

# **VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY**

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## **Managerial Economics and Financial Analysis**

### ***Unit I - Introduction to Managerial Economics***

#### **Economics: -**

The word economics derived from greek word ‘Oikonomia’ which in turn is composed of two words ‘Oikos’ Which means “House” and ‘Nomos’ which is “Managing”. Combined its meaning ‘Household Management’.

Economics was first read in ancient Greece. Aristotle, the Greek Philosopher termed Economics as a science of ‘Household Management’.

Economics is a study of human activity both at individual and national level. It is a social science; its basic function is to study how people – individuals, households, firms, and nations –maximize their gains from their limited resources and opportunities.

So Economics is characterized as a social science dealing with goods and services, production, distribution, and consumption. Economic studies evolved in the 19th century and became one of today’s most critical studies. Economics plays a key role in the successful running of all companies be it small, big, or even a government. No organization will succeed without applying economic principles.

**Definitions:-**[wealth, welfare, scarcity]

**Adam Smith** The father of economics, defined economics as “the study of nature and uses of national wealth”.

**Dr. Alfred Marshall**, one of the greatest economists of the 19<sup>th</sup> century, writes “Economics is a study of mans actions in the ordinary business of life; It enquires how a man gets his income and how he uses it.”Thus, it is on one side, a study of wealth; and on the other hand, it is the study of man. As Marshall observed, the chief aim of economics is to promote human welfare but not wealth.

**Lionel Robbins** defines economics as “The study of human behaviour as a relationship between endless wants and scarce means having alternative uses”.

### **Nature of Economics**

The essence of economics addresses the issue of whether economics belongs in the science or art group. Different economists have argued in favor of science, although some have inclined toward the arts. We have given both the theories below.

#### **1. Economics is a science**

Before we can consider anything is science, we first need to understand what science is about. Science is a systematic branch of knowledge that analyses the cause and effect relationship between economic agents. In any science, facts and figures are collected and analyzed and a conclusion is derived. Economics helps in using various sciences such as mathematics, statistics, etc. to identify the relationship between price, demand, supply, and other economic factors.

Positive Economics:

Positive science studies but does not provide a valuable evaluation of the relationship between two variables. It states what is. The facts of the whole economy are discussed.

Normative Science:

Economics passes value evaluation as a normative science – ‘what’ should be. It focuses on economic objectives and strategies to achieve these objectives.

Economics is considered a social science because:

It involves a systematic collection of facts and figures

Like science, it is based on the formulation of theories and laws

It deals with the cause and effect relationship

#### **2. Economics is an art**

Knowledge is science and action is art. Economics is a study that expresses how things are to be done to achieve the desired results. Various branches that provide general rules and laws that are capable of solving different problems of society fall under the branch of economics. A few of these are production, distribution, consumption, and economics. These theories are used to solve

various economic problems in society. Therefore it is said, along with being a social science, economics is also an art.

### **SCOPE OF ECONOMICS:**

1. Micro Economics
2. Macro economics

Professor Ragnar Frisch of Oslo University (Norway) was the first person to these two concepts in the year 1933.

### **Micro Economics:**

The term 'micro economics' is derived from the Greek word 'micros' means small. Micro Economics deals with the analysis of a particular economic unit and considers in detail the behaviour of that particular unit. In other words micro economics is the microscopic study of the economy. Here we study the behaviour of individual units such as households, firms and industries.

Micro economics is the study of economics action of individuals or groups of individuals.

“Micro economics is the study of economic actions of a particular firms, particular households, particular commodities, individual prices, individual wages, individual incomes and individual industries.

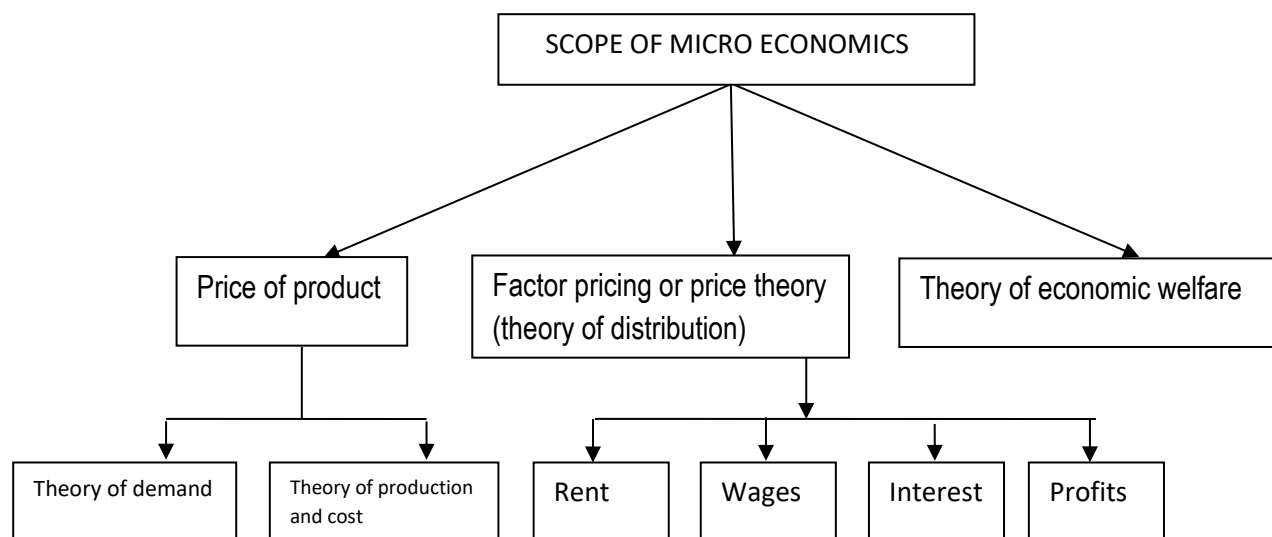
-----**K.E Boulding.**

It has the following features:

- Elasticity – It calculates the ratio of change in the proportion of one variable to the other. For instance, the income elasticity of demand, the price elasticity of demand, the price elasticity of supply, etc.
- Theory of Production – It comprises an efficient conversion of input into an output. For instance, packaging, shipping, storing, and manufacturing.
- Cost of Production – Using this theory, the price of an object is determined by the price of the