and yet imperfectly substitutable commodities are on a same scale), increased competition (i.e., an increase in number of firms within the group) might lead to' a reduction of technical efficiency rather than to a reduction in price or an increase in aggregate output; while in cases where the firms can vary the number of different products produced, this might come about even without an inflow of new firms.

It is extremely difficult to deduce any conclusion from the above analysis, about the effect of generation of 'excess capacity' upon economic welfare—in whatever arbitrary way this concept maybe defined. If the money value of national income (at a given price level) is to be its criterion, then it could be increased by cartel-agreements, standardisation etc., causing the emergence of "economies of scale" to the producers. But such monopolisation will create distributive injustice.

Neither is it possible to argue, on the other hand, that the generation of 'excess capacity' is itself the result of consumers' choice, since it only comes about by creating a greater diversity of goods, and consequently at its emergence constitutes an evidence that the public prefer variety to "cheapness". But this is an unrealistic, assumption; the consumers are not allowed to choose between these two alternatives; they are offered either of the two and not both.

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# 24

# PROFIT DECISIONS

Economic decision-making by modern management has obvious reference to a company. A company is an economic unit. By 'economic unit', we mean any organisation or institution which is engaged in economic activities of production, exchange and consumption. A company produces the output of goods and/or services. This output is sold in the commodity market, i.e., output is exchanged against money—money is a medium of exchange universally accepted in the market. The company gets back some money by way of market value for its output. The money so earned determines the net profit of the company. Net profit is the value of output less the value of the inputs which have gone into the productive process. As consumer, the company obtains the inputs like machine, men and materials from the factor-market against some payment in terms of money. Thus, a company normally consumes resources which it does not produce and produces output which it does not consume. To balance its production possibility with its consumption requirement, exchange through money is an indispensable activity. The purchase of inputs and the sale of output are effectuated through exchange transactions in the market at some price expressed in some monetary unit. Comparable to companies, the other economic units operating in an economy are : agricultural farms, factory establishments, hospitals, educational institutions, so on and so forth. These economic units together determine the form and functioning of any economy.

In competitive conditions where there are a large number of companies producing homogeneous output, a company is a microscopic unit within an industry. In economists' way of thinking, the industry is a collection of companies, e.g., within the textile industry, we have cotton spinning company, cotton weaving companies, bleaching and dying companies etc. Under condition of monopoly, a company constitutes the industry or an industry consists of one company. Sometimes different companies may combine together to form a group like cartel or combination; and this may create market imperfections. It is, therefore, necessary to understand the behaviour of business companies so as to analyse the form and structure of the market. In understanding business behaviour, we have to analyse the criteria of business efficiency and the objectives of business companies.

**Business Efficiency :**

For the economist, a company is an economic unit engaged in income-earning and income-spending activities; these activities are primarily meant to cope with the problems of choice arising out of scarcity of resources. For the practitioners, a company is merely a business concern. Management is interested in running the business concern efficiency. Managerial economics is, therefore, very much concerned with business efficiency.

Efficiency is an illusive concept; its definition involves value judgements. There is no point entering the philosophical debate about the definition of this concept. For operational purpose, we may talk of efficiency at two levels; technological and economic. Technological efficiency means that production is carried out to the best possible technological specification, subject to the availability of resources. For a company, the production function which states the factor-proportion and factor combination is a statement of technological specification. The available quantity and quality of inputs, of course, will decide if or not that technological specification can be satisfied. More a company can satisfy the technological specification with the use of available resources, more technologically efficient the company is, and vice versa. Economic efficiency recognizes the limitations imposed by factor endowment and consumers' preference. Factors of production are scarce and have alternative uses. For the company, economic efficiency lies in minimizing the use of scarce factors to achieve a given level of output or in miximizing a level of output produced out of a given resource, i.e., cost minimization subject to the constraint imposed by a given production function or output maximization subject to the constraint imposed by a given cost structure from the factor market. On the other hand, prices and consumers' preferences which they reflect impose limitation on the choice of output which the company produces. In this respect, economic efficiency consists in choosing that output (or product mix) which can yield maximum revenue for the company, given the market price for the output as a parameter. It is the balance of efficiency in production and efficiency in consumption which determines the degree of economic efficiency for the company. For example, a farm may employ very high-cost factors in its productive process hoping to raise a high-quality output which can be sold at a high-price in .the market. Thus high (commodity) prices may cover high costs (of production). Thus the company sacrifices cost minimization in favour of output-quality, because the company is confident to find quality-concious consumers who will offer high prices. The economic efficiency considerations are based on both cost and price considerations.

The difference between price per unit and cost per unit of output measures the average rate of profit. Recall

$$\frac{\pi}{Q}=\left[\frac{R}{Q}-\frac{C}{Q}\right]$$

where $\pi$ is profit, R is revenue, C is cost, and Q is the units of output produced. It follows, in considering economic efficiency, profit is a crucial variable. Profits are commonly taken as criterion of business efficiency. In fact, profit can reflect both technological and economic efficiency.

**Economists Theory of the Company :**

Finding profit as a measure of business efficiency, the economists have developed a theory of the company based on the hypothesis of profit-maximization subject to a given market environment and production technology. There are different versions of this theory. Some economists have also developed econometric theories of the company. Without attempting elaborate refinements and sophisticated developments, the economists' theory of the company may be summarised in a following set of propositions :

1. The company is a transformation unit. It transforms factors into products. In this process of transformation, it aims at creating 'surplus values'—the value of products higher than the value of factors which enter the products. This, involves (a) knowledge of production function and (b) knowledge of least cost factor combination.
2. The company tries to create as much 'surplus values' as possible. It is this surplus value which constitutes the profits for the company. The company aims at maximizing profit either by maximizing revenue which it earns by the sale of its product in the commodity market or by minimizing costs of production by cutting down the expenditure on the factors which it purchases in the factor market or by both.
3. The company attains its objective of profit-maximization in a rational manner. The economic rationality on the part of the behaviour of the company implies (a) that the company regards profit maximization as the state of equilibrium, (b) that the company takes those decisions and follow-up actions which ultimately lead to the state of equilibrium, and (c) that the company tries to return to its equilibrium path even if it is momentarily displaced from it.
4. The company maximizes profit (and thus attains the state of equilibrium) by equating marginal revenue (MR) with marginal costs (MC). The company decides to produce that level of output, Q, at which the addition made to total revenue, R, just covers the addition made to total costs, C. In terms of our notations, the necessary condition of the company's equilibrium reads :

$$\frac{dR}{dQ} = \frac{dC}{dQ}$$

or $$\left[\frac{dR}{dQ} - \frac{dC}{dQ}\right] = 0$$

In addition to this necessary condition MR=MC, the company must satisfy the condition that at the point of equilibrium, the MC must be rising: here is the sufficiency condition which makes the equilibrium stable.

5. The market environment in which the company operates is given. The nature of competition in the market is defined in terms of (a) number of companies, (b) nature of the company's product, homogeneous or differentiated, and (c) movements, entry or exit, of companies. Depending on whether the market is perfect or imperfect, the quantum of maximum profit is determined, though the MR=MC condition for maximum profit remains unchanged.

6. The given time-perspective before the company is defined in terms of the economic concepts of 'short-run' and 'long-run'. The profit-maximizing condition does not change with reference to the time-perspective. The introduction of time element, however, helps the analysis of adjustments with respect to the structure of industry, the size of company, the scale of plant and the scale of output; these factors affect the magnitude of profit. The companies tend to maximize long-run profit.

7. The decision variables which the company can affect are : prices, quantities and qualities of inputs and outputs. Most of the behavioural theories of the company overlook the quality variable presumably because it is not easily reducable to economic measurement. It is , implicity assumed that the company has perfect knowledge of all relevant variables when making decisions; there is no information cost involved in acquiring this knowledge.

Fundamentally, the economists' theory of the company centers on the assumption of profit-maximization and the assumption that the company acts rationally in pursuit of this objective subject to the constraints imposed by market environment, factor endowment, production technology etc.

**A Critique of the Economists Theory of Company :**

For a critical analysis of the economists' theory of the company we may begin by stating the two sets of assumptions underlying that theory :

1. Motivational Assumptions :
   a. Profit is the sole objective of any business activity,
   b. Business companies aim at profit maximization.

These two assumptions together imply that profit maximization constitutes the objective function before the company.

2. Cognitive Assumption :

Business companies have perfect knowledge about their decision environment, market as well as non-market. There is no information cost involved This assumption implies that the decision environment does not present any risk or uncertainty, because the change and their outcome are known and definite. Most of the criticisms about the economist's theory of the company have been directed towards these assumptions. Many economists attempting empirical verification of their theory of the company have found that profit is not always the business objective. Profit motive does not explain business activity of many concerns. For example, A. Popandreou, while referring to some basic problems of the theory of company, suggests that the objective function which the company has in mind is not a single variable function including profit alone; rather it is a general preference function' which emerges out of an interaction among the interest of various participants within an organisation. K. Rothschild, on the other hand, suggests the hypothesis that long-run survival is the primary motive of business enterprises; business decisions, therefore, aim at maximizing the organisational security and stability! This is particularly true of oligopolistic concerns. On similar lines W. Fellner argues that the companies are interested in 'safety margin' particularly when the market competition is confined among few. WJ. Baumol extends this line of reasoning by maintaining that companies try to maximize total sales or total revenue rather than profit (i.e., net revenue = total revenue -total cost); they consider profit as a constraint rather than objective function-a minimum level and/or rate of profit, if ensured, induces the company to take up economic activities. This profit-constrained-revenue- maximization hypothesis implies that the decision principle is to set MR=0 rather than MR=MC. Related to Baumol's hypothesis some economists emphasize that a very dominant business objective is to maintain or extend, if possible, the company's share of the market. Here is a notion which is also not unrelated to the ideas of Rothschild and Fellner. T. Scitovsky introduces the idea of a trade-off between profit and leisure. More profits an entrepreneur hopes to earn, more leisure, he has to sacrifice and more efforts he has to put in. It is, therefore, likely that the organisational objective may be to have some combination of both leisure and profit which yield maximum security to the company. M. Reder argues that business companies sometimes sacrifice profit objective because of reasons of financial control. An entrepreneur may sacrifice his share of profit to finance the company's expansion programme form private funds or retained earning so that he may exercise some financial control over the operation of the company. For similar arguments, W.W. Cooper introduces the liquidity variable, while suggesting some revisions for the theory of company. The argument runs that the business companies attempt to keep liquidity reserve sufficient to assure a sound financial position and retention of control. The banking companies' activities are very often limited by such liquidity constraints that profit consideration may be pushed to secondary position in the company's preference function. Recently the sociologists have developed the idea that business concerns can no longer afford to ignore their social obligation of securing 'maximum good for maximum number'. As such profit motive stands replaced by the social welfare motive.

The social responsibility of business exercises a limit on the profit objective of business companies. From this standpoint the set of alternative goals is by no means exhaustive; this set includes goals like customers' service or consumer protection, product excellence, employee security and welfare, peaceful industrial relations, promotion of national cause and government programme etc.

It is important to note that the alternative hypotheses which have been suggested, do not, rather cannot, exclude profit objective altogether. Security, safety, stability, survival, growth or whatever it may be, will have some bearing on profit, if not immediate, at least remote. A company can satisfy a social cause but that will involve some expenditure. To finance expenditure, the company must earn sufficient profit. Just as a hungry man cannot be asked to preach religion and morality, a loosing company cannot be expected to promote national economic growth and social welfare. Therefore, even if we talk of objectives other than profit, we cannot get rid of considerations of profit for the company. After all, profit is the index of business income. This is the reason why socially conscious public enterprises also talk of profit as one of their important objectives.

The business companies may not give up considerations of profits. Then the question is: Do they maximize profit? This brings in the criticism of the economist's theory of the company with respect to the second motivational assumption. The critics argue that maximization does not correctly describe what companies do about profits. It is assumed that companies have a profit goal, but they do not attempt to maximize profit. Many companies often have multiple goals of which profit is one. In such cases of multiple goals, maximization of the goal is neither meaningful nor possible. Maximization of one goal may come in conflict with another goal. Where the goal variable is more than one, we can only talk of optimization so that the best possible combination of different goals is achieved. Even if profit is the only relevant long-term goal variable, the companies may not maximize profit because either they do not know what is the level of that maximum or even if they know, they may not want to attain it in view of considerations of safety, security, market share etc. Peter Drucker, for example, lists eight areas of company behaviour in which objectives have to be maintained, namely, market standing, innovation, productivity, physical and financial resources, profitability, managerial performance and development, worker performance and public responsibility. This line of criticism is thus quite consistent with most of the hypotheses that we have stated in the context of the criticism of the first motivational assumption. In fact, both criticisms are highly complementary. Both deal with profit maximization; in the first case, the emphasis is on the word profit; in the second case, the emphasis is on the word maximization. The empirical verification by economists like Laster, Baumol, Sweezy, Hall and Hitch reveal that the companies in reality follow short-cuts and rules of thumb rather than the marginal principle of profit maximization to take/ make their economic decisions.

Finally, we come to the criticism concerning the cognitive assumption. Business decisions are meant to cope with changes. Normally changes are unknown. Even if changes are known, the magnitude, direction and actual impact of the change may be indefinite. It is unlikely that the business companies know the probability distribution of the events which shape changes. In others words, in most of the cases, the decision environments full of incalculable risk and uncertainty. Given such uncertainty, it would seem impossible for a company to know perfectly how to maximize its profits as a long-run goal. It seems doubtful that export the companies could know whether or not profits have been maximized. The idea of maximization seems meaningless in the world of uncertainty. Boulding writes, "A theory which assumes knowledge of what cannot be known is clearly defective as a guide to actual behaviour". Popondreou writes in the similar vein, "In the absence of knowledge concerning enterpreneunal horizons and expectations, the profit maximising construction becomes an empirically irrelevant tautology". The perfect knowledge assumption implies perfect adjustments-instantaneous adjustments when changes occur Such a static theory of the company has hardly any relevance for the real world of dynamic changes. In reality, changes occur so swiftly and so fundamentally that it is not possible to know them simultaneously. At best, we can predict those changes which are coins to occur in future and, therefore, we can at best, assume that the company has perfect knowledge only up to a probability distribution of all possible future states of world and that companies maximize the discounted value of future profits. But discounting presents problems the problem of identifying and measuring the profit stream, the problem of finding an appropriate rate of discount etc. Finding that a company does not have complete and perfect knowledge about maximization and about the alternative courses of action open to the company, some economists like R. A. Gorden, H. A Simon and J Margolis, assert that the company tends to become deliberative rather than "maximizing", that the companies aim at satisfactory rather than the maximum level of profit. Here satisfaction is defined with reference to some aspiration level of profit in view of its feasibility and consistency. Even to verify the criteria of the satisfaction-level of profit, some information may be needed. The companies are not readily supplied with information; they have to obtain the relevant information; and for that they have to organise search activity and scrutiny activity. The company must search for information, they must gather information, they must process information to yield facts on the basis of which they can choose one line of action from the available alternative courses to tackle a problem. The theory of choice and the theory of search thus become the two essential parts of the theory of business company. The theory of search allows for positive information costs, and the theory of choice allows for the opportunity costs. Both of these costs have significant bearing on economic decision making by the company.

Attempt has been made by various economists to answer some of these criticisms discussed above. M. Friedman argues that the test of a theory depends on its explanatory and predictive value. If a theory is capable of either explaining the existing phenomenon or predicting the non-existing phenomenon, then the theory is sound and significant in terms of its operational value; its underlying assumption cannot be the relevant point of attack. The economist theory of the company cannot, therefore, be criticized because of its profit-maximization assumption. Machlup has defended the orthodox economic theory of the company as reasonable, costs, revenues and profit being subjective or perceived by the businessman rather than objective. Early, in his study of 110 "excellently managed companies", has found that these companies do use the marginal principle of the economist's theory of the company. Horowitz has reconstructed the economic theory of the company, assuming that information lacks such that uncertainty prevails. This theory of the company's decision making makes an extensive use of techniques from Applied Mathematics like Operation Research, Goal Programming and Game Theory. Some economists have recently formulated the econometric theory of the company, this theory is also capable of explaining corporate behaviour under uncertainty. The econometric theory of the company has more predictive value than the economic theory of the company.

In view of different theories (economic, econometric and behaviourial) that exist now, one may probably conclude that it is difficult to have an acceptable theory of the company which can explain different brands of behaviour of different companies under different situations. The business environment around us is very complex. In real world, the companies differ widely with respect to size, form, structure, activity and ownership. No simple and single generalization about business behaviour can, therefore, hope to describe, explain and predict the complexity of business decision making. It follows that depending upon differences in size and character of business, different companies may cultivate different objectives : survival, goodwill, security, growth, social welfare etc. The objectives of business policy define the norms or criteria of business efficiency. However, most of the business objectives have direct or indirect bearing on the level and the rate of profit which the companies make. Companies may not aim at only profit or companies may not go for maximization of profit, but still they do have a profit policy. So profit will always remain an important measure of business efficiency. Profit is, therefore, still used as a leading indicator of business performance. To the extent we can not dispense with the profit criterion, [the traditional economist's theory of the company, however crude and imperfect it may be, will remain relevant for an analysis of real world business behaviour.

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# 25

# FUNCTIONS OF PROFIT

According to Peter, F. Drucker, profit serves following three main purposes :

1. Profit may not be the most perfect measure of business efficiency, but it is probably the least imperfect *measure of the general efficiency of a company.* Profit measures the effectiveness of business strategy and the efficiency of business tactics. An increasing level of profit, other things remaining the same, is an indicator of sound and successful business operations.
2. Profit is the *premium* that covers the costs of staying in business—replacement, obsolescence, market and technical risk, and uncertainty. The management must generate sufficient profit to cover these operational costs. In other words, profit is a business income to meet business expenditure.
3. Profit ensures the *supply of future capital* for expansion, innovation and reconstruction. The part of profit which is retained is a means of internal finance for the company. The part of it which is distributed to the shareholders as returns on their investments reflects the soundness of business and may become a means of inducing new shareholders i.e., of financing indirectly external capital for the company.

**Two Concepts of Profit :**

The economic theory of income distribution analyses the nature and size of the payments made for productive inputs. Traditionally such inputs (factors) are classified into land, labour, capital and organistion; accordingly traditional classification of factor shares or factor income distinguishes rent, wages, interest and profit. Rent is the payment for land, wage is the payment for labour, interest is the payment for borrowed capital, and profit ($\pi^*$) is that part of business income (R) which is left after meeting the expenditure (C) on rent (T), wages (W) and interest (I) .

$$\pi^* = R - C$$

$$C = T + W + I$$

$$\pi^* = R - T - W - I$$

The most important point about this profit $\pi^*$ which comes out clearly in this formulation is that it is a residual. Here profit turns out to be the revenue realized during a given period less the costs and expenses incurred in producing that revenue. This is the accountant's approach to the concept of profit today.

The economists do not agree with the above approach. The accountant would deduct the explict or actual costs from the total revenues to measure profit. The economist would deduct not only explicit but implicit or imputed costs as well. By imputed costs, the reference is to the concept of *opportunity costs.*

Thus, if we represent the sum total of these opportunity costs as Oc then the economist profit, tc, can be stated as

$$\pi = \pi^* - O_c, \text{ where } \pi^* \text{ is the account's profit}$$

$$= R - T - W - I - O_c$$

$$\text{or} \quad R - (T + W + H) - O_c$$

Where (T + W + I) represent explicit costs.

From this relation, the implicit or opportunity cost can be defined as the difference between the accountant's profit and the economist's profit.

$$O_c = \pi^* - \pi$$

The coneptual distinction between *economic profit* ($\pi$) *and accounting profit* ($\pi^*$) can be examplified. A garage run by its owner-mechanic has a gross income of Rs. 20,000. Annual Expenses amount to Rs. 17,500. This leaves an annual profit of Rs. 2,500. The fixed investment (*i.e.*, the investment in building and machine) is say, Rs. 8,000. The prevailing rate of interest is 5%; this means that the fixed investment by our garage-owner would have earned Rs. 400 a year, had it been invested in fixed deposits with a bank. The site rent saved, had the business not been carried on, might amount to another Rs. 200 a year; while the owner might have earned Rs. 1,800 a year from his managerial and engineering skills by working for some concern. The sum of these opportunity costs is Rs.400+Rs. 200+Rs. 1800=Rs. 2400. If we consider these imputed costs as well, we find that our garage-owner is making a profit of Rs. 100 only. In this example Rs. 100 is the economic profit and Rs. 2500 is the accounting profit per year. It follows that in calculating accounting profit, we have to subtract the cash value of the enterprise at the beginning of the year from the cash value of the enterprise at the end of the year. In economic profit, we have to take care opportunity costs as well.

**Measurement of Profit :**

Above distinction between accounting profit and purely economic profit makes the measurement of profit a difficult task. The difficulty arises due to the difference in cost concepts which the economist use. It is difficult to decide what is included in or excluded from the opportunity costs. Conventional financial accounting involves an orderly process by which the transactions of the company are recorded, classified and summarised; there the accounting costs are easily identifiable. A fundamental principle of accounting is that the assets of business are subject to claim from two parties, owners (proprietors) and creditors.

Thus Assets—Liabilities+Proprietorship

$\therefore$ [Assets—Liabilites]=Net assets =Proprietorship

The *balance, sheet* of the company indicates the value of the companies, assets corresponding to claims of creditors and owners at some given time. The *income statement* or *the profit and loss account* records the changes in these items resulting from business transactions over the course of a year. Income or profit is the difference between the net assets at the beginning of the year and at the end of the year. *The fund flow statement* is concerned with a record of funds available and the manner in which the funds are utilised. In preparing these statements such as the balance sheet one, the accountant normally shows assets valued at original (historical) costs. But the economists value the assets at replacement costs rather than historically recorded costs. Ideally the economists attempt to asses the present worth of future cash flows which existing assets will bring to the business. Each asset may be assumed to have a present worth equal to the expected stream of earnings over its working life, discounted at an appropriate rate of interest. The economist's approach to valuation of assets derives from income expectations. Traditional financial accounting finds it unsatisfactory, because it is essentially speculative; the uncertain future cannot be predicted accurately. However, the economists argue that it is better to be vaguely correct than to be precisely wrong.

There are three specific aspects of profit measurement where the use of accounting profit and of economic profit give different results. Let us discuss following three aspects so as to focus on the problems of measurement.

1. ***Depreciation :*** Depreciation is the normal wear and tear in fixed capital assets like machines which occur through continuous use over a passage of time. Depreciation must be deducted from gross profit to measure the net profit. The problem is : how to measure the cost of depreciation? A financial accountant may employ following alternative methods to compute depreciation.

(i) Straight line depreciation method is the simplest one where by a fixed percentage of original value is deducted annually over the working life of the asset to leave only its salvage value at the end of the asset's life. Thus annual depreciation charge, D, may be measured as $D = \frac{F-S}{n}$ where F is the cost of the fixed asset, S is the salvage value, and n is life of the asset in number of years.

(ii) *Diminishing balance depreciation method provides* for a constant percentage of an annually diminishing written down asset value as the annual depreciation charge; here this constant rate of depreciation may be measured as.

$$D = \left[1 - \left(\frac{S}{F}\right)^{\frac{1}{n}}\right]$$

(iii) *Annuity method requires* the cost to be covered equal the original fixed cost of the asset (F) plus an interest rate (r) equal to the cost of capital, covering annual fixed installment over the estimated life of the asset (n). Here depreciation appears as,

$$D = \frac{F - r}{n}$$

(iv) *Service unit method* is appropriate where the life of an asset depends on its use rather than time. In its simplest form, the difference between the original cost (F) and the salvage value (S) is divided by the life time capacity (Q) so that

$$D = \frac{F - S}{Q}$$

From the point of view of the economists, these and other accounting methods are not relevant. The economist is interested in estimating the differences in discounted value, if enough is known about future earnings from the asset, to enable these to be computed or the *opportunity cost of using an asset and its ultimate replacement cost* and not a convenient depreciation formula based on the original costs. A machine may be used for one year as alternative to selling and the opportunity cost of using it for one year is the difference between its market value at the beginning of the year and the market value at the end of the year. Suppose, the machine had a life of ten years. The machine was brought in 1970 at Rs. 200. In 1980 the machine is obsolete but it can be sold for Rs. 10. It becomes necessary to replace the machine by a new one, having similar capacity to produce output and revenue. In 1980, a similar machine costs Rs. 600. If this machine is brought, then the replacement investment to cover up the fixed disinvestment (i.*e.*, depreciation of the old machine) amounts to Rs. 590 (=Rs 600—Rs. 10). In other words, replacement investment, Ri, is the difference between the new investment, I, and the salvage value of old machine, S.

$$R_i = I - S$$

In times of rising price level, replacement investment exceeds original (historical costs : $R_i > F$. In times of falling price level, replacement investment will be less than the historical costs: $R_i < F$. The point remains, the economists tend to look at depreciation in terms of opportunity cost and to use asset replacement costs rather than the historical costs used by the accountant.

2. ***Inventory Valuation*** : Here is another area of profit measurement where accounting conventions and the application of economic concepts give different results. Inventory refers to stock i.e., goods in pipe-line, If production of X exceeds the final consumption of X, then the inventory of X increases with the stockist, and *vice versa.* Had the price level been stable, there would have been no problem of measuring inventory variation. In actual practice, price level changes, material costs change—different prices may have to be paid for different lots of the same material purchased at different periods. There are three popular methods of inventory valuation, (i) *First-in-First-Out* (FIFO) method assumes that materials are withdrawn from stock in the order in which they are acquired, so that the current manufacturing costs are based on costs of the oldest material in stock, (ii) *Last-fn-First-Out* (LIFO) methods assumes that the most recently purchased materials are withdrawn from the stock first sd that the current manufacturing costs are based on costs of the newest material in stock, (iii) The *Weighted Average Cost* (WAC) method takes into account the costs of different lots purchased at different periods and values the inventory by taking a weighted average of different costs. There are also other methods which an accountant can employ.

The recorded value of business income in periods of rising or falling prices may diner considerably, depending upon the choice of inventory valuation methods. For example, FIFO will show unrealistically high profits during inflation and low profits during deflation. LIFO my be a better choice for the measurement of profit, because it will show relatively more accurate manufacturing costs during periods of inflation or deflation. The economists feel that neither of these accounting methods provides the basis for a true measure of net business income at *constant prices.* Moreover, a realistic measure of economic profit must take some account of the changing real purchasing power of the businesses liquid assets like cash. Thus the economists would like to adjust the accountant's data at constant prices, because they are more concerned about real values rather than nominal values of inventory so that they can compare the levels of profits over time, reference being 'economic profits' net of opportunity costs.

3. ***Unaccounted Value Changes*** : There may be certain items of business expenditure which may not have any impact on current purchasing power of the company, but which may increase the future earnings of the company. The accountant does not bother to consider the future value of the present expenditure, so they sometimes may understate current profit and overstate future profit. For example, -expenditure on research and development today may create intangible assets by increasing the business income tomorrow. Advertisement expenditure may create goodwill of business and brand loyalty. The skill and dexterity of a manager may be another intangible asset. An accountant does not record these values of certain assets, and liabilities and, therefore, the economists argue that the accounting profit is not a correct statement of the true economic profit,

It follows that the management accounting techniques and conventions of measuring profit do not appeal to the economists though both agree that the measurement of profit is necessary for business decisions. Most of the economic decisions of the company are ultimately based on profit decisions involving opportunity cost calculation.

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# THEORIES OF PROFIT

We have studied the meaning and measurement of profits. We now study explanation of profits. We know what profit is and what are the problems of measuring profit. Now we raise the questions : Why does profit arise? Why does profit exit? Who produces it? Who gets it? The answer to the questions will throw further light on the nature of economic profit, the basis for economic decisions by companies.

The economists have developed different theories of profit from time to time; it has been one of the controversial subjects in economics.

***(1) Classical, Anti-classical and Neo-classical Theories : Smith, Marx, Marshall and Others :***

The classical economists like Adam Smith and Ricardo treated profit and interest together as a kind of business income which was left after paying for labour and indestructible powers of the soil. The classical authors did not make any distinction between ownership of capital and management of company, because both rested in the same hand in classical days.

Karl Marx classified all incomes into earned income and unearned income, depending on the source of that income. Income from labour like wages was termed 'earned income', whereas income from property was termed 'unearned income' which included rent, interest and profit. Marx believed that profit is a 'surplus value' which emerges because the labourers produce a value of output exceeding the value of input, i.e., they produce more than what is needed to maintain them in productive process. The capitalist's profits, therefore, originate in the exploitation of labour.

The neo-classical economists tried to develop functional theories so as to justify profit as a business income. Walker developed the 'rental ability' theory of profit on lines of Ricardian theory of rent. In Ricardo's theory, rent on superior grade of land was determined by the difference in productivity between superior and inferior grades of land. Following this, Walker argued that entrepreneurship represents a superior grade of labour. The difference in the level of productivity between an entrepreneur and an ordinary labourer entitles the entrepreneur to earn profit, a surplus over normal costs of production. In other words, profit is a payment for rental ability of some people—their capability or capability.

Marshall argued that the organiser receives only normal earnings for the supply of business power in command of capital. Thus, there is no profit in the sense of a differential gain. However, he allowed for the existence of frictional profit. Competition brings down earnings of entrepreneurs in all branches of trade to the normal level. Normal profit is the remuneration for co-ordination and supervision, it is apart of cost and not a surplus over costs. However such normal profits prevail only in the long-run. In the short-run, exceptional successes or failures are possible. That is how frictional profits exist. There may be different levels of normal profits in different industries. Marshall explained this in terms of different degrees of risk However, Marshall's risk is not risky. Since the organiser is supposed to have perfect knowledge, risk is made an available and ascertainable datum. In this sense. Marshall's risk does not explain the emergence of profit Though Marshall developed a functional notion of profit, yet he did not have a theory of profit.

Some neo-classical economists developed the marginal productivity theory of distribution whereby it is argued that profit rate is determined by the marginal product of an entrepreneur. One can make use of the Euler's Theorem to demonstrate that if each factor (land L, labour N, capital K, and organisation E) is rewarded its marginal product, then the total product Q exhausts, without any residue.

$$Q = Q(L, N, K, E)$$

$$Q = L\frac{\partial Q}{\partial L} + N\frac{\partial Q}{\partial N} + K\frac{\partial Q}{\partial K} + E\frac{\partial Q}{\partial E}$$

where $\frac{\partial Q}{\partial L}$ is the marginal product of land, $\frac{\partial Q}{\partial N}$ is the marginal product of labour $\frac{\partial Q}{\partial K}$ is the marginal product of capital and $\frac{\partial Q}{\partial E}$ is the marginal product of enterprise. $L\frac{\partial Q}{\partial L}$ measures that part of total product which goes as payment to land i.e., rent. Likewise $E\frac{\partial Q}{\partial E}$ is that part of total product which goes as payment to entrepreneur, i.e., profit. To ensure that the value of the total product exhausts by way of the aggregate of factor costs (no adding up problem) is to ensure that the profits equal the marginal product of entrepreneur. This holds true, if perfect competition and constant returns to scale prevail, i.e.., the production function is homogeneous of degree one. However, the real world problem is how to calculate the marginal product of an entrepreneur.

*(2) Modern Theories : Clark, Schumpeter, Hawley, Knight :*

J B. Clark develops the dynamic theory of profit. Basic to his theory is the distinction between a static and a dynamic economy. A dynamic economy is one where following five generic changes are constantly in progress:

1. Population is increasing;
2. Capital is increasing;
3. Production techniques are improving;
4. Forms of industrial organisation are changing so that efficient producers survive;
5. Consumers' wants are multiplying.

An economy without these changes is a static economy where every factor of production has a 'natural price, Marshallian type of frictional profit may exist in such an economy. But true profits emerge only in a dynamic economy. For example, an invention is there. It will increase production per head. The factors which have invented will start getting something more than their natural rates. Thus profits will emerge. But very soon, others will come to know about this invention and they will imitate. The fruits of invention will be diffused throughout the society. The society will move to higher level of development. Natural rates will go up and ultimately competition will bring a situation where nobody will earn any surplus over the natural rate, i.e., profits will vanish. The idea is that in a dynamic economy, change causes the emergence of profit. The entrepreneurs grasp it but cannot hold it.

J. Sehumpeter develops the innovation theory which runs very close to the theory of Clark. The 'five generic changes' of Clark are summed up by Schumpeter under the heading 'innovations'. An innovation may take the form of introduction of a new kind of machinery, enlargement of the size of business unit, exploitation of a new source of raw material, capturing a new market, developing a new product etc. Profit comes into existence when an innovation is introduced. The introduction of any innovating change brings enterprise into action to try a new factor combination It is this enterprise which reduces costs and causes emergence of profits. Profit accrues to the person who introduces innovation. It is thus the capability and willingness to carry out a new combination-that is the entrepreneurial act-which is the source of profit. Profit is the reward for entrepreneurial innovating skill Innovation involves scientific discovery-invention-application and spread of a new production function. The innovator reaps the profit of commercial adoption of an innovation. Following successful innovation comes a period of adjustment. As others start imitating an innovation, others start making profits at the cost of the original innovator The process of innovation and its adaptation can explain business cycles in the short-run. In the long run, the function of profit is to increase the rate of capital accumulation, which is the test of economic development. Entrepreneurship is the talent which engineers the process of long-run development.

Hawley has advanced the risk theory of profit. Profit is a reward for a special function performed by the entrepreneur. This is the function of risk-bearing. Supervision and co-ordination are routine jobs of management. The most challenging job is that of bearing risk. Profit is a payment which induces people to take risk. No one will be prepared to undertake the hazards of production unless he expects to earn a profit. The person who ventures, believes : no risk, no gain. Higher the risk, larger is the expected rate of profit, and vice versa. The amount of risk involved in the process of production differs from industry to industry. As a result, different rates of profit prevail in different industries. Profit emerges as a 'dynamic surplus', because in a dynamic economy characterised by changes, there are risks of taking any venture. Similarly, the entrepreneur is entitled to profit because he undertakes risk when he invests. His innovation may or may not be accepted. If innovation reduces the cost of production, it is readily accepted and he makes profit. If an innovation does not reduce costs, it is not accepted and, therefore, the entrepreneur makes losses. Thus profit is a premium for risk-bearing, The investor or speculator expects to be paid a higher premium on his risky investment to compensate for his greater risk of loss. Though Hawley locates the very crucial function of entrepreneur- ship, yet his concept of risk is very vague. As Clark assumes that changes are homogeneous, Hawley assumes that risks are homogeneous.

Frank Knight has developed a hybrid theory by overcoming the weakness of both dark's dynamic theory and Hawley's risk theory.

Knight argues against Clark that changes are heterogeneous. Some changes are known and predictable, others are not. It is the latter which introduces uncertain decision environment and, therefore, gives rise to profit. If the magnitude and direction of changes can be foreseen a reasonable time in advance, then the question of entrepreneurial venture to face the changes is irrelevant and, therefore, the question of rewards like profit does not arise.

Knight argues against Hawley that risks are also heterogeneous. Some risks calculable and others are not. If the changes are known and definite, then the decision environment is certain. If changes are known, but indefinite, then the likelihood of the events can be estimated by- statistical probabilities. If it is known that either of the two events, A and B, will occur then the probability of the event B will be [1–P(A)], where P(A) is the estimated probability of the event A. The calculable actuarial probability can be called risk; this risk can be insured depending upon the co-efficient of estimated probability. On the other hand, if the course of the changes is unknown, then the risk involved can be neither calculated nor insured; the decision environment characterised by incalculable, immeasurable and indefinite risk is one of uncertainty. There are different types of unavoidable risk and uncertainty :— (a) market risk i.e., the emergence of rivals, (b) technological risk, i.e., a new, innovation (c) business cycle risk, i.e., the appearance of recession, (d) non-market risk, i.e., government rules and regulations.

It is the uncertainty about conditions of price, demand, technology and laws—the imperfect knowledge about the future market and non-market situation—which is the true explanation of profits. The divergence between anticipated sales-revenue and actual production costs will result in profits, positive or negative. It is the entrepreneur who while taking economic decisions, anticipates the course of events; the actual event may or may not conform to the anticipated events. To induce the entrepreneur to undertake the uninsurable risk involved in uncertain cases of divergence between the expected event and actual event, profits have to be Sanctioned. Keirsteed distinguishes between static expectation and dynamic expectations depending on if the past being expected in the future or not. Unless the profit rate is sufficiently attractive, no entrepreneur will be induced to face the uncertain world.

The hybrid theory above relates profits to changes, risk and uncertainty. All changes do not cause profits, only unknown changes give rise to profits. All risks also do not cause profits, only uninsurable risk of the uncertain environment gives rise to profit It may be suggested now that the entrepreneurial income is constituted of three components : (i) There is the contractual element for routine services of management (ii) The entrepreneur receives the return on property which includes rent on land and return on capital provided by him. (iii) The remainder is the differential element which is profit, a reward for accepting challenges of uncertainty

*(3) **Recent Theories : Kalecki and Kaldor :***

Recently some macro theories have been developed which tend to explain the share of profit in the aggregate income of the economy as a whole. Most of these theories have micro-foundations or micro-implications. However one must be sure, while applying these theories, not to enter into "fallacy of composition".

Kalecki develops a monopoly theory of profit. He starts with a micro-assumption that the price per unit of a commodity (P) covers the costs—average cost of raw materials (R) and average cost of labour (W) and an average rate of profit (p). Thus

$$P = R + W + \pi$$

Or $$\pi = P - (R + W)$$

$$= P - MC$$

Since (R + W) measures the marginal cost of production = average variable costs.

Then $$\frac{\pi}{W} = \frac{P-MC}{W} \cdot \frac{MC}{MC}$$

$$= \frac{P-MC}{MC} \cdot \frac{MC}{W}$$

It means that the ratio of profit to wages, $\frac{\pi}{W}$ is the product of $\frac{P-MC}{MC} = \left[\frac{P}{MC} - 1\right]$ which is a measure of the degree of monopoly or market imperfection and $\frac{MC}{W} = \left[\frac{R+W}{W}\right] = \left[\frac{R}{W} + 1\right]$ which is the measure of cost structure. Under a perfectly competitive market situation, P = MC, when the profit maximizing principle, MR = MC is followed, and therefore, $\left[\frac{P}{MC} - 1\right] = 0$ implying that profit is caused not by market imperfection but by the relative costs of raw materials to labour. In an imperfect market environment, both the market structure and the cost structure become decisive factors in explaining profit. Since P + W = national income. The real question is not if it is a micro or a macro theory. The real question is if or not it is a theory which explains profit. Some have felt that the way it is formulated, it is a definitional truism because it follows from a premise of identity, P=MC. This is not to deny that monopoly net revenue is an important element of profit and that profit may be caused by market imperfection. A monopolist may increase profit by either restricting output or inflating the price of his product. Profits may exist even in a world of perfect competition and certainty. Profits will vanish only when different inputs cost the same such perfection is unlikely.

Kaldor develops a macro theory of profits by incorporating the ideas of Keynes and Marx. Kaldor starts with the Marx's concept of society where there are two classes : the wage earners with a propensity to save. Sw and the capitalists with a propensity to save Sc. The national income, Y is therefore, the aggregate of total income accruing to the wage earners, i.e., wages W, and total income accruing to the capitalists i.e., profit $\pi$.

Thus by Keynesian definition of national income and social accounting, we have

$$Y = W + \pi \qquad \text{(i)}$$

Another standard Keynesian assumption with which Kaldor starts is the saving-investment equality.

$$I = S \qquad \text{(ii)}$$

where I = National investment and

S = National savings

Finally, Kaldor assumes that the national savings consist of total savings of the wage earners, $S_1$ and total savings of the capitalist, $S_2$.

$$S = S_1 + S_2 \qquad \text{(iii)}$$

and it is also true by Keynesian definition that

$$S_1 = W.S_w \qquad \text{(iv)}$$

and $\quad S_2 = \pi.S_c \qquad$ (v)

From this set of structural equations, we can get a reduced-form solution which may throw light on the determinants of macro profits.

From equation (i), we find that

$$W = Y - \pi \qquad \text{(vi)}$$

Now we can rewrite the equation (iv) as

$$S_1 = (Y - \pi).S_w \qquad \text{(vii)}$$

Incorporating the equation (vii) and (v) in (iii),

$$S = (Y-\pi)S_w + (\pi.S_c)$$

$$= (Y.S_w) + (S_c - S_w) \qquad \text{(viii)}$$

Incorporating the equation (viii) in (ii), we have

$$I = (Y.S_w) + (S_c - S_w) \qquad \text{(ix)}$$

or $\quad \pi(S_c - S_w) = I - (Y.S_w)$

$$\therefore \quad \pi = \frac{1}{(S_c - S_w)}.I - (Y.S_w) \qquad \text{(x)}$$

Dividing both sides of (x) by Y, we have

$$\frac{\pi}{Y} = \frac{1}{(S_c - S_w)}.\frac{I - (Y.S_w)}{Y}$$

or $$\frac{\pi}{Y} = \frac{1}{(S_c - S_w)}.\left(\frac{I}{Y} - S_w\right)$$

or $$\frac{\pi}{Y} = \left(\frac{I}{Y}.\frac{1}{(S_c - S_w)}\right) - \left(\frac{S_w}{(S_c - S_w)}\right) \qquad \text{(xi)}$$

The equation (xi) brings out that the share of profits in national income depends on the share of investment in national income, the propensity to save of the capitalists and the propensity to save of the wage-earners. If the wage earners fail to save, i.e., $S_w = 0$, then from the equation (vi), we get

$$\frac{\pi}{Y} = \frac{I}{Y} . \frac{1}{S_c} \qquad \text{(xii)}$$

A special case of the above special case will occur when we assume that the capitalists save their entire income, i.e., $S_c = 1$. In this case, from the equation (xii), we find

$$\frac{\pi}{Y} = \frac{I}{Y} \qquad \text{(xiii)}$$

This shows that the profit-to-income ratio depends only on the investment-to-income ratio. As more is invested out of a given income, more of that income will accrue to the capitalist as profits. In other words, as more is invested in the economy, the wage-earners will be impoverished. Such a generalisation appeals also on a micro level. It is often argued by the trade-unions that by increasing reinvestment of undistributed profits, the management does not and cannot improve the lot of the wage-earners. An important flaw in this argument must be noted, viz. it is true only if we assume that the economy has reached the full-employment level so that further investment can affect only the composition (shares) of income, not the level of income.

However, in most of the underdeveloped economies, actual income level is less than the full-employment and full-capacity level of income; and wage-earners also save, i.e., $S_w > o$. As a result, investment can benefit all the classes of these economies in the long run. One may use this as an excellent argument for workers' sectorl in India, though it does not readily follow from Kaldor's model. In fact, Passinetti finds inconsistency in Kaldor : workers may save, but profits may accrue increasingly to the capitalists.

The basic proposition of Kaldor seems simple and obvious. The level of profits depends on tie level of investment. But on what does the level of investment depend, in its turn? Kaldor believes that investment depends on some sort of "animal spirit" —a strong urge to invest more to earn more profit. Thus ultimately, profits become a function of "animal spirit" of the enterpreneurs. On a micro platform, we understand the working of this spirit better. It is the animal spirit which induces the entrepreneur to shoulder risk while investing in business ventures or projects whose returns are uncertain. Expected levels of profit are proportional to investment which depends on "animal spirit" to invest. We have here a type of psychological theory of profits.

To sum up, there are many theories of profit. We may distinguish five broad sets of profit determinants : (1) entrepreneurial compensation, (2) innovation and changes, (3) risk and uncertainty (4) market imperfection and monopoly, and (5) investment and animal spirit. Neither of these factors alone can offer a satisfactory explanation of profits. The theories which are complementary to each other only help us to identify some of the crucial factors which may influence profits. The significance of these factors may vary between countries, between industries within a country and between companies within an industry. The nature of profit is complex.

**Profit Policies :**

In reality, business companies may or may not maximize profits; but whatever objectives they may have either in the short-run or in the long-run, are ultimately linked up with profit considerations, immediate or remote or both. As such, each company has a profit policy. The profit policy which the company designs is always subject to the constraint imposed by the market environment. But given this, one can throw some light on two sets of problems which the company faces in its profit policy : (1) setting profit standards and (2) limiting the rate of profit. The two problems are related.

***Profit Standards :*** In setting profit standards, the first task is to decide on a measure of profit. Profit can be measured in aggregate money terms (absolute measure) or as a ratio (relative measure). There are several ratios. For example,

(i) $\text{Gross operating margin} = \dfrac{\text{Gross operating profits}}{\text{Total sales revenue}}$

(ii) $\text{Net operating margin} = \dfrac{\text{Net operating profits}}{\text{Total sales revenue}}$

Here 'net' means net of depreciation.

$$\text{(iii) Return on capital} = \frac{\text{Net operating profits after tax}}{\text{Net worth}}$$

The choice of an appropriate ratio or rate, and its interpretation must b made carefully. For many purposes including inter-company comparison of business performance, return-on-capital is perhaps the best one.

In setting profit standards, the second task is to decide on an acceptable rate of profit. Various criteria may be applied to decide what rate of profit should the company aim at:

(i) Rate of profit earned by other companies in the same industry or of selected companies of other industries working under similar conditions may be the basis for selecting a given rate of profit as the company's objective.

(ii) Normal or historical profit rates of the company may be another criterion. The rate of profits earned in the past may be the basis for setting a standard rate of profit for the present.

(iii) A company may set a profit standard, keeping in view the rate which is necessary to attract equity capital. A company which intends to issue new shares, must earn sufficient to support a high enough average level of prices for its ordinary shares—to protect the equity of the present shareholder, when the new capital issue is made.

(iv) A company may set a profit rate in view of the requirements of internal financing of company's reconstruction and expansion programme A company tries to see if or not the proportion of retained earnings (=undistributed profits) is sufficiently high to reduce the company's dependence on external capital market. In this case, the plough back rate furnishes the appropriate standard to adopt.

*Limits to Profits* : In addition to the above internal considerations which may suggest a feasible and optimal rate cf profit, there may be other external influences which may cause a company to limit its profits:

(i) Limitation of profits in the short run may be practised by a company so that it can successfully prevent other companies from entering the industry. Such barriers to entry may be deemed necessary because the company may be interested in having a secure share of market in the long-run. Thus limiting profit is a method of discouraging competition and of safeguarding monopoly thereby.

(ii) Some companies may deliberately limit profits to create a 'good will of business' and customers' confidence. Customers have their notion of fair profits. A company, interested in maintaining goodwill with buyers, potential and actual, may limit its profits close to the notional 'fair' level.

(iii) Sometimes high profits are taken as evidence of ability to pay higher wages. In such cases, to maintain good industrial relations and restrain the demands of trade unions for wage-increases, the company may limit its profit earnings.

(iv) Sometimes, profits are limited in view of keeping good public relations with Government. High profits earned by a company may induce the Government to impose restrictions on the trade practices of the business concern. To avoid such controls and regulations, the company may try to limit its profits. In fact, governmental intervention is an important factor behind profit-planning by the corporate company.

(v) In general, a social welfare function imposes a limit on the company's profit policy. The companies sometimes limit profit because of considerations of social responsibility of business, a consideration which incorporates everything : labour welfare, customers' welfare, investors' welfare, so on and so forth.

The point remains that the choice of an appropriate profit policy is a difficult task. Each company must determine its own profit policy in the light of its business objectives and strategies, and within its particular market environment. The design of a profit policy must take short-run as well as Ion-run views. The short-run standards or limits to profit are primarily meant to secure a stable flow of profit in the long-run. It is the synchronization between short-run and long-run considerations which make a profit policy design a formidable task.

**Control and Management of Profit :**

Setting a profit-standard and limiting the volume-and-rate of profit are essential steps to achieve a planned rate of profit, profit planning in its turn, is meant to secure control over internal and external forces affecting business objectives and strategies.

It follows from our proceeding discussion that the operating profits ($\pi$) can be managed by controlling either sales-revenue or production costs or a combination of both. Sales revenue (R) are affected by the sales volume (Q) and the price per unit of output sold ($P_1$). Total costs of production (C) are affected by the volume of inputs (F) purchased and the price per unit of input purchased ($P_2$).

$$\pi = R - C$$

$$R = P_1.C$$

$$C = P_2.F$$

$$\pi = (P_1.Q) - (P_2.F)$$

In perfectly competitive market situation, price, $P_1$ and $P_2$ are given, and therefore, the management of profit has to be confined to the control of sales volume (Q) and input requirements (F). In order to increase the profit volume, the company can either increase Q or reduce F. Much would, of course, depend on the technological constraint specified by the production function, Q = Q(F). Available technology will decide how far can the company restrict the use of F without affecting the level of Q produced; it will also depend on the constraint imposed by consumer preference. If the market for Q is limited, there is no scope for increasing the volume of Q to increase profit of the Q producing company.

In reality competition is not perfect and, therefore, the company interested in controlling profits can control sales price as well as costs, fixed and variable. For example, by creating artificial scarcity of Q, the company may attempt to increase $P_1$. Similarly by a bulk purchase of F, the company may try to obtain a cut in $P_2$. Sometimes the company spends on research and development so that it can innovate some cost-reducing processes and techniques. Thus there are various methods by which the profits can be controlled and managed. The efficacy of these methods can be judged by applying sophisticated techniques such as break-even analysis, profit-volume analysis, linear programming and goal programming. Here as a concluding remark, we must state that the various factors which influence profits are interrelated by their connections with the markets and by their interactions with the aggregate business activity. The management interested in controlling profits must, therefore, take a careful view of both micro and macro determinants of profits.

The economic decision marking focus is always on the business company, a primary economic unit engaged in transforming factors into product. In undertaking the process of transformation, the company aims at creating profit. In the conventional economic theory, it is assumed that the company maximizes profit by following the decision rule MR=MC. The critics have put forward different hypotheses suggesting that the companies do not necessarily maximize profit, but they do have a profit policy. Profit, by and large, is the least imperfect measure of business efficiency, technical as well as economic. This justifies a study of profit decisions. There are two concepts of profit—accounting and economic- Economic profit has reference to opportunity costs. It is difficult to measure such costs. Depreciation, inventory valuation and unaccounted value changes constitute other areas of measurement where there is a difference between accounting profit and economic profit. True economic profit is an elusive concept; its nature is very complex. There are different theories of profit which try to explain profits in terms of factors like entrepreneurial compensation, innovation and changes, risk and uncertainty, market imperfection and monopoly, investment and animal spirit etc. The concept and nature of profits, when analysed, throw considerable light on the decision variables which the company can control in order to manage profit. An essential step in the management and control of profit is planning profit policies with reference to (a) setting profit standards and (b) limiting profit volume. These two aspects of a profit policy design are interrelated, they are meant to provide the company with considerable control over a set of internal and external factors influencing business objectives, strategies and tactics.

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# INVESTMENTS

In recent years, the economists have stressed on following two different types of investment in modern business cycle analysis :

(1) Inventory investment i.e., investment in working capital.

(2) Investment in building activities i.e., investment in fixed capital.

### Inventory Investment

To begin with, it is important to avoid confusion between inventories and inventory investment, the latter being the rate of change of the former. The inventories mean the value of stocks and work in progress in the hands of company at a given point of time. Since inventory investment is the rate of change of this 'inventory', it can either be positive or negative. It is a component of national output, like consumption and investment. So a rise in national output and income is caused by a rise in inventory investment.

**Application of Acceleration Principle :**

In considering the determinants of inventory investment the motives for holding inventories should be studied. Comparable to Keynesian three motives of holding cash (transaction, precautionary and speculative), there are following three motives for holding inventories :

(1) partly because they are required by the nature of the productive process;

(2) partly because they might meet an unexpected increase in demand;

(3) partly because of speculative reasons like expected rise in prices.

Above positive motives must be weighed against the cost in the form of interest, storage expense, wastage etc. Inventories will normally vary in the same direction as output. This is equivalent to capital stock adjustment principle. The acceleration principle is a special case of the capital stock adjustment principle. This acceleration principle (namely that I = $\Delta$ output X normal-capital output ratio) applies more to inventory investment than to the investment in fixed capital because of the following reasons :

(a) Time horizon for decisions relating to inventory investment is shorter. These decisions are based on immediate future and current situation like current level of income. But investment in fixed capital is affected by long-run expectations.

(b) A desired change in capital stock can be brought about more quickly in the case of inventories than in the case of investment in fixed capital.

In so far as inventory investment is subject to the acceleration principle, it is liable, in conjunction with multiplier, to set up fluctuations in income. But cycles originating from this inventory investment will be of shorter duration than those originating from investment in fixed capital.

**Passive Inventory Change :**

Besides the acceleration principle, there are other considerations affecting inventory investment. The most important of these is the 'passive inventory change.' If sales increase and output remains constant, then inventory investment must fall. Such a movement in inventories occurring as a passive response to a change in sales is referred to as 'passive inventory change.' Thus, this 'change' is the result of output not responding fully to changes in sales. Such inertia may arise from mere reaction lags or technical obstacles. As inventory investment falls, income falls and so output reacts to changes in sales with a lag. This is "inventory cycle."

**Cobweb Cycle :**

In the above case, it is assumed that any divergence between sales and output is met by an adjustment in the level of stocks. An entirely different type of market mechanism is where sales are brought into equality with current output by movements in price. But here again the existence of a lag will cause cycles. But these cycles are called "cobweb cycles" as distinct from inventory cycle. But this cobweb cycle may sometimes lead to inventory fluctuations. As a self-contained recurring phenomenon, the cobweb cycle may be no more than a theoretical construction. But over adjustment of output on a number of occasions has probably contributed to fluctuations in inventory investment and fluctuations in price and intersect oral shifts of income.

**Conclusion :**

Considering other influences on inventory investment and inventory investment in practice; following two distinguishing characteristics of inventory investment need mentioning :

(1) The divergence between the actual and the desired capital stock arises more easily in the case of inventories than in the case] of fixed capital. This is partly because of 'passive inventory change', and partly because of 'short time horizon of inventory investment'.

(2) The divergence between the actual and the desired capital stock will be more quickly corrected in the case of inventories then in the case of fixed capital-

## Investment in House-Building

Another class of investment which is idiosyncratic in its behaviour is the investment in house buildings. This is the most unstable constituent of fixed investment. This is important, amounting roughly 30% of the total investment. Moreover, this investment largely determines the level of certain other forms of investment such as construction of public utilities etc. Another notable fact is that fluctuations in this investment is also violent. These 'building cycles' have long duration averaging 20 years in most of the great powers. Because of building's seemingly regular 20 years cycle and its infrequent, divergence in behaviour from national income, some writers treat this "building cycle" as separate and independent from fluctuations in general business activity.

**Durability and Reaction Lags :**

Investment in house building is similar to other classes of investment since it is subject to capital stock adjustment principle, it has multiplier effects and it is subject to erratic shocks. The question is, how within this general framework, the special characteristics of building cause it to react in a distinctive fashion.

Exceptional durability of houses is the main cause for the long duration of fluctuations in building and its insensitivity to short period movements in national income. Added to this cause, several reaction lags do account for such behaviour of the investment in fixed capital.

Let us now study the ultimate influence on the level of buildings. Here one thing is, of course, clear. The capital stock adjustment principle applies here. This means that the level of decisions to undertake building will vary directly with national income and inversely with the existing stock of houses. It is here in this context one may ask : How does a change in national income influence investment in house building?

If national income increases, the overall demand for house room and hence house rents will also increase. This is the direct repercussion. An increase in national income may also have indirect demographic effects on housing demand. Firstly, marriage rate varies directly with the level of economic activity. Secondly, there will be a downward movements—migration. Thirdly, young immigrants will also increase in number. Thus at the time of rising national income, building investment will be stimulated. This is empirically observed that national income has considerable effect on building business; however the channels through which these effects occur may be different from those in other investments.

**Innovation in Building and its Cumulative Effects :**

Building boom and building slump have long duration. This may have cumulative effects. With the increase in buildings, better transport facilities, shops, places of entertainment develop which may, in its turn, stimulate building activities. Innovation in transport acts as a shock capable of setting a building cycle in motion. Speculation in land values also causes a different sort of cumulative effect.

**Influence on Building:**

Building is subject to a variety of influences acting as shocks—war, short-term demographic movements, immigration, govt. intervention, the rate of interest etc.—all these affect building innovation. There is a difference of emphasis on such factors.

**Built-in-Stabilizers : Anti-Cyclical Policies at the Macro Level**

Economic development under capitalism has brought into existence the problem of chronic instability because of the periodical ups and downs of business which causes unhealthy dislocations in the economy from time to time, the unplanned, uncoordinated economic activities of a large number of entrepreneurs lead to the occurrence of periodical crises. Most staggering is the fear of a depression which brings about a fall in prices, a shrinkage of profits, a slump in investment, a dwindling of employment opportunities, a cut in the general level of incomes, a deficiency in the aggregate demand etc., leading to a miserable state of economic affairs. The industrialized economies are eternally worried as how to stabilise economic activities at a high level of employment and output.

The differences regarding what lies at the ultimate root of trade cycles are bound to be there, but there is almost general agreement as to the general process that the trade cycles take. They are agreed as to the course which a trade cycle in general takes in its upward and downward phases, and there seems to be also a general agreement as to the forces which aggravate the upward or the downward process.

In the economy there are often certain built-in mechanisms which themselves may not be able to generate a reverse process but which are certainly very helpful in checking the speed of the movement. Such mechanisms in the economy are called built-in-stabilizers, meaning thereby that when the economy is passing through a rising phase of the trade cycle, they try to pull it back; and while the economy is in the depression phase, they try to push it up. Such 'stabilizers' naturally should go against the general trend of the working of various economic forces in the economy if they are to be effective. In the rising phase, for example, when purchasing power is increasing, all round, the built-in-stabilizers should be able to reduce the availability of purchasing power to the public. In the falling phase of trade cycle, the 'stabilizers' should be able to inject more of purchasing power and revive demand.

An example of such a built-in-stabilizer is income-tax. In most of the countries income-tax has a progressive structure. Even if income tax were proportional, it is quite clear that with rising income, income-tax would go on increasing leading to increasing appropriation of a part of income by the State. In the case of progressive taxation, the tendency is strengthened further. However, just taxing away a part of the income does not suffice; it is necessary that this taxed income should be shunted out of the purchasing power flow of the economy which the government may be doing through surplus budgeting etc. On the other hand, in the case of a depression, automatically with declining income taxation goes on decreasing leaving comparatively more purchasing power with the people. In the list of built-in-stabilizers, we can add certain devices of a modern welfare State primarily designed to help the common people when they are in need. The case of unemployment insurance is in point. With rising income and employment, unemployment benefits automatically go down and contributions to unemployment funds go on rising; while with the falling employment, the payments out of these funds increase—thus ensuring a sort of automatic adjustment of the flow of purchasing power in the light of the needs of the economy. Another example is of price support policy adopted in the case of certain industries. Such a policy, when prices are falling, ensures minimum prices to the producers with the result that producers do not cut down their investment and employment abruptly. Further, when prices rise, the government releases the stocks of the commodities purchased during "bad" times thus preventing a speculative rise in prices.

However, it has to be remembered that those built-in-stabilizers are often mild in their effectiveness, unless they cover a major sector of the economy. Clearly, if only a very small portion of population is subjected to income tax, if the rates are low and similarly if the government has trot very substantial social security programmes, there will not be enough of automatic squeezing out or injection of purchasing power in the economy. Similarly, if the government is trying to interfere for price stabilization it must cover major sectors of the economy and not concentrate upon unimportant things. Above all, it has to be remembered that built-in-stabilizers work only in a simple way. The actual situation is always much more complex and needs an intricate treatment. An economy, if it is not very sensitive to changes in some of its sectors, will not respond quickly enough to built-in-stabilizers working in some of the sectors only; while if it is sensitive, it is bound to be a complicated affair and will definitely need various checks and balances at several points. In order to have a realistic policy, we heed a thorough controlling system of the economy's various organs—financial, monetary and others

For example, when we are faced with inflationary pressures various other fiscal measures will also be needed. With rising prices, there will be demand for rising wages which, if granted, will raise the cost of production further and thus will generate a cost-price spiral. In order to check it, it is necessary that money wages should be held in check. Also in order to discourage excessive investment, the government should levy extra taxes on profits and other incomes and should try to have surplus budgets. In the foreign trade field, the efforts of the government should be to have a deficit so that the foreign trade multiplier works in the direction of reducing money incomes of the people. Ordinarily if exchange rates are pegged with rising prices in the home country in the face of comparatively low prices in the foreign markets, exports will be discouraged, and imports will be encouraged. But it may happen that special efforts are needed to curb the inflationary pressure especially when the foreign countries are also affected by it. In such a situation, the reduction of import duties and enhancing of export duties is admirable. In one word, what is required is increasing flow of goods and services and decreased flow of purchasing power in the economy.

There has to be a reversal of these measures in the depression phase of the business cycles. One of the important steps is to raise wages so as to bring about increase in the purchasing power of the workers. But here it is feared that wage increase will mean increased cost and hence reduced profits leading to discouragement of investment. On the other hand, Keynes says that a reduction in money wages would mean reduction of effective demand by almost the same proportion which would mean no increase in marginal efficiency of capital and hence no encouragement for investors. Accordingly, Keynes recommends that instead of a wage- cut we should try to encourage consumption and investment through other measures.

Coming to fiscal and monetary measures in general we find that the primary aim of the government should be to stabilise the economy at a high level of employment and income. This does not imply absolute stability in a rigid manner. A modern economy is so complex by its very nature that it would be impossible to achieve this. Stability, however, here would mean to stop abrupt change in any of the major aspects of the economy—income, employment, output and prices.

The built in-stabilizers are also called anti-cyclical measures. The most important task of these measures is to regulate the flow of purchasing power in the economy so as to correspond to the flow of goods and services at high level of employment and income. Here special reference should be made to the fact that in order to have good anti-cyclical policy it is necessary to maintain not only an overall balance of demand and supply, but also various sectorial balances. For example, when the government decides to have a deficit budget, it is decided that some purchasing power is to be injected into the market; but the net effect of this injection will depend upon its quantity, its speed, and the way it is injected and the sector in which it is injected. It is quite essential, therefore, that the increased purchasing power should flow in those hands which are most likely to create requisite demand both for unsold stocks at present as well as for unutilized capacity of various industries. Sometimes the government may itself have to undertake various investment projects in hand in order to generate additional employment and demand and to convince the private investors of the profitability of investments. In this connection it has to be remembered that a comprehensive .control of investment would imply a comprehensive control of financial and monetary system of the economy. Ordinarily it is thought that probably during depression, lowering of bank rate and a general easing of the money supply should suffice with at the most occasional selective credit controls. But actually a much thorough regulation of the country's monetary and financial institutions is necessary. Firstly, regulation of bank credit alone does not suffice. Especially in the depression period, investment will not revive simply because loans are easy to have; the investors must feel that it is profitable to reinvest. When profit prospects are high, investors are apt to find various ways of crossing the hurdles put in their ways through monetary controls. We may be able to check the flow of bank credit but the people have other sources of finance, if, therefore, the economy is be regulated, not only bank money but the whole financial structure of economy needs controlling.

Then there are psychological and institutional implications of these anti-cyclical measures. For example, we must be in knowledge of the reactions of investors and consumers to various measures taken by the State. It is necessary to know how the investors react to various changes in the tax structure, changes in the cost structure and how they interpret the various investment opportunities presented before them. In other words, we must know on what major factors marginal efficiency of capital depends. Further, it is to be found out as to what extent the economy is beset with various rigidities in the form of complementarities and specificities of technical or other nature. The less the technical specificities and complementarities of the factors involved, the easier it will be to push the economy out of a depression or prevent it from inflation. More troublesome than technical rigidities will be the social rigidities in the form of non-competing groups etc. Kaldor has pointed out that it is easy to reach full employment through various anti-depression measures, but it is almost impossible to stabilise the economy there. The anti-cyclical measures imply the absence of all kinds of rigidities.

Talking further of the implications, we have to consider the existence of "money-illusion". This psychological factor has a great importance in practical policy. For if it is there, it will be possible to reduce real wages without reducing effective demand and money-profitability of investment In other words, it will be easier to get the economy out of depression. If it is not there and the workers demand a certain level of real wage, depression cannot be remedied through a cut in real wages; the methods employed will have to increase consumption and direct investment by the government. Similarly, the exact selection of monetary, fiscal and financial regulation of the economy will depend upon the institutional structure of the economy.

Finally, we are required to think in terms of binding fiscal policy and monetary policy towards the goal of achieving development with stability. When markets are booming, fiscal policy has to be so designed as to mop up the excess of money in the public hands. The state ought to have a surplus budget during a period of boom. A surplus budget implies not only heavier taxation but also reduced expenditure, so that governmental administration of a part of the economy does not contribute to the intensification of the boom. Governmental debt-administration must also be synthesized in tune with the general anti-cyclical fiscal policy. The government has to raise loans rather than repay the same during a period of boom. There is no room at all for embarking on a scheme of public works when the boom is on. If anything, some of the works already started must be withdrawn from execution, if possible. This is, in substance, the essence of the fiscal policy to be pursued during a period of boom.

Monetary policy during a boom aims at reducing the accessibility of entrepreneurs to sources of easily ingestible resources. Raising of the bank rate, selling of treasury bills to the public, raising the ratio of liquid deposits of the banks to the total advances, imposing rigid restriction on the banks in order to control their lending policy etc. are some of the monetary measures to be undertaken in conjunction with appropriate fiscal measures to combat a boom.

Prevention of depression is far more difficult. Tax-concessions, increased grants and subsidies, expansion of public works, repayment of loans to enable the public to spend more etc. are some of anti-depression fiscal measures. Lowering the bank rate, lowering the liquidity ratio of banks, liberal discounting of bills, buying of shares etc. are some of the anti-depression monetary measures.

Monetary and fiscal policies which might prove ineffective taken independently, have to be integrated into a coherent single scheme so as to ensure development with stability. It is obvious that a multi-frontal intensive attack should be much more powerful in its operations than a unilateral fiscal or monetary policy. Moreover, there is a certain amount of complementarily between the two sets of measures and hence, both have to be taken together.

The fiscal and monetary measures envisaged for an advanced economy during a state of depression have to be duly intensified in the case of an under-developed economy aiming at a planned programme of development. The advanced economies are bothered about a high stable growth. The backward economies have to deliberately design a clean break from a state of stable equilibrium at a low level of production an ' consumption.

**Anti-Cyclical Business Policy : Micro Level Adjustments**

From the standpoint of Managerial Economics, we are interested more with the micro level than macro adjustments by a business firm to cope with the problem of business cycles. It may be argued that a business cycle is an environmental factor and that an environmental factor is by definition one on which a business firm has no control and therefore, there cannot be anything like anti-cyclical business policy. The fact that a firm cannot control the intensity and duration of a trade cycle does not necessarily imply that a firm should not make any attempt to overcome the shocks of cyclical fluctuations. Modern business firms are very much concerned about both short-run fluctuations and long-run growth in their business. Many organised firms prepare detail corporate plans to proceed with their expansion, modernisation and rationalisation programme. Corporate planning today is an accepted technique of regulating and* directing long-run business growth on desired expansion path. To the extent cyclical fluctuations occur around a long-run trend path, corporate planning of business activity may be regarded as an anti-cyclical device in the short-run. Accurate business forecasting and adequate forward planning are also important for absorbing short-run business jerks, and this requires managerial foresight. The manager of a business firm must be able to anticipate the various market risks and accordingly strategic and tactical business decisions may be designed and follow-up actions taken to cope with business fluctuations. Different firms may be subject to different types of short-run market risks and business fluctuations and, therefore, different firms must follow different sets of policies. No general policy prescription can hold for all firms.

The nature of business policy decision and action appropriate to face a particular phase of a business cycle may be illustrated with reference to a particular firm. Let us take the case of a marketing firm selling consumers' durables like television sets. Suppose, the firm is located in a developing economy characterised by inflation. Due to rising prices, the costs of living increases so much that most of the people in this economy are forced to transfer their expenditure from nonessential items like consumers durables to essential consumption items like food and clothing. As a result of slackening demand, there comes a sharp fall in the sale of consumers' durables. The rate of sales being less than the rate of production results in overproduction and stockpiling. Thus inflation causes business recession in the consumers' durable sector. In this situation, the government may follow dear money policies, pay subsidies, and arrange export market so that it fights stagflation. Government action does not imply inactivity on the part of our marketing firm. First and foremost, our firm must be alert to see if or not the government is adopting adequate and appropriate anti-cyclical measure, in time. This should call for either healthy conflict or cooperation between Business and Government. Our firm alone is certainly unable to control the entire situation, but it is a part of an industry which can certainly take up some actions. This requires careful planning and prompt decisions. The manufacturers must temporarily cut down the rate of production and must seek fulltime utilisation of their plant and equipment through product diversifies cation. New products may be arranged to be sold through the existing marketing firms so that neither underemployment of sales force nor underutilisation of capacity results. Alternatively, our firm should endeavour to secure infrastructural facilities (like satelites) in rural areas through government efforts so as to promote sales of its product (like TV sets) in rural market. During inflation, as food prices rise faster than any other prices, the terms of trade move in favour of agriculture and, therefore, farmer's income rise. Our firm must make efforts to get this rural income spent on items like television sets. There are many more adjustments, like deferred payments, which may be allowed by the marketing firm to promote sales of its product during periods of inflationary recessions. Such .adjustments will have reference to firm's product policy, advertisement policy, investment policy, price policy and so on. On many occasions, it pays a business firm to seek consultancy services from economists and other experts so that it can keep away the evil consequences of business depression and market glut.

The conclusion emerges that business cycles call for integrated attack from all fronts—persons, firms, industries and government. As such the micro level adjustments are definitely necessary to meet the challenges of business fluctuations.

**An Overview :**

Among the variables which affect the economic environment of a business firm, business cycles have received considerable attention from the economists. Business cycles refer to fluctuations in income employment, output and prices, all used in aggregative sense. Four phases of a business cycle are: prosperity, recession, depression and revival. Trade cycles may be of various types—Yuglar, Kondratief and Kitchen. There are many theories and principles explaining the periodicity, duration, intensity and phasing of a trade cycle. Among the pre-keynesian theories, role of monetary factors, over-investment and underconsumption are stressed. Keynes explained business cycles in terms of erratic nature of marginal efficiency of capital. Another explanation runs in terms of the lagged adjustments of demand and supply: this is the Cobweb theorem. In the context of post-Keynesian explanations, a number useful concepts have been developed, e.g. acceleration and capital stock adjustment principles. Samuelson's model provides a scientific explanation of a trade cycle in terms of interaction between multiplier and accelerator. More recently, Hicks and Mathews have attempted explanation of full employment ceiling and lower turning point. The behaviour of inventory investment and of fixed investment in house-building in the context of business cycles have received special attention. To fight business cycles, there is a need for built-in-stabilizers in the form of an integrated monetary and fiscal policies. Business cycles today call for both macro and micro level adjustments by persons, corporations and the government. Business forecasting and forward planning by the corporate sector should be viewed in the context of business policies designed to cope with short-run fluctuations and long-run growth.

# 28

# BUSINESS FORECASTING

Modern management employs a number of techniques in arriving at scientific decisions to cope with the real world business problems.

Business forecasting is slightly narrower than business forecasting. To organise, run, control and manage a business concern, we need to forecast so many things: organization structure, workers' attitude and aspirations, the market structure of the present business etc. Business forecasting has thus reference to both non economic and economic variables. By business forecasting, our reference is confined to that part of business forecasting which is concerned directly with economic variables such as demand pattern, sales, profit and market share of the firm. To the extent business is an economic activity, economic forecasting tends to approach almost all aspects of business forecasting. This is the reason why terms 'economic forecasting' and 'business forecasting' are sometimes used interchangeably.

To give a scientific definition to the term business forecasting, we may start with a distinction between prediction and projection. Predictions usually deal with events : who will win the election, if or not there will be a famine, if or not there will be custom unionism in international trade etc. Such predictions cannot be formalised i.e., made subject to rules. The prediction of events, specifically economic events like depression, inflation, economic growth etc. is inherently difficult, because events are the intersect of social vectors (interests, forces, pressures and the like). Though the strength of these vectors can be assessed individually, yet the cross-points where these vectors meet to shape an event and its outcome cannot be accurately predicted in the absence of some sort of 'social physics'.

Projections deal with variables and not events. We project the course of a variable—population, income, per capita consumption—by 'course' we mean here the behavioural time-pattern of change in the relevant variable. Projection is possible where there are regularities and recurrences of phenomena (these are rare), or where there are persisting trends whose direction, if not exactly trajectory, can be plotted with statistical time series or be formulated as historical tendencies. Necessarily, therefore, one deals with probabilities and an array of possible forecasts and/or backcasts. The limitations of projection are evident. The further one reaches forward and/or backward in time-scale with a set of forecasts and/or backcasts, the greater the margin of error, since the fan of projections widens.

Projection with regard to the course of a variable assumes a high degree of rationality on the part of men who influence events—the recognition of costs and constraints, the common acceptance or definition of the rules of the game the society plays, the willingness to be consistent and the like factors. Thus projections involve some element of predictions too. In a way, the projected course of one or many variable (s) may give content and shape to a predicted course of an event.

Predictions and projections both contain policy-implications depending on the system of values and preferences which the society maintains at a point of time. If we predict famine conditions, we do imply that the society must build up a buffer stock to avoid those conditions when they are due. If we project explosive population growth, we do imply that either food production should be increased or else population should be drastically controlled. These policy implications follow from the assumption that our society is interested in maintaining, if possible, improving our standard of living. Thus social preference-and-valuation determine policy-prescriptions. That is why, when we predict an event or project a variable, we keep the policy prescriptions implicit rather than explicit. An attempt to make the prescriptions explicit has the potential danger of converting prediction/projection into propaganda. If at all any propaganda (i.e., what should happen) has to enter in an exercise of projection (i.e., what might happen) as distinct from prophecy (i.e., what will happen), it enters in the form of target-planning. In this chapter, we are concerned with projections, to be exact, forward projection which is the other name for forecasting.

We can distinguish between conditional and non-conditional economic forecasts. In conditional forecast, we estimate the impact of certain known or assumed changes in the independent variables on the dependent variable. For example, if we know the demand schedule for a particular commodity, we can estimate the effect of a change in price or the quantity of sales. We take the change in price as given, but we try to predict its effect. Here two kinds of uncertainties are involved—we cannot be certain that we have measured the past price-volume relationship correctly, and we cannot be certain that the past relationship still holds.

Non-conditional forecasting, in contrast, requires the estimation of the changes in the independent variables themselves. Most of this chapter is concerned with non-conditional forecasting. Such forecasting involves all of the risks of conditional forecasting already mentioned, it also runs the risks of inaccurate estimation of the independent (exogenous) variables.

In practice, forecasters almost always treat some variables as "exogenous" or determined outside of the particular model being used. For example, it is usual to treat government expenditure as exogenous, on the view that decisions on such expenditures are determined by political rather than economic forces.

Executives at all levels make forecasts about the future. Examples of such forecasts are :—The production manager requires estimates of sales in order to plan future production levels. The treasurer makes forecasts of economic activity and money availability in order to budget for cash needs. The sales manager needs estimates of inventories in the hands of customers in order to plan sales force assignments. The personnel director needs estimates of labour supply in order to advise the production manager on the feasibility of running extra shifts.

Business forecasting in general and economic forecasting in particular are essential steps towards corporate planning. Forecasting is an integral part of the forward planning process of any business and its management can never avoid forecasting because every business decision necessarily rests upon some forecast of future conditions. Had the world been certain and repetitive of a given status quo, there would have been no need for a forecast. However, the business world is full of risk and uncertainty. To minimise the element of risk and uncertainty, forecasting is necessary. The business and its management have to cope with the situation of indefinite future. To meet the challenges of an uncertain future, corporate planning is essential. Forecasting is necessary, though not sufficient, for a successful long-term corporate plan and / or a short-term forward plan.

A successful planning by a corporate business entails following three things :

(a) *Passive forecasts* : Some view of the problem which lies ahead;

(b) *Objective function* : Setting of immediate and remote objectives of corporate activity; and

(c) *Actual forecasts* : Company's ability to forecast given (a) and (b), the likely outcome of pursuing the business objectives by means of a set of policy instruments.

Thus forecast plays a very crucial role in the decision making function of management. Management cannot choose between forecasting and no-forecasting. Management can only choose between various techniques of forecasting, between sizes of forecasting budget etc. Because of these choices, forecasting presents an economic problem as well.

**Forecasting Techniques :**

Since business forecasting plays a crucial role in decision making, it is necessary to use the best available forecasting techniques. But there is no first best method of forecasting. The availability and the urgency of forecasts determine the choice of a forecasting method. Often we have to use the easy and less reliable techniques because the data are not available and the forecasts are urgently required.

The important forecasting techniques are as follows :

1. Historical Analogy Method
2. Trend Method or Time Series (Extrapolation Method)
3. End-use Method
4. Survey Method
5. Regression Method
6. Leading Indicators Method
7. Econometric Models and Simultaneous Equation Method

*1. Historical Analogy Method :* In this method, forecasting is done on the basis of country comparisons. There are two stages (i) selection of a country A which sometimes in the past (period T*), particularly with respect to the industry I, the demand of whose product is under forecasting, was in the same stage of development as the country B for which forecasts are being made at present period T, (ii) forecasting of the demand for industry I's product in country B in periods t +1, T+2, T+n on the basis of the actual demand of that industry's product in country A in period T*+l, T*+2,......... T*+n respectively.

*Example :* Let us assume that the present (2008) stage of India's development with respect to the demand for cement is the same as that of U.S.A. in 1990. Then the demand for cement in India in 2010 and 2015, by this method will be forecasted as equal to the cement demand in U.S.A. in 2000 and 2005 respectively.

*Advantages :* It requires neither any time series data nor the use of any statistical technique.

*Limitations :*

(i) It is difficult to find two similar countries, for comparison,

(ii) Also the trend pattern exhibited in one country in one time period need not repeat itself in another country in another time.

Due to these limitations, many forecasters do not even include this method among forecasting techniques.

2. *Trend Method :* This is a very simple method. Here one extrapolates the historical data on the assumption that the variable under forecasting will move along the established path. Hence it is necessary to determine the appropriate trend curve and the values of its parameters and to forecast with the help of the estimated trend line or curve.

There are four kinds of trend lines :

(i) Arithmetic linear trend

$$Y = a + bT$$

Y = unknown variable to be forecasted

T = Trend variable which has a value of zero in the first period, 1 in the second period, and 2 in the third period and so on.

a(=intercept) and b(=slope) are parameters. This trend line assumes that change will be a constant absolute amount=b every period.

(ii) Exponential (semi-log) trend

$$Y = ae^{bT}$$

or $\log e\, Y = \log e\, a + bT$

The semi-log trend assumes a constant growth rate = b each period.

(iii) Second and higher degree polynomials trend.

The second degree is called a parabola. Its equation is

$$Y = a + bT + cT^2$$

The slope of the parabola is given by the term $\frac{dY}{dT}$ and it changes direction only once, either from positive to negative or vice versa. The shape and location with respect to axis will vary according to the values of the constants a, b and c.

(iv) Cobb-Douglas (double-log) trend

$$Y = aT^b$$

or $\log_e Y = \log_e a + b \log_e T$

The double-log trend assumes a constant elasticity=b every period.

The selection of the most appropriate growth curve is governed by both theoretical and empirical considerations. Theory might support a particular growth pattern. Empirically, the curve that best fits the past movement of the data (i.e. the one which guarantees highest R2) is the most appropriate curve. The coefficients of these trend curves can be estimated by the least sequare method and the chosen estimated trend equation can then be used for forecasting purposes.

*Advantages :*

(i) It can be used easily and quickly, for it does not require the knowledge of economic theory and market.

(ii) It requires only the time series data on the variable whose future values are to be forecasted. Also since many time series follow a particular trend, it often yields good results.

*Limitations :*

(i) It assumes that past trends will continue in the future. It is possible that the value of the parameters of the trend curve changes in the prediction period.

(ii) It requires a long time series of the variable under forecasting in order to yield good results. Hence it cannot be used for, say, forecasting demand for new products.

The trend method can be used for obtaining quick forecasts and as a preliminary to using sophisticated techniques and comparing with the results of the latter.

3. *End-Use Method :* In this method, the steps are : (i) identify all the possible uses—e.g. as input to other industries, direct consumption demand etc. of the product whose demand is being forecasted; (ii) obtain the input-output coefficients with respect to the product whose demand forecasting is being attempted and the industries using this product as an item; (iii) obtain the desired or target levels of output of its (the product whose demand is being forecasted) all consuming industries, and its probable demand for

final consumption and exports net of imports in the prediction period; and (iv) derive its inter-industry demand and add the same to its probable demands for final consumption and exports net of imports in the prediction period to yield the forecasts of aggregate demand for the product. Let us take an illustration. We have to forecast steel demand in India in 2010. Assume that:

(i) Steel is used as an input in only 4 industries.

(ii) It is used for final consumption and exports and that it can be imported.

(iii) The input-output coefficients of steel in its four consuming industries are $a_1$, $a_2$, $a_3$ and $a_4$.

(iv) In the prediction period 2010, the desired or target levels of output of the four industries are $X_1$, $X_2$, $X_3$ and $X_4$ respectively and Cs Es and Is are its probable levels of final consumption, exports and imports. The forecast of the aggregate steel demand is given by

$$D_s = a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + C_s + E_s - I_s$$

$$= \sum_{i=1}^{4} a_i x_i + C_s + E_s - I_s.$$

***Advantages:***

(i) Data for using this method is easily available.

(ii) Use of this method is supposed to yield good results, for it can take care of anticipated technological, structural and other changes. Expected technological changes can be incorporated by changing the concerned input-output coefficients.

(iii) It yields section-wise forecasts. While obtaining forecasts of aggregate demand, the forecaster obtains the demand by the individual consuming industries, by the final consumers and by exporters and importers.

***Limitations:***

(i) The targeted or desired levels of outputs of different consuming industries very often differ from their actual production in the prediction period.

(ii) It is necessary to use some other forecasting techniques to arrive at the probable final demand and exports net of import demand in the prediction period.

(iii) It is quite tedious and time-consuming. This method has not been widely used because of these limitations.

4. ***Opinion Poll and Survey Methods :*** Polls and surveys are used to discover the anticipations and intentions with regard to production, consumption, savings and investment. In the survey method, complete reliance is placed on planning in order to obtain forecasts. There can be two types of survey — (a) Complete Enumeration Survey Method (b) Sample Survey Method.

*4(a) Complete Enumeration Survey Method :*

Here aggregate demand forecasts are obtained by aggregating the probable demands of all individual consumers in the prediction period by first obtaining the probable demands of all consumers and adding the individual probable demands to obtain the market demand.

To explain, if there are n consumers and the probable demands of them are $D_1$, $D_2$ and ......... Dn, then the forecasts for market demand are given by $\sum_{i=1}^{4} D_i$ In this method, there is no bias caused by the forecaster, since he just collects the information and aggregates.

***Limitations :***

The use of the complete enumeration survey method is not feasible especially in the case of products consumed by a large community. Hence its restricted version i.e., the sample survey method is recommended.

*4 (b) Sample Survey Method :*

Here the steps followed are :

(i) Select a representative sample of the total universe.

(ii) Obtain the probable demands by the selected sample units.

(iii) Translate the demand of the sample units into the demand of the whole population.

*Advantages :*

The main advantage of this method is that it does not require any time series data or the use of any statistical technique. This method yields good results if the sample is properly chosen.

*Limitations :*

The limitations of this method are :

(i) It is highly subjective and it is possible to arrive at different forecasts with different samples of the sample population.

(ii) The sampling error decreases with every increase in sample size. This temptation makes the method a tedious and expensive one.

(iii) Since a survey requires the services of many field workers, all of whom may not always be accurate, it is subject to large errors.

*4 (c) Delphi Methods :*

A recent variant of the opinion poll and survey methods is the Delphi technique. Here is an attempt to arrive at a consensus in an uncertain area by questioning a group of experts repeatedly until the responses appear to converge along a single line. The participants are supplied with responses to previous questions (including reasoning) from others in the group by a coordinator or a leader or an operator of some sort. Such feedback may result in an expert giving weight to a factor previously not believed significant.

The Delphi method has proved popular in forecasting non-economic rather than economic variables; after all, the delphi method produces "reasoned expert opinion" which is a poor proxy for market behaviour, anticipated or actual, of economic variables.

5. ***Regression Method :*** Here we forecast on the basis of an estimated relationship between the forecast (dependent) variable and variable on whose value it. depends i.e., the independent variable. It is assumed that the functional relationship existing between the dependent and independent variable in the past will continue as before in the prediction period. Hence it is necessary to:

(i) Identify the variable which appear to have determined the forecast variable (Y) in the past. This is done on the basis of the principle of economic theory.

(ii) Determine the most appropriate form of the functional relationship on the basis of both economic theory and empirical research. The most popular kinds are linear, exponential and Cobb-Douglas.

(iii) Estimate the functional relationship between the forecast (dependent) variable and its causes i.e., independent variables by using statistical techniques (least squares) using past time-series data or cross sectional data. Here it may be pointed out that time series data refer to the same population at different sequential points of time, e.g. national income in the years 1971, 1972, 1973 and soon while cross-sectional data refer to the different populations at the same point in time e.g. income of states of Rajasthan, U.P., M.P., Gujarat etc. in 1978. The coefficient of determination RJ measures the percentage of total variation of the dependent variable that is explained by its explanatory (independent) variables. Thus higher the $R^2$, better is the equation for prediction period.

(iv) Predict the values of the determining (independent) variables $x_1, x_2 \ldots\ldots x_n$ in the prediction period.

(v) The final forecasts are obtained by substituting the forecasted values of $x_1, x_2 \ldots\ldots x_n$ into the estimated functional relationship.

***Advantages :***

(i) Like other methods, it provides the forecasts. In addition, it also explains the variations in the forecast variable in the past. Hence it is both prescriptive and descriptive.

(ii) It is neither mechanistic as the trend method nor very subjective as the sample survey method. Though there is a possibility of two forecasters choosing two slightly different forecasting equations to obtain different forecasts, the differences in their forecasts will rarely be significant; the differences may, however, be significant if any or both of them are not using the trend method in forecasting the values of the explanatory variables.

(iii) It is easy to apply provided, of course, the data for a good sample size are given.

***Limitations :***

(i) The main disadvantage of the regression method of forecasting is that it is necessary to use some other method to forecast the values of the explanatory (independent) variables in the prediction period. To the extent forecasts of the values of explanatory variables are incorrect, the forecasts based on regression method will be wrong.

(ii) To the extent the structural changes have taken place, the past relationship between independent and dependent variables will not continue in the future.

(iii) The forecasts under this method assume that the forecast equation holds exactly in the prediction period. To the extent it is stochastic, i.e., the disturbance term is non-zero, the forecasts will be wrong.

In fact, no forecast is 100% correct and so the only severe limitation of this method is (i) above.

***6. Lead-Lag Indicators Method :*** Leading indicators are series which move up or down ahead of some other variable. In this method it is necessary to (i) identify the appropriate leading indicators and (ii) determine the relationship between the leading indicator and the variable under forecasting. Here we measure the leading period and relationship between the leading variable and the variable under forecasting. This is accomplished with the aid of regression analysis.

According to Mitchell and Burns, a leading indicator series should be operative under a variety of conditions : lead the cycle by three to six months, sweep smoothly up from each cycle through to the next peak and then smoothly down, be pronounced enough so as to be readily recognized, and finally be related to general business activity in an obvious way.

A short list of twenty-five series indicating the level of business activity is given below.

***Leading Indicators :***

(i) Average length of work week, production workers, manufacturing hours

(ii) Non-agricultural placements, all industries

(iii) Index of net business formation

(iv) New orders for durable goods (terms)

(v) Contracts and orders for new plant and equipment (in money terms)

(vi) New building permits, housing

(vii) Change in book value of manufacturing and trade inventories (in money terms)

(viii) Index of industrial material prices

(ix) Index of stock prices, 500 common stocks

(x) Corporate profits after taxes, quarterly (in money terms)

(xi) Ratio of price to unit labour, cost in manufacturing (index)

(xii) Change in consumer installment debt (in money terms)

***Coincident Indicators :***

(i) Number of employees on non-agricultural payrolls

(ii) Total Unemployment Rate

(iii) Gross National Product in constant price

(iv) Index of Industrial Production

(v) Personal Income (in money terms)

(vi) Manufacturing and trade sales (in money terms)

(vii) Sales of retail stores (in money terms).

***Lagging Indicators :***

(i) Unemployment rate, persons unemployed fifteen weeks or more.

(ii) Business expenditures for new plant and equipment (in money terms)

(iii) Book value of manufacturing and trade inventories (in money terms)

(iv) Labour cost per unit of manufacturing output (index)

(v) Commercial and Industrial Loans outstanding, (in money terms)

(vi) Bank rates on short-term business loans.

Individually, no single indicator can be used with complete confidence. Hence we use a new method called the diffusion index. It is formed by counting the number of indicators that are rising at any one time and taking this as a percentage of the number under observation. For example, if nine out of the twelve leading series turn up during a given period, the diffusion index is 75%. If nine turn down, the index is 25%

Moore defines a diffusion index as follows—"It shows how widely or narrowly diffused an expansionary movement is among the indicators."

Almost invariably the leading diffusion index reaches a maximum and begins to decline before the end of a business cycle expansion. It also reaches a minimum and begins to rise before the end of a business cycle contraction. Usually the diffusion index based on leading- indicators shift their position before those based on coincident indicators, and these in turn move before those based on lagging indicators. This method overcomes the regression techniques' problem of forecasting the values of the independent variables in the prediction period.

***Limitations :***

(i) It is not always possible to find out a leading indicator for every variable under forecasting.

(ii) Lead time is often not constant over-time. Relationship between the leading indicator and the forecasting variable often varies with time.

Because of these rather severe limitations, the leading indicator method has rarely been used in forecasting. Diffusion indexes have three limitations which impair their usefulness in forecasting business fluctuations. Two of them are inherent in any business cycle indicator. First, they fail to give a clear indication as to the magnitude of the impending change. Second, they are not immune from the effects of random factors which influence their movements. In addition, the diffusion index suffers from the problem of weight. We cannot say that the decline in new orders for durable goods has the same economic impact as a drop in contracts for new plant and equipment, yet each is weighted equally.

7. *Econometric Models and Simultaneous Equations* : Econometrics is a science of economic measurement. It is a combination of economics, statistics and mathematics.

The simplest econometric model consists of one dependent and one independent variable, plus a random disturbance factor, the so-called stochastic variable. Let Y =sale of notebooks and let us hypothesize that it is a function of the student population (X) using that kind of notebooks, and of a stochastic or random variable u, then we have an econometric model which appears simply

$$Y = f(X) + u$$

If the relationship is linear, then the equation can be written as:

$$Y = a + bX + u$$

This equation means that sale of notebooks will go up as the student population increases. How large is the impact of X on Y will depend on the value of the coefficient b. The term u is introduced here to account for the deviation of the forecast from the actual result.

Econometric models generally have two basic kinds of eqnations : behavioural and definitional. One definitional equation states that the level of Gross National Product (GNP) is determined by the sum of consumption, investment and government spending.

$$Y = C + I + G$$

Such an equation simply shows the economic interrelationship among the variables but does not show what determines the level of each component. For that, we need behavioural equations such as :

$$C = a + b\,\pi_{t-1}\,cW_1 + dW_2 + u$$

which states that the level of consumption is determined by last years profits, this year's wage level paid by private industry and wages paid by government and a random disturbance factor, u.

The Gross National Product is a measure of the value of goods and services within a particular period. For the purposes of forecasting it may also be considered as a measure of aggregate demand, of the total spending taking place in the economy. The basic assumption in GNP model building is that demand governs business activity; if the total spending increases, business activity increases; the problem of forecasting is thus one of forecasting the components of aggregate demand. For doing this, it is desirable to break the GNP into parts, with each part representing an important segment of total expenditure.

It is necessary to forecast the components of the GNP and its sum. The components of the GNP are interdependent. The level of purchases of plant and equipment depends on many factors and among them is the rate at which the GNP is increasing or the extent to which demand is exerting pressure on capacity. Inventory investment depends on the rate of current purchases, as well as the accuracy with which this rate has been anticipated. Net foreign investment depends partly on the rate of growth in the domestic GNP as compared with that of foreign national products. Hence in order to solve the problem of interdependence, it is necessary to construct a series of simultaneous equations to reflect the kinds of interdependence under discussion. In business forecasting, it is possible to make adjustments in one component to bring it in line with a forecast of another, making succeeding adjustments of this sort until we reach a whole that appears consistent.

In the simultaneous equations method, the following steps are there :

(i) Specify the complete model. This is done on the principles of economic theory.

(ii) Estimate the complete model from the past time series and/ or cross-section data. This is attempted with the aid of the appropriate statistical technique, such as two-stage least square (2SLS) methods.

(iii) Solve the model algebrically into its reduced form.

(iv) Forecast the values of the pre-determined variables in the prediction period.

(v) Obtain forecast for the endogenous variables by feeding the forecasts of pre-determined variables into the estimated reduced-form equations.

The simutlaneous equations method of estimation overcomes the main limitation of the regression method by specifying a complete model which can be solved into reduced (forecasting) form equations. A reduced-form-equation is one which expresses an endogenous variable in terms of only pre-determined variables and parameters. The reduced-form contains only one endogenous variable and one or more predetermined variable whose values in the prediction period can easily be forecasted. The predetermined variables are either policy variables (such as government expenditure, tax rates, government securities with the non-government sectors, bank rate etc.), lagged endogenous variables or some non-policy exogenous variables (such as population, weather etc.). Under this method, the appropriate model can be developed to overcome almost completely the problem of forecasting independent variables.

*Advantages :*

(i) This method possesses all the advantages of the regression method,

(ii) Furthermore, if one is not worried about the size of the model, it can almost eliminate the regression method's major problem of forecasting the values of the independent variables in the prediction period,

(iii) Provided the data are available, one should not really be concerned with the model's size, for the computer is there to help the forecasters to estimate and solve the model.

*Limitations :*

It is subject to limitations (ii) and (iii) of the regression method. However, as noted above, these are not severe. The main obstacle to its application is the nonavailability of the data for a good sample In developed countries like U.S.A., U.K., Canada, where long time series data are easily available, this method is the most popular one. In India also the data constraint is becoming weak and weaker with the passage of time and so the simultaneous equations method of forecasting has good prospects.

**Testing Forecast Accuracy—Need an Methods :**

The data on which the forecast is based may not be accurate; in fact, it might be obsolete. Even if the data the forecaster uses are absolutely accurate, the prediction of future events is still subject to errors of estimation. Our systematic equations may simply be unable to account for all variations in the dependent variable.

Hence there are two kinds of errors implied here :

. (i) One kind of error arises because the independent variables, while they account for much of the variability in the dependent variable, do not account for all of it.

(ii) There are changes which come about because there are new forces at work which modify the degree to which variation in the independent variables actually affects the dependent or forecast variable. In other words, the functional relationship between the dependent variable and the independent variables does not remain constant. All economic data are stochastic.

In view of this, many managers believe in remaining uncommitted and keeping as many open alternatives as possible, in order to be able to move as conditions change. Also despite the considerable progress made in economic forecasting, we still have no adequate explanation for some of the systematic relationships between economic variables. Thus an actual (realised) state may differ considerably from an anticipated (forecast) state. This calls for an evaluation of forecast accuracy.

The forecast accuracy tests compare the forecasts ( $\hat{Y}_t$ ) with the realization ($Y_t$). There are two kinds of forecasts ex-ante forecasts and ex-post (genuine) forecasts. Ex-ante forecasts are the forecasts for the sample periods or cross-sections, and expose forecast are for future periods. The non-statistical forecasting method i.e., Historical Analogy, Leading Indicator, End-Use and Survey Method can be used to yield only ex-post forecasts, while the statistical methods, i.e., Trend, Regression and Simultaneous Equation Method can be used to yield both ex-ante and ex-post forecasts. The alternative tests for evaluating the accuracy of ex-ante forecast are :

(i) Coefficient of Determination Test

(ii) Root Mean Squared Error Test

(iii) Percentage Mean Absolute Error Test

The accuracy of ex-post forecasts which can be tested only after the prediction period has come, can be evaluated by the following test.

(iv) Percentage Absolute Error Test,

**(i) Coefficient of Determination ($R_2$) Test :**

The Coefficient of determination is measured by

$$R2 = \sum_{T=1}^{n} \frac{(\hat{Y}_t - \overline{Y})^2}{\sum\limits_{T=1} (Y_t - \overline{Y})^2}$$

where $\overline{Y}$ = Sample mean of Y

n = Sample size

and subscript t stands for the period if time-series data are used and for the particular cross-section, if cross-section data are used.

Higher the $R_2$, better are the ex-ante forecasts. This test is appropriate for evaluating the forecasts of the Trend and Regression Methods. It is not useful for testing the accuracy of the ex-ante forecasts of the Simultaneous Equations Method.

**(ii) Root Mean Squared Error (RMSE) Test :**

The root mean squared error is measured by

$$RMSE = \sqrt{\frac{1}{n} \sum_{T=1}^{n} (Y_t - \hat{Y}_t)^2}$$

The RMSE test is such that lower the RMSE better are the ex-ante forecasts. This test is appropriate for evaluating the accuracy of ex-ante forecasts of any statistical forecasting technique.

**(iii) Percentage Mean Absolute Error PMAE) Test :**

The % Mean absolute error is measured by :

$$\text{PMAE} = \frac{100}{n}\left[\sum_{T=1}^{n}\frac{Y_t - \hat{Y}_t}{Y_t}\right]$$

Lower the PMAE, better are ex-ante forecasts.

**(iv) % Absolute Error (PAE) Test :**

The % absolute error is measured by

$$\text{PAE} = \frac{100(Y_t - \hat{Y}_t)}{Y_t}$$

Hence, t stands for the prediction period to which ex-post forecast applies. Lower the PAE, better is the forecast.

These various tests can be used to evaluate the accuracy of forecasts both on absolute and relative basis. That is, they can be used to evaluate the accuracy of forecasts of different forecasting techniques.

The conclusion emerges that expert judgment has to be employed in selecting any forecasting technique, in obtaining the forecasts for any variable and in interpreting those forecasts as a basis for long-term corporate planning and short-term forward planning of business. Alternative forecasts should be obtained based on all possible alternative assumptions about the future. These alternative forecasts enable the decision-maker to plan his business strategy better . While selecting the forecasting technique as an aid to planning business strategy, the decision-maker must keep in mind (a) the reliability of data, (b) the possibility of error of estimate and (c) the difficulty involved in interpreting the forecast results derived.

**A Note on Demand Forecasting :**

We now move from general business (economic) forecasting to a specific forecasting, namely demand forecasting. Demand is reflected in terms of the volume or value of sales.

In forecasting the sales of a particular product, there are factors which affect the demand in the short-run, and those which affect it in the long-run. In the short-run, the potential demand for some product is a function of the economic variables affecting its consumption. Price, disposable income and expectations as to price and income are generally most important. However, if the product is a, durable one, or if a lead time is needed within which to change the rate of output, then the demand relationships are altered. For articles of immediate consumption, the variables like price and income are important in altering the rate at which the goods are supplied to meet the demand. The purchase of a consumer durable is a function not only of price and income but also of the useful life of the stock of goods rendering similar service.

Thus it is necessary in the short-run to consider not only the uses of such an item, its price and the price of substitutes, and the available disposable income of possible customers, but also the size of the stock of items or substitutes presently in the hands of customers, the age of that stock, and its probable service life. The longer the "run", the less the stock will exercise an influence on our calculations.

In forecasting the demand for a new product, the firm will need to make a market survey of customer need, analysis of sales records of potentially competing products or analysis of the life cycle of existing products which may be substitutes. The sales records of a comparable product may be used as the basis for making an estimate or a prediction of sales of a new product. The life-cycle approach is based on the theory that each product goes through a predictable growth pattern following its initial introduction. Application of this method assumes that a product experiences an introductory phase, further development, growth, maturity, stabilization in acceptance and then decline. The key to using this method is to find a growth pattern in some established product which serves the same market, so as to use its record as a guide.

In the case of an established product, change in some key variables such as customer income or the level of economic activity may provide the required clues. Here forecasting becomes a matter of predicting possible elasticities or responsiveness to key variable changes. The market survey method of predicting new product demand requires that questionnaires be sent to potential customers selected by a random or stratified sampling method.

In analysing the demand for an established product, it is necessary to identity and isolate the factors which influence demand responsiveness in different ways. Examples of such factors could be a crop-failure which causes a temporary shortage of the product, and this will be reflected in a price rise. By plotting the sales of a product against a time scale, we observe the effects of many events and causes. However, we will not be able to identify all the factors which may cause variation, unless we employ the tools of statistical analysis. If, for example,, the demand for a product appears to be influenced mainly by the general level of economic activity, then our forecasting will be concerned almost entirely with methods of predicting the GNP, or the level of disposable income. We may employ, econometric methods or a system of simultaneous equations in which the GNP is a dependent variable. Other models are more concerned with estimating the several components of GNP such as consumption, capital goods spending, or private construction. It may, for example, be more worthwhile to have a forecast of the probable level of investment spending than of GNP as a whole.

Product or commodity forecasting generally works from a supplied GNP forecast. It may also be based on a simple trend analysis,] or employ an econometric model in which product demand is the dependent variable, or use an input-output grid, in which sales are the sum of the anticipated demands of using industries. The aggregate opinion of expert observers, as opinion polls or surveys, may also be used. A recent variation is "Delphi", after the place at which the ancient Greek oracle issued forecasts of things to come. For details about these methods, the reader may refer back to the section on forecasting techniques. Here we will consider rather the forecasting factors, i.e., factors entering into demand function.

In an analysis of statistical demand function, it is customary to classify the explanatory factors into (a) trend factors which affect demand over, long-run, (b) cyclical factors whose affects are periodic in nature, (c) seasonal factors which are a little more certain compared to cyclical factors, because they appear at specified time of the year, and (d) random factors which create disturbance because their operation and effects are not very orderly. Such characterisation of factors depends very much on the nature of product.

Forecasting the demand for individual products requires special techniques adapted to meet the peculiarities of the special market involved. A number of interesting factors which have been considered in actual forecasting of items like consumer durables may be referred here.

*Saturation Levels :* Some forecasters give attention to a limit or saturation level in the particular market. This consideration is especially important for durable consumer goods such as automobiles or household appliances. As we approach the point at which close to 100 per cent of the households have refrigerators, the potential market for additional refrigerators becomes limited; the demand becomes mainly a replacement demand.

*Population Changes :* Some demands are closely related to demographic factors like changes in size and growth rate of population. The producer of baby toys profits from projections of birth rates. The publisher of textbooks studies the potential bulge in college enrolment in the near future.

*Discretionary Income :* Some forecasters make use of measurements of discretionary or supernumerary income rather than the usual measures of GNP or disposable personal income. There is evidence that the sale of consumer durables relates closely to discretionary income. Discretionary income is disposable personal income (personal income after income-tax) but including temporary earnings.

*Discretionary Buying Power :* Indexes of discretionary buying power start with discretionary income and add cash balances with liquid assets and new consumer credit. This buying power affects demand pattern.

*Consumer Credit Outstanding :* A forecaster may wish to consider the status of consumer debt outstanding before estimating the demand for a durable consumer good. A high ratio of outstanding consumer debt to current income may suggest a slowing down of purchases based on new debt for two reasons : lenders will become more cautious about risks; and the consumers themselves will slow down incurring added debt.

*Size and Age Distribution of Existing Stocks :* For many consumer durables, the size of existing stacks must have a considerable influence on additions to stocks. In a way this repeats the point already made about saturation levels.

*Replacement Demand versus New-Owner Demand :* The demand for durables falls into two parts : the demand for replacements on the part of those who already own the item and the demand of entirely new owners. Some forecasters separate these two demands, recognizing that the influences on each are different. New household formation, for example, will have little effect on replacement demand, but may be a major influence on new-owner demand.

*Consumer Attitudes and Plans :* Forecasters of the demand for individual products are beginning to make use of the surveys of consumer plans. The forecasters should not neglect the impact of socio-phychological determinants of demand.

The proceeding observations relate mainly to consumer durable goods. Similar observations may be helpful to the forecaster of the demand for producers' goods. Such a forecaster may want to examine the extent of excess capacity in the industry using the producers' good as well as the age distribution of existing assets, the rate of obsolescence, the effect of tax provisions on equipment, the availability and cost of funds and the market structure of the product in question.

Demand is just one among many other economic variables. We have selected demand forecasting as an example of economic forecasting. The knowledge of forecasting techniques-and-factors in general, and of demand forecasting in particular, may hopefully help us to form some idea about forecasting other variables like total sales, market share, factor costs and profit flows. Despite repeated attempts towards objectivity, precision and accuracy, there is no end to the complexity of techniques and factors involved in forecasting. Business forecasting remains an art of employing the available scientific methods.

**An Overview :**

Decision-making involves a coordination along the time scale—present problem, past data and future follow-up actions implied by currently arrived at decisions have to be coordinated. To minimise the uncertainty of future, we take to forecasting as a necessary step towards long-run corporate planning and short-run forward planning. Economic forecasting is the projection of behaviour of economic variables like demand, sales, costs and profit. Forecasting is distinct from prediction. We may have (general) business forecasting, (particular) economic forecasting and specific forecasting such as demand forecasting. We may also talk of conditional and non-conditional forecasts, active and passive forecasts etc. There are a number of forecasting techniques : historical, analogy method, trend method, end-use method, survey or opinion poll including delphi method, regression method, lead-lag indicators method, an econometric model-cum-simultaneous equation method. Each of these methods has its uses and abuses. No forecasting technique is perfect. The forecaster should employ a combination of techniques, depending upon his convenience. The foreaster should also consider the general limitations of his forecasts with reference to (a) reliability of the data, (b) errors in forecasts and (c) interpretation of forecast results. In view of these considerations, business strategies are to be worked out. A failure to balance these considerations may lead to inaccurate forecasts and hence larger degree of uncertainties about the future. Forecasting is, after all, both an art and a science. Forecasting is the art of employing scientific methods. The success of a forecaster depends not only on the scientific technique chosen but also on the art of appraising the environment of business. One of the critical elements in the economic environment of business, which a forecaster has to cope with is the nature of business cycles. This is what we are going to take up in the next chapter.

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# 29

# BUSINESS CYCLES

One of the fundamental factors which affect every business organisation is business cycles. Fluctuation and change rather than constancy is observed to be the most characteristic feature of every business activities. In dealing with such business cycles, the following points must be remembered at the outset :

(1) Business cycles are associated with the emergence of capitalism. In the pre-capitalist stage, in the early years of Commercial Revolution, there is evidence of some sorts of cycles—optimism in trade leading to boom and suddenly bursting, the case like that of the South Sea Bubble— but they cannot be regarded as true cycle. Business cycles as the predominant feature of capitalist system started only in the later part of the 19th century.

(2) Not only business cycles are the outcome of the capitalist development, but these are cycles around a trend and the long-run trend is upward. Thus economic growth and business cycles are found interrelated.

(3) Physical output and prices move generally in the same direction during cyclical fluctuations. If physical output increases, price increases, and *vice versa*. This fact has an important bearing on understanding the cause of business cycles. It is implicit that business cycles are caused by changes on the demand side. Had it been caused by changes

on the supply side, there would have been a fall in prices, with an increase in output.

(4) Finally, it is observed that fluctuations in total income are not very violent. Investment fluctuates more violently than consumption ( income ). In fact, Keynes established that the marginal propensity to consume remains more or less stable; it is only investment that fluctuates due to speculation and expectation.

Thus, general observation suggests that four things, namely capitalist context, growth trend, demand side and investment function, must be emphasized in any study of business cycles.

**General Features of Business Cycles :**

Business cycles are matters more of description than of definition. However we may start with a definition.

W. Mitchell offers a brief definition : A trade cycle consists of "aggregate fluctuations in economic activity", which has four interlinked components :

(1) fluctuations in employment,

(2) fluctuations in output,

(3) fluctuations in price,

(4) fluctuations in money value of produce (income).

The fourth category is merely an extension of the second and the third. These fluctuations are described variously: 'capital proceeds by whicks and jerks'; business is characterised by loom and slump;' 'there is able and flow in the system' so on and so forth.

The must common classification of business fluctuations is as follows :

(a) Secular trends;

(b) Seasonal fluctuations;

(c) Cyclical fluctuations;

(d) Miscellaneous random fluctuations.

Business cycles have *different phases* : Schumpeter says in this context that :

(i) Prosperity and Recession constitutes the upper half of the cycle,

(ii) Depression and Recovery constitutes the lower half. These phases are illustrated in the diagram.

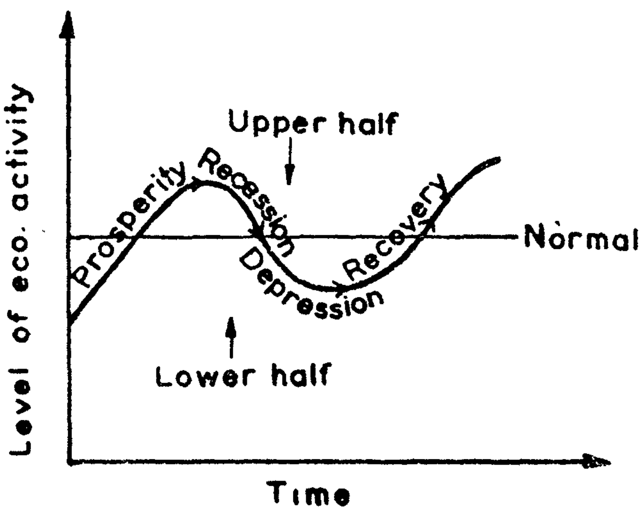



*Fig. 1*

In the prosperity or expansion phase, the output, employment and income grow at a rapid rate so that the peak of boom is reached. In the recession phase, employment, output and income decrease at a slow rate. In the depression or contraction phase, employment, output and income decrease at a rapid rate. In the recovery or revival phase, the rate of growth is at a slow pace. These phases move in cyclical, wave-like fashions so they are called trade cycles. Upswing and downswing are the normal feature of a trade cycle.

In regard to this cyclical movement, it should be noted that each phase leads to another; but there is a missing link. Depression cannot lead by its spontaneous way to recovery; and it is here that there is need for ant-cyclical policy.

Pigou has pointed out the following characteristics of trade cycles :

(1) A trade cycle is generalised in character; it is synchronies in operation so that fluctuations in one sector affect fluctuations in another sector of the national economy.

(2) A trade cycle is synchronic all over the world; it may assume an international character. The mechanism of international trade results in "the transmission of the trends of economic activity of one country into another."

(3) Trade cycles are similar in their cyclical nature of periodicity; but they differ in detail. One trade cycle is not an exact replica of the other. Trade cycles are all members of same family, but they are not twins.

**Standard Types of Business Cycles :**

Business cycles are not figments of imagination, they are based on empirical evidence. The evidence is found by statistical time-series data. A statistician may observe the following types of cycles:

(1) There is the standard type of cycles with a duration of 7 to 11 years. Income reaches its peak within an interval of 7 to 11 years. Yuglar first studied these cycles. Hence it is called *Yuglar type*. Business cycle theories generally explain it.

(2) A Soviet statistician discovered another type of cycle with a duration of 48 to 60 yrs. Unfortunately this *Kondratieffian cycles* did not come true. According to this, the peak of boom was to be 1920 and onward in the following period there was to be the downswing of the capitalist cycle. But this prediction has been proved wrong'

(3) Kitchens conceived of some shorter cycles with a duration of 2 to 4 years. After the second world War, these *kitchen's cycles* became importantly popular.

Though business cycles are associated with capitalism, their character is changing. It is observed that there are infinite variations in cycles-

**Theories of Business Cycles : Causes of Fluctuations :**

The phenomenon of business cycles has give rise to a bewildering multiplicity of theories. In reviewing the earlier theories, Haberler follows the following classification :

*Business Cycle Theories*

Theories which explain cycles through exogenous factors like climate. Jevon's 'sun-spot' theory is a representative example here.

Theories which explain cycles through endogenous factors

Monetary factors

Non-monetary factors

Here the difference is only a matter of emphasis. Monetary theories have some crude reference to nonmonetary elements, and non-monetary theories have some reference to monetary factors.

Following Haberler, we will concentrate here on endogenous factors. We will however group the theories as preekeynesion and post-keynesian.

**1. Pre-Keynesian Theories :**

***The Monetary Explanation :*** Estey has enumerated five propositions on which the monetary theory of the cycle rests :

(1) The cycles in the capitalist economy could not have occurred without elastic money supply.

(2) The money supply of all countries equipped with modern banking systems, is elastic, i.e. capable of expansion and contraction.

(3) The normal behaviour of the banking system is to have elastic money supply.

(4) The expansion and contraction of money supply do account for cumulative expansion and contraction of business activities. These cumulative elasticities are sufficient to account for trade cycles.

(5) Thus a trade cycle is a "purely monetary phenomenon" produced by variation in money supply.

*Hawtrey's monetary theory* : Hawtrey is the most celebrated exponent of this purely monetary theory of cycles.

Hawtrey regards trade cycle as "a purely monetary phenomenon", because general demand itself is a monetary phenomenon. This general demand depends on the changes in "consumers' outlay". Change in "consumers' outlay" is determined by the quantity of money. Hence if the flow of money is stabilised, there can be no cycles. But the 'normal behaviour' of the banking and financial institutions-does not permit it. Let us now examine the mechanism of changes in money supply, causing changes in consumers outlay and hence a change in money demand causing cycles.

Hawtrey thinks that the upswing is brought about by the expansion of credit. The liberalisation of credit system is put forward by undertaking cheap money policy like reduction of discount rate. Keynes might have thought that this policy would affect economic activity through its effect on long term rate of interest. But Hawtrey thinks that the policy operates through its effect on the behaviour of the dealers—'stockists'—. Hawtrey tackles the question from the point of view of 'working capital' and thus differs from Keynes fundamentally. The stockiest hold stocks of raw materials, and semi-finished goods but they do not produce. The stockiests finance the holding of their stocks by depending on 'borrowed finance' from the banks. If the rate interest is reduced, then it means that the cost of holding stocks is reduced. The stockiests, therefore, decide to hold more stocks. They place more orders with manufacturers to produce more. Thus initial demand is transmitted to the manufacturers. In producing more, the manufacturers get additional income which pays them to employ more factors. The higher income results in higher effective demand of the income-recipients. If the increase in demand is just matched by additional production i.e., if the Say's law is valid, then the traders do not get additional stocks to hold; and therefore, the stockiests place more and more orders with the manufacturers. This means that business is booming towards prosperity. This is the virtuous expansionary process of the upswing.

This cumulative process would have been indefinite, had the easy, liberal credit policy been continued. But it is exactly what is not done. Some external brakes operate. As cheap money policy is followed, there takes place a large outflow of cash from the bank to the public. Due to the availability of liquid cash, prices start rising; inflationary spiral begins; the economy experiences deficits in her balance of payments position. This adverse balance of payments will mean a drain of foreign exchange from the central bank. All these symptoms will mean, in operational term, a fall in bank's cash ratio below conventional level. So the banks will now reverse their process. They will undertake dear money policy. And as soon the rate of interest rises due to dear money policy, the cost of holding stocks will increase. The stockists will cancel orders with manufacturers. Less "consumers' outlay" will imply less demand. The downswing characterised by deflation has thus started. In the process recession will lead to depression. But after sometimes, this contraction process will come to an end. Recovery begins. The persuasion of dear money policy will ultimately result in the favourable balance of payments position. The cash reserves will increase and banks will again find it profitable to frame a liberal credit policy. So again there will be movement towards prosperity.

A comment is due about the assumption of 'normal behaviour' of the bank. It may be asked : why do not the bankers act rationally so that the stability is maintained? Hawtrey argues categorically :

(a) The usual attitude of the commercial banks is to supply credit, whenever wanted but to their capacity. The blame lies with the business world, not with the bankers. The aim of banking is to promote the growth of trade, industry and commerce.

(b) Commercial banks are competitive institutions; one bank acts as the other bank does. So the blame lies with the central bank which cannot control the 'average behaviour' of the commercial banks.

(c) The central bank cannot undertake sufficient control measures; they adopt "wrong methods". The "normal behaviour" of banking, therefore, brings about cyclical fluctuations.

If the marginal propensity to spend is not equal to one, i.e., if there is some saving, then explanation other than 'normal behaviour' of banking may be put forward.

It is precisely here that Hawtrey has introduced the concept of "unspent margin". Unspent margin is the difference between the income generated and the amount spent on consumption. In Keynesian terminology, this represents a 'leakage'. If the "unspent margin" exists, the stockists can increase their demand for holding stocks, with Out being influenced by the monetary policy. The demand generated is less than the increase in income, so that the traders find in each Stage that stocks are rising. If demand increases more than the addition to stocks, the traders may decide not to hold more stocks. So the expansionary process comes to an end. Thus expansion ends, not due to the external brakes applied by the banking system but due to the internal brakes being operated—traders impelled not to hold stocks.

Hawtrey does not elaborate this line of thought. The concept of "unspent margin" is a non-monetary element in his monetary theory. According to Hawtrey, such non-monetary factors as unused resources, crop failure etc. are only of secondary importance. They aggravate fluctuations by reinforcing the primary factor— the monetary factor.

Some other critical comments are necessary on Hawtrey line of thought. The peculiarity of the Hawtrey line of thought is its stress on the change in the cost of holding stocks as the mainspring of change The forcefulness of this argument depends largely *on:* two factors :

(i) the proportion which interest charges bear to the total cost of holding costs.

(ii) the 'elasticity of demand for the convenience of holding stocks' (Sayers).

So far as the first factor is concerned, it should be noted that the most important items in the cost of holding stocks are costs of storing, costs of warehousing, costs of handling; costs of borrowing is not an important constituent So Keynes doubts very much how far the fall in cost of borrowing, rate of interest can stimulate the stockists, behaviour.

So far as the second factor is concerned, this elasticity is relatively negligible. This means that Hawtrey effect is limited in its operation.

One may ask: How far is Hawtrey's theory acceptable? The answer depends on what one takes the theory to stand for. If it is said that trade cycles are caused by monetary factors, say interest rate fluctuations alone, then the theory cannot be accepted, because the role of non-monetary factors is assumed away here. However, if it is said that trade cycles cannot be explained without recourse to monetary factors then this theory may be accepted.

The validity of the theory can be tested by asking what is the effectiveness of the influence of the banks over the economic activity of a community.

(a) If there is a boom, the theory suggests that the rate of interest should be controlled. But non-monetary factors like the marginal efficiency of capital cannot be overlooked.

(b) If there is a depression, the theory suggests that a cheap money policy should be attempted as a cure. But the Great Depression invalidated this suggestion.

It is with these limitations that Hawtrey's monetary theory can be accepted.

*Wicksell's monetary theory* : Wicksell has also a kind of theory which closely resembles that of Hawtrey. But there is one difference. Hawtrey emphasizes the dealers who demand to hold stocks. But Wicksell emphasizes the enterpreueurs who demand capital goods. Wicksell's cumulative process is initiated by the entrepreneurial demand for capital goods; and Hawtrey's banking system can check it. Thus Hawtrey and Wicksell have logic the same and explanation though they have got some conceptual differences. Wicksell is subject to same criticisms as Hawtrey is.

In both analysis, the fluctuations are caused by the demand side. The problem does not lie on the supply side in the sense of physical bottlenecks.

**Over-investment Theories :**

The most important thing to be noted about the overinvestment theories is that they have a monetary start, they come out with a non-monetary ending. In Hawtrey, inadequacy of credit on the demand side is the crux of the problem. Here expansionary process comes to an end due to problem of the supply sides-the appearance of physical bottlenecks : shortage of physical resources. Let us examine one of its standard version.

According to this overinvestment theory, expansionary process starts by credit becoming available more cheaply, i.e., the banking system lowers the rate of interest. This reduction in interest rate may be interpreted in the wicksellian sense 01 market rate becoming less than the natural rate of interest. Not knowing what the natural rate is, the banking system may lower the market rate. This cheap credit policy will lead to capital investments. The effect on capital investments comes in two ways :

(i) A reduction in the rate of interest increases the demand for capital for investment purposes.

(ii) A reduction in the market rate will change the character of investment in the direction of more capital intensive projects. Lower the interest rate, larger will be the amount of capital-intensive investment. More capital-intensive it is, the more it will be productive in the sense of lengthening of production process, i.e., A long gestation period is justifiable, only because the stream of future output will be large.

Hicks has considered the effect of the rate of interest on the time path of investment and production. If the future stream of output is represented by $X_1$, $X_2$, ... $X_n$, then the percent value,

$= \frac{X_1}{(1+r)} + \frac{X_2}{(1+r)^2} + \frac{X_n}{(1+r)^n}$ .... A lower rate of interest means a greater value of the distant output. If the rote of interest is zero, then we £et equal value in future as well as in present. If the rate of interest is changed the input and output of distant dates are more affected than that of the near future. A lowered interest rate affects X1, the output of near future, to a less extent but it affects Xn, the output of remote future, to a greater extent so that the value of distant future output becomes larger and larger, as more and more capital intensive investment is undertaken in projects with long maturity period.

Due to reduction in interest rate, the rate of investment goes up; the capital-intensive investment increases. Entrepreneurs undertakes investment which brings output at a distant date. In the intermediate period, entrepreneurial investment means a flow of resources from consumers' goods sector to capital goods' sector. This will cause a fall in the supply of consumers' goods; this means that the demand for consumers' goods will rise. This will be reflected in the increased price of consumer's goods. Profits will be multiplied in the consumers' goods sector. Entrepreneurs in the consumers goads industries will be able to offer higher prices to factors. Thus the operation of miraculous price-mechanism will compete away resources from capital goods sector to the consumers' goods sector. The capital goods projects will face shortage of factors and resources; the projects will remain incomplete. Thus the upswing comes to an end. Expansionary process is reversed due to problem on the supply side-physical bottlenecks.

A purely non-monetary phenomenon—lack of resources—checks the expansionary process. This is the result of over-investment in the world of competition.

Some comments are now necessary on this version of overinvestment theory :

(1) Over-investment theory cannot be regarded as a purely non-monetary theory of cycle, though the explanation runs in terms of physical bottlenecks of resource availability. The mainspring of the upswing change of the cycle is the cheap credit policy, a monetary element in non-monetary theory.

(2) One can see here why capital goods industries are adversely affected during depression. But one cannot explain the adverse position, experienced by the consumers' goods industries during the depression. The theory says that there is a diversion of resources in favour of consumers goods sector, when the capital intensive projects suffer and face bottlenecks. The fact remains, it is only when Keynesian multiplier principle is introduced that an explanation is worked out for the depression, any set back in consumers goods sector. When effective demand falls due to a fall in investment, income falls and so consumption also falls. In fact, the multiplier theory can explain why consumers' goods industries suffer during depression, while over-investment theory, as it stands here, can explain why capital goods industries suffer more than the consumers' goods industries.

There are following two supporting thesis to the over-investment theory (A) Ricardo effect, (B) Acceleration principle.

(A) *Ricardo effect* is a name given to a relationship which was first noticed by Ricardo. The relationship is between real wages and capital intensity of the economy. Hayek has revived this concept of Ricardo-effect as a counterattacking tool against Keynes, in the context of business cycles. According to Keynes, the rate of interest is rigid, it cannot be used to maintain equilibrium, Hayek, with the help of Ricardo-effect proves that equilibrium can be maintained even when the rate of interest is rigid. Keynes thinks that to increase income, there should be an increase in consumption expenditure, which will increase investment, which in its turn through multiplier effect will increase income. Thus according to Keynes, if the rate of interest is rigid, to increase income, consumption expenditure should be increased. But Hayek says that a high propensity to consume lowers investment, not because it raises the rate of interest, but because it lowers the demand for investable funds.

In this context, a distinction may be drawn between "widening" and "deepening" of investment. 'Widening' of investment means having more of the same type of capital. The use of 3 power-looms instead of 1 powerloom is the example of 'widening' of investment. 'Deepening of investment means changing the technique—the use of more capital intensive techniques. The use of 1 automatic boom instead of 3 powerlooms is the example of 'deepening' of investment.

If consumption is increased, the initial effect will be 'widening' of investment; but as the process goes on, there will be a tendency on the part of the entrepreneurs to use less capital intensive technique. This is 'non-deepening' or 'shallowing' of investment. This is the transition from powerloom to hand loom, not to automatic loom. Due to this 'non-deepening', the demand for capital goods is reduced, which is the result of a change in the nature of investment technique. Thus 'widening' is offset by 'non-deepening'. In this case increase in consumption does not lead to increase in investment.

A fundamental question may be raised : can the techniques of production be changed in the short-period? Flexibility of techniques in the short-period is unrealistic, it can happen only in the long-period. Hence one can conclude that 'Ricardo-effect cannot be applied in explaining short-period cyclical fluctuations; 'Ricardo-effect' can be used only in the context of long period trend of growth.

(B) *The Acceleration Principle* is based on the notion that there is a certain stock of capital which is appropriate and normal to a certain particular level of output, if such relationship remains valid and constant, then it means that any given increase in the level of output would requite an increase in the stock of capital. In other words, the principle represents a relationship between the net addition to the stock of capital and the net addition to the stock of output.

(1) Investment is a function of the rate of growth of output. This means that even if the total output is increasing but if at the same time the rate of growth of output is falling then investment will also fall. It is because of this, that the capital goods industries are subject to wider cyclical fluctuations. Even if consumption is rising, the capital goods industries may have fluctuations more than the consumers' goods industries. In other words, even when the demand for consumers' goods is rising, there may be a slump in the capital goods' sector, because the later depends on the rate of

the growth of output. On the other hand, if consumption does not increase at a constant rate, investment will be affected. Thus the Acceleration principle can be used in support of the overinvestment theories.

Further, an indivisibility of capital stock may cause a bunching of investment. To produce steel, a whole steel plant may have to be constructed. This will result in the emergence of excess capacity. The outcome may be overproduction and economic crisis of depression.

**Under-Consumption Theories :**

The under consumption theories are based on the idea that as output increases, the demand does not increase; and if saving increases it does not go into the channel of investment.

The classical writers overlooked the possibility of such under consumption or over-prod action. In fact, Say's law of market asserted emphatically that overproduction is impossible. The classical theory of interest was put forward only to protect the belief of the underconsumptionists. It was stated that, when saving increases, the rate of interest will fall; and this will increase investment to the extent that demand remains constant.

In the beginning of the present century, the theory was again put forward by Hobson. He thinks that with the development of capitalism, redistribution of income takes place in favour of the rich community. As a result, the propensity to save increases, the propensity to consume falls. This means that the consumption demand falls and, therefore, the effective demand falls to create fluctuations bringing business depression and instability in the economy. Thus Hobson blames the redistribution of income in the capitalist society; he follows Marxian thought. Marx was also a strong believer in over-production and under-consumption thesis.

None of the underconsumptionist could prove the way in which the neo-classical theory of interest was wrong; so the basis of the Say's law remained unshaken. It is only with keynes that the say's law was challenged and thereby the underconsumptionist thesis has been re-established.

The basic features of the Pre-Keynesian theories of cyclical fluctuations may now be summed up as follows :

(1) We have a set of theories which explain cycles through purely 'monetary' factors. Hawtrey and Wicksell stands in this category. Wicksell's arguments run in terms of investment in fixed capital, Hawtrey tackles the question from the standpoint of working capital.

(2) Most of the theories of the pie-Keynesian world, except the underconsumptionsist, accepts the Say's law of market and exchange.

(3) The pre-Keynesian theories take into account the effect of consumption expenditure on investment; but they do not take into account the effect of a change in investment on consumption, and income i.e., the so-called 'multiplier effect'. It is because of this lack of imagination that the overinvestment theories have failed to explain the slump in consumers' goods industries at a time when capital goods industries are facing depression.

(4) Pigou's prychologfcal theory is left out of account here. Nor is the Schumpeter's theory dealt with. They are understood better by following the post— Keynesian developments.

# 30

# THEORY OF TRADE CYCLES

Keynes did not formulate any elaborate theory of trade cycles. The General Theory, which contains a crude reference to this subject, is entitled as "Some Notes on Trade cycle".

His "notes" are significant, indirectly as well as directly Keynesian analysis has contributed much to the trade cycle literature. The following points suffice to summarise his contribution.

(1) By challenging the Say's law of market and providing the anti-classical Liquidity preference theory of interest, Keynes has lent a support to the under consumption theory. Keynes is regarded as an under-consumptionist.

(2) By considering various "leakages" (saving is a leakage from the income stream), Keynes provides an explanation of the 'internal brakes' of the boom; thus he has lent another indirect support to Hawtrey's concept of "unspent margin", a non-monetary element.

(3) By the tool of multiplier, Keynes has showed how the depression in capital goods sector can affect depression in consumers goods industries. Thus in one sense, Keynes has removed one of the shortcomings of the over-investment theory. But this does not mean that that he is supporting the over-investment theory; rather he is a critic.

Keynes does see the point that 'physical bottlenecks' will bring boom to an end. But this is a matter of probability. The matter of certainty is that even before the emergence of 'physical bottlenecks', the boom will come to a sad end due to sudden collapse of the 'marginal efficiency of capital', a purely psychological phenomenon.

(4) It is precisely here that Keynes has made some direct contribution, if at all, to the trade cycle analysis. According to Keynes, the marginal efficiency of capital is the villain of peace. The main cause of the crisis lies in the sudden collapse of the marginal efficiency of capital, helped by other factors like the rate of interest and the propensity to consume. The marginal efficiency of capital is unstable in the short period. A low marginal efficiency of capital associated with a high rate of interest aggravates the decline in investment demand. Thus Keynes explains fluctuations in income and employment through fluctuations in the effective demand. As investment demand falls, the aggregate effective demand falls so that the downswing begins. Similar explanation is possible for the upswing through an increased business optimism i.e., a high marginal efficiency of capital.

**Cobweb Theorem :**

It is a well-known fact that the world economic system in the last hundred years of its development have experienced recurring cycles in the production and prices of commodities. The persistence of this cycle has come in conflict with the equilibrium theory worked out by the economists.

The cobweb theorem was first suggested by Nicholas Kaldor in his article "A Classificatory Note on the Determinateness of Equilibrium", Review of Economic Studies, Vol. I, Feb. 1934. Some economists like Schlutz in Holland, Tinbergen in U.S.A, and Ricci in Itally considered lagged adgustments with reference to supply and demand curves. They discovered oscillations of three types : continuous., convergent and divergent. Schlutz analysis was of the convergent type. Tinbergen's analysis was of both convergent and divergent types. Ricci's analysis was of three types continuous, convergent, and divergent. The ideas of these economists, when given diagrammatic representations take the shape of cobwebs.

Thus around 1930s, the agricultural economists offered an explanation why there is always a tendency towards cycle, and not equilibrium. All the cobweb cases are represented through demand and supply curves, assuming that there is a lag of one period between demand and supply.

Like every other theory of business cycle, the Cobweb theorem suffers from many limitations. The Cobweb theorem is applicable only when the following conditions are satisfied : (1) the price is governed by the supply available; (2) the production is governed only by price consideration under pure competition; (3) the production cannot vary before the expiry of one full period. These conditions may appear very unrealistic.

However there is one virtue. Equilibrium economics says that if an equilibrium is disturbed, it tends to come back towards the normal equilibrium. That is the stability condition. The cobweb theorem explains the fluctuations, disturbing equilibrium and stability. Even under static conditions, price and production of any commodity may diverge away from the equilibrium level or may converge towards it without never reaching it.

**Post-Keynesian Theories :**

The post Keynesian developments in the business cycle theories arc very significant. Some of basic shortcomings of earlier analysis are now being overcome.

In the earlier theories, the breakdown of boom is explained by endogenous factors. (1) In the monetary theory, it is the dear money policy necessitated by the shortage of gold. "Unspent margin" is an internally imposed factors. (2) In the over-investment theory, it is the "physical bottlenecks". This theory has failed to justify itself any better by introducing and incorporating the multiplier mechanism. The over-investment theory explains the whole process of breakdown in terms of external impediments. But if the acceleration principle is introduced, some form of internal break is conceivable—

the boom breaks down, because the rate of the growth of income falls such that investment cannot be maintained.

*Samuelson's Model :* Modern theory takes into account all these possible reformulations and tries to offer a satisfactory analysis of the investment function. Samuelson undertakes an explanation of cycles by introducing "interactions between the multiplier analysis and the principle of acceleration." Multiplier and Acceleration— together constitute the most significant mechanism under lying cyclical fluctuations. The multiplier states that the increase in demand (income) depends upon the increase in investment. The acceleration states that the increase in supply (output) depends on the increase in capital stock. Samuelson's model of analysis incorporates these two innovations into one.

There are following assumptions behind Samuelson's model :

(1) lag of one period in consumption;

(2) no unutilised capacity;

(3) instantaneous adjustments i.e., investment and output increase instantaneously.

Neither the multiplier theory in itself nor the acceleration by itself is helpful in explaining the fluctuations in income. This is because the multiplier explains only the demand side of the picture, while the acceleration explains the supply side. If we combine the multiplier concept with the acceleration principle, we can get a proper theory, complete in its structure, explaining the trade cycle. And it goes to the credit of Hansen to combine these two. Accordingly as a step towards this end, he defines addition to national income as consisting of (i) government deficit spending (ii) consumption expenditure induced by previous public expenditure and (iii) induced private investment. From the acceleration principle, we know that the volume of investment depends on the rate of growth of output or the rate of growth of income. Bearing this in mind, we see the process of fluctuations of income. For that we have following two assumptions :

(a) Marginal Propensity to consume, $\alpha = 2/3$ and

(b) Marginal capital output ratio, $\beta = 2$.

| Periods | Autonomous Investment govt. spending | Induced consumption | Induced Investment | Total change in income |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| I | 10 | 0 | 0 | 10 |
| II | 10 | 6.7 | 13.4 | 30.1 |
| III | 10 | 20.0 | 26.6 | 56.6 |
| IV | 10 | 37.7 | 35.4 | 83.1 |
| V | 10 | 55.4 | 35.4 | 100.8 |
| VI | 10 | 67.2 | 23.5 | 1001,3 |

Induced investment is the difference between consumption in two periods of time. Let us recall that Investment depends on the rate of growth of output and not the absolute level of output. In period II, we have induced consumption = $\frac{2}{3}$ of income in period I $= \frac{2}{3} \times 10 = \frac{20}{3} = 6.7$ approximately. As consumption has increased by 6.7, output must also increase by 6.7, if there is to be no rise in price. Now if output is to increase by 6.7, investment must increase by 6.7×2, because we assume $\beta$, the capital-output ratio = 2. Hence investment is 13.4. Thus the total change in income in period II = 10 + 6.7 + 13.4 = 30.1.

In the period III, autonomous investment remains fixed at 10. consumption will be 2/3 of 30.1 (because $\alpha$=2/3)=20.0. Now the output will have to increase not by 20.0, but by the difference between 6 7 and 20.0. = 13.3. As the acceleration principle applies, investment in-period III will be 13.3×2=26.6. because ($\beta$=2).

The above table we will see that income goes on rising till period VI. By continuing the illustration we will find that it reaches minimum in period IX, and then rises again. Thus as a result of the introduction of the acceleration principle, we can show income fluctuations. Such oscillatory behaviour could not occur in the conventional model sequence. For other chosen values of a and J3, similar model sequences can be developed :

| | (i) | (ii) | (iii) | (iv) |
|---|---|---|---|---|
| Period | $\alpha$=.5 | $\alpha$=.5 | $\alpha$=.6 | $\alpha$=.8 |
| | $\beta$=.0 | $\beta$= .2 | $\beta$=.2 | $\beta$=.4 |
| I | 1.00 | 1.0000 | 1.0000 | 1.00 |

| | | | | |
|---|---|---|---|---|
| II | 1.50 | 2.5000 | 2.8000 | 5.00 |
| III | 1.75 | 3.7500 | 4.8400 | 17.80 |
| IV | 1.875 | 4.1250 | 6.3520 | 56.20 |
| V | 1.9375 | 3.4375 | 6.6256 | 169.84 |
| VI | 1.9688 | 2.0313 | 5.3037 | 500.52 |
| VII | 1.9844 | .9141 | 2.5959 | 1459.592 |
| VIII | 1.9922 | .1172 | .6918 | 4227.704 |
| IX | 1.9961 | .2148 | 3.3603 | 12,241.1216 |

If we take only the multiplier analysis, then there will be no oscillations. Oscillation only occurs when we introduce the acceleration principle. In the first case alone, we have assumed $\beta=0$, which necessarily leads us to conclude that no oscillations are possible. In the second case, the oscillations are damped and regular. In the third case, things are still worse—the oscillations are explosive, becoming larger and larger, but always fluctuating around an average value. In the fourth case, the behaviour is no longer oscillatory, but explosive upward.

If $Y_t$=national income in pertod t, $C_t$ consumption expenditure of period t, $I_t$=investment expenditure in period t and $G_t$=government expenditure in period t, then we have :

$$Y_t = C_t + I_t + G_t \tag{i}$$

$$C_t = \alpha Y_{t-1} \tag{ii}$$

$$I_t = \beta[C_t - C_{t-1}] \tag{iii}$$

$$G_t = 1 \tag{iv}$$

Then $$Y_t = 1 + \alpha[1 + \beta] Y_{i-1} - \alpha\beta Y_{t-2} \tag{v}$$

where $\alpha = \dfrac{\Delta C}{\Delta Y}$

where $\beta$ = capital—output ratio.

This reduced-from solution (v) reads : if we know the national income for two preceding periods, the national income for the following period can be simply derived by taking a weighted sum. The weight depends on $\alpha$ and $\beta$.

Thus from Sarauelson's model, we find that there is a tendency for income to rise upto a certain point (period VI), after that it falls steadily upto a certain point (period XIII), and then again it starts rising. There is a tendency for income to fluctuate around a certain level. The precise amplitude of fluctuations depends on the relative values given to $\alpha$ (marginal propensity to consume) and $\beta$ (capital output ratio). Using Difference Equation, Samuelson works out these relative values which are helpful in determining the fluctuations. All types of behaviour can be categorised as follows :

***1st Case :***

$\alpha$ has a positive value, while $\beta$ has a zero or almost a zero value. Here the behaviour will conform to the Keynesian multiplier with time-lag introduced as in the model,

***2nd Case :***

$\alpha < \frac{1}{\beta}$ Here income fluctuations will follow "damped cycles"—amplitude of fluctuations will get narrower. The movement will be cyclical, but "damped"; and it will fluctuate around a value of $\frac{1}{1-\alpha}$.

***3rd Case :***

$\alpha > \frac{1}{\beta}$ but values of $< \frac{4\beta}{(1+\beta)^2}$. Here there will be antidamped cycles—the amplitude of fluctuations will get wider and wider.

***4th Case :***

$\alpha < \frac{4\beta}{(1+\beta)^2}$ Here there will be an increasing continuous flow of national income, without any fluctuation.

In the 1st and the 4th case, we do not have fluctuations, but steady growth of income; only in the 2nd and 3rd cases we will have fluctuations either "damped" or "anti-damped". In the case of "damped" cycles, business cycles will wipe out slowly over a period of time. In the case of "anti-damped" cycles, business cycles will become more and more intensified over a period of time.

A question may be asked : How far is this model true? We can have a unique set of values for a and b in which case the fluctuations will be neither "damped" or "antidamped" — the amplitude of fluctuations may remain same over a period.

If we accept all the assumptions and give different values to $\alpha$ and $\beta$, then we will have "anti-damped ' fluctuations. But this case of "everwidening" cycles may not be found in practice.

It is said here that some bottlenecks of supply may develop as a result of which income and output will not go above a certain level. With given techniques and rate of growth of population, the "ceiling" imposed on income may rise; with same resources one can produce a higher level of output. But there will be a ceiling at every point of time. When the 'ceiling' is reached following two possibilities exist:

(1) Income gets blocked and suddenly comes down, or

(2) Income may graze along the 'ceiling'

According to the acceleration principle, investment depends on the rate of growth of income. So the moment ceiling comes into the picture, the rate of growth of income is adversely affected so that there will be a fall in investment. When investment falls, income will fall by a larger amount — this is what the multiplier mechanism brings to work. When income falls, the acceleration principle will suggest that the capital stock must also be decreased so that it gets itself adjusted to the lower level of income. This principle is sometimes called the 'capital-stock-adjustment theory of trade cycles". Capital stock adjustment downward is a difficult task. Increasing the capital stock is an easy task, it can be done by producing mere capital goods. But how to decrease the capital stock? The only way to decrease capital stock is to allow its depreciation without any corresponding replacement. This depends entirely on the life of capital stock. Longer the life, slower is the depreciation. Capital-stock-adjustment is, therefore, a slow process. The maximum we can do is to have gross investment equal to zero. This gives us the maximum rate at which capital stock can be allowed to fall. In other words, gross investment being equal to zero, gives us a lower limit beyond which investment cannot fall. Thus there is a level of

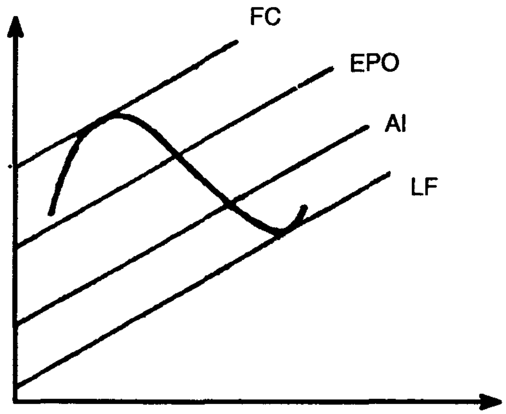



*Fig. 1*

income beyond which income cannot fall. This is what Hicks calls "transformation of the accelerator" at the floor". The values of $\alpha$ and $\beta$ get altered by 'ceiling'. This is referred to as "nonlinearity of $\alpha$ and $\beta$" by some external factors such as 'ceiling', 'buffer', 'floor' etc. The diagram 1×4a reproduces Hicks' concepts. In the diagram, we have

FC =" Full employment ceiling"

EPO= Equilibrium path of output deduced by super. multiplier $\alpha + \beta$.

AI = A given autonomous level of investment

LF = Lower point of negative acceleration—"floor"

This type of explanation corresponds to overinvestment theory where also 'physical bottlenecks' the cause boom to end. The credit policy may be treated as 'buffer' in the process of expansion. Here in the analysis of "anti-damped" cycles, bottlenecks may be of different kind such as foreign exchange crisis, shortage of raw materials etc.

So far our analysis was based on the assumption of a lag introduced on the side of consumption—consumption is lagged for

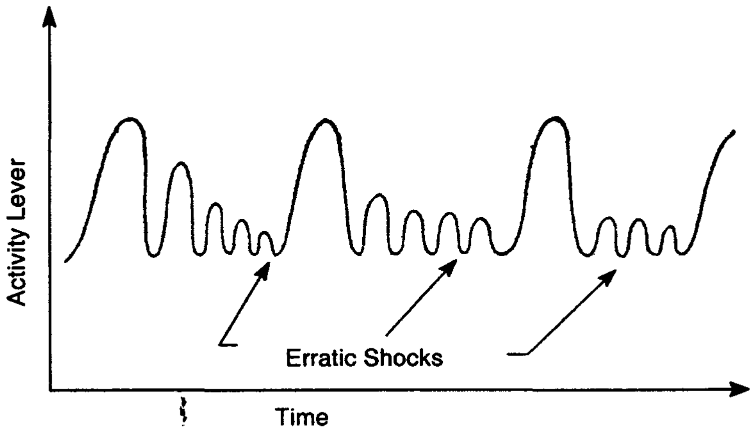



*Fig. 2*

one period and investment increases simultaneously. If lags are now introduced on the investment side, economists believe that there will be a tendency towards "damped" cycles. But empirically it is found that the cycles do not get themselves 'damped' totally. The explanation lies in the concept of "erratic shocks" (Frisch). Erratic shacks prevent the cycles from being damped, they cause a revival of cycle. If at the process of being damped, certain "erratic shocks" occur, a new cycle begins. The position is illustrated in Fig. IX.4b What are these "erratic shocks"?—They include natural calamiteds like earthquake, war, innovation, changing taste, babyboon etc.

From this general analysis, certain broad inferences can be drawn. It is found that the moment we introduce lag depending on the values of $\alpha$ and $\beta$, we can get an explanation of cyclical behaviour. And we find that 'ant-damped' and 'damped' cycles can get checked by factors like 'ceiling', 'buffer', 'floor', erratic shocks' etc. This is the view the modern theory of business cycles.

**Recent Developments- in Trade-cycle Theory :**

In the modern theory, a distinction is made between two types of investment :

Investment

- Induced investment
  - Working capital investment
  - Fixed capital investment
- Autonomous investment (include 'erratic stocks' etc.)

It is clear at a glance that the modern theory of trade cycle is an attempt at further analysing the "investment demand schedule" of Keynes. 'Investment function' gets into further refinement.

The basic skeleton of this modern theory can be found in 'the treatment of Mathews. To start with, Mathews analyses multiplier and accelerator principle with the assumption no of time-lag. Here certain consent proportion of the rate of growth is arrived at. According to Mathews, $Y_t = V \ Y_{i-1}$... The rate of grown of income is a constant multiple of the income of the proceeding period, (i.e., V= constant multiple). This is based on the interactions between the multiplier and accelerator principles; here we do not have any fluctuation. Fluctuations arise only when Mathews introduces the "buffer" analysis— 'nonlinearity'. Finally, the time lags are introduced.

$$It = f\{V[Y_{t-1}) - (Y_{t-2})]\}$$

Mathew discusses 'ceiling' as a special explanation of the upper turning point. Ceiling refers to scarcities or bottlenecks of some sort which obstruct the rate of growth of income. There are different types of ceiling such as :

(1) the general full-employment ceiling, referring to full employment of labour;

(2) supply inelasticities in the investment industries; and

(3) monetary ceiling, shortage of money and finance.

Mathew also discusses the lower turning point. The explanation of the lower turning point presents a problem. The basic reason is the contrast between positive and negative net investment principle from working in the same way in slump as it does in the boom.

In every types of cyclical model based on the capital stock adjustment principle, the notion of the declining stock of capital (negative net investment) in the slump plays a crucial part. , This dependence on negative net investment makes the model open to objections on both a-priori and empirical grounds. The priori objection is that since negative net investment in fixed capital can only take place by the neglect of replacement, it is found to be a very slow process. The difficulty of reducing the stock of capital within a short space of time is arrested by the excess capacity which is a well known feature of the slump. Admittedly disinvestment in inventories does not present the same difficulty. Secondly, the empirical objection is that most slumps, negative net investment does not occur.

Of course, it is possible to explain the lower turning point in terms of models that make no use or only subordinate use of the capital stock adjustment principle—models, for example, that lay chief emphasis on monetary or psychological factors. In that case the difficulty under discussion is less acute, since reduction in the capital stock is not the motive force relied upon to give recovery. But it can scarcely be denied that there is excess capacity in the slump and that its presence discourages investment. If the evidence shows that this excess capacity is not removed by net disinvestment, there is some problem in explaining the downswing.

If there are certain secular growth factors, excess capacity may be eliminated without any actual disinvestment. The following are the secular growth factors :

(1) Technical progress encourages investment.

(2) An increase in productivity of population encourages investment.

(3) The growth of population or productivity imparts an upward trend to the consumption function.

These trend forces act well, if floor level stability is established. The real causes of recovery are :

(1) the above threefold secular growth .factors,

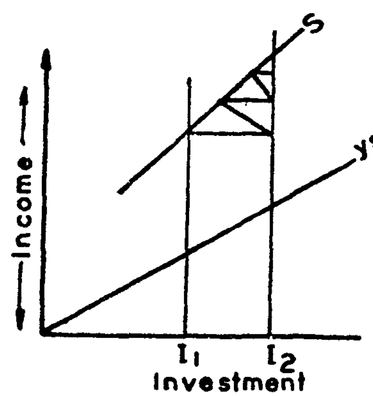
(2) sectoral disinvestment,

(3) favourable shocks' like major innovation, good harvest, growing foreign exchange reserves etc.

(4) financial factors, like interest behaviour, investment habit, supply of near money etc.

Let as now examine Hicks version of modem theory. Hicks first discusses the concept of Keynesian multiplier with introduction of time lag in chap II. Here investment is said to remain constant over period so that the position which is arrived at, is illustrated above. In chapter of III, he discusses the multiplier in a changing economy. Here investment does not remain constant at a given level. After reaching a peak it becomes constant, then starts falling. The path of

*Fig. 3*



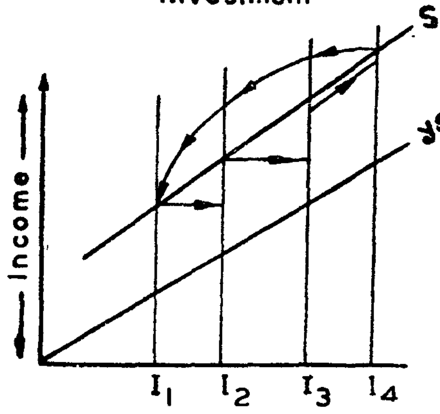




*Fig. 4*

income changes in this case is illustrated in Fig. 4. Hicks discusses the principle of acceleration,

It is there that he sums up the basic proposition of modern theory of trade cycle, 'The theory of multiplier and the theory of accelerator are the two sides of the theory of fluctuations, just as the theory of demand and the theory of supply are the two sides of the theory of value."

**Shortcomings of Acceleration :**

Some comments are necessary on modern theory. The principle of acceleration seems basic to modern theory. How far is the accelerator principle acceptable? The acceleration principle is based on certain kind of technological relationship between output and capital stock. Such relations are helpful in the study of growth-economics. But in actual practice, there exists no such unique relationship. The point is that the capital-output ratio changes from time to time so that it is not capable of serving as a sound basis for our model. In the short-period, one does not see any constant technological relation such as capital-output-ratio. If the demand for output increases in the short-period, capital stock need not increase, it only needs intensive utilisation.

The other aspect of the problem is that in microeconomics, the relationship is useless; in macroeconomics, of course, there is some sense in talking about capital-output-ratio. It is quite sensible to say that for the economy as a whole, an increase of 33½ output will need an increase of capital stock by 100. But it does not mean that every firm will work according to marginal capital output ratio. The investment decision of a single firm depends on profit motive. If profit incentive is high, it is quite possible for the capital stock to increase more than the increase in output. Here there will be over-production of capital goods, which causes a fall in profit and so low production in the next period. However in case of planning, the use of capital-output-ratio is justifiable, because there we want to know the magnitude of capital requirements of the economy in future in order to increase the output.

If we want to stick to accelerator principle, we will have to make certain concession. This is what Mathews does by introducing period analysis.

In Marshall's long-period equilibrium condition the rate of return on capital = the supply price. The rate of return is just sufficient to maintain the stock of capital. There is no tendency for the amount of capital to increase ot decrease. So higher demand for capital stock can be met by intensive utilisation of the existing stock of capital. If this is done, then the profit will increase; and when the profits increase, the entrepreneur may be able to increase their capital stock. Thus increase in profit will cause increase in investment; this increase in investment will go on till the rate of return=supply price of capital. In this context, the accelerator principle is reborn not as a constant technological relationship, but as a relationship in the long period which is imposed by the desire for long-term normal profits. Thus in microeconomics of individual firm, capital-output ratio cannot serve as a binding force. There are limitations of capital output ratio.

**Limitations of Capital Stock Adjustment Principle :**

Investment depends on the rate of technical change. It also depends en the long term growth experience of entrepreneurs; think that the underlying trend is that of a long term growth and not depression. Capital stock adjustment principle cannot explain investment in slump. So slump is an exception to this principle.

Another exception is that of the case of certain types of investment, such as overhead investments like investment in railways, hydroelectric power. These investments depend on a very long-term view of the future trend of demand.

Our conclusion will be that in case of many investments, it is correct to say that investment decisions are based on current income. But there are exceptions to this rule. One is the case of slump-where the entrepreneurs think that the fall in income is a temporary one so that there is no tendency to adjust capital stock downwards. Second exception is in the case of certain types of investments. What determines these investments in overheads depends on a number of considerations.

To the extent there are certain exceptions, it introduces some stability in the economic system. There are certain types of investment which do not follow the capital-stock adjustment principle. We know that It = ayt–lkt. The parameter 'a' may have a value lower than the capital-output ratio. This leads. Mathews to use some value of capital output ratio whic h has no base as a normal capital-output ratio.

There are some other considerations which have to be taken into account in determining investments. The role of speculation is one important factor. Speculation means some kind of projection in the future Speculation can be rational or irrational. It has a function in the economy. Speculation is generally irrational. The important fact is that speculation is a factor affecting investment.

Another consideration which has to be taken into account is the replacement investment. Replacement investment is undertaken to maintain the stock of capital constant. It is a kind of investment which have to be undertaken every year. In an economy which has a large stock of capital, replacement investment may take a large part of gross investment. Supposing that the capital stock is 3 times the national income (i.e. capital output ratio is 3 : 1), then 3% of capital stock=9% of national income. The replacement there fore stands half of gross investment. Developed economies have 18% of gross investment as replacement investment. Therefore, when there is a reproducible capital (which can be replaced), then changes in the replacement of capital can lead to fluctuations. The rate of replacement depends as a number of considerations like age composition, flexibility of the life of capital stock.

It can be said that the need for replacements arc great in a boom. Scrapped replacement is greater in a boom than in a slump. This increases the general level of investment. In slump, the replacement is not so great because of inadequacy of demand. But this does not prevent scrapping. Because in a slump, businessmen find that old machines are very expensive for maintenance, so that when profits are low in a slump, there might not be any tendency to maintain the older equipment. Thus scrapping is common to both boom and slump. What is not common is replacement, it takes place in boom, and not in slump.

Scrapping is an unimportant thing. It does not involve any expenditure. But scrapping affects the stock of capital. If we scrap a great deal in slump, then in the beginning of a boom, a large investment is necessary to adjust capital stock than would otherwise have been the case, if there were no scrapping.

Another consideration is the tendency for the replacement to take place in bunches. If investment is undertaken in one period, then replacement maybe done in bunches. If the life of several machines is 15 yrs, then their replacement will be done after 15 yrs. Replacement investments in bunches effect those countries which specialises in one industry like the case of Norway which specialise in shipping. If there is a diversification of the industries, then this case does not occur.

Replacement investment is also affected by technical progress. Technical progress affects the nature of replacement. There is a qualitative difference in replacement. This is another reason for a distinction between gross and net investment.

We arrive at the conclusion that the capital stock adjustment principle has many limitations in explaining the determinants of investment. What determines investment is a difficult question to answer. For the whole economy, the capital stock adjustment principle is difficult to generalise. This is precisely the difficulty of the modern theory of business cycle. There is a difference of emphasis on factors determining the level of investment. In particular, it is found that capital stock adjustment principle represents a loose formulation of ,the acceleration principle. But capital-stock adjustment principle does not take into consideration the role of speculation, replacement investment and innovation in determining investment in an economy.

□□□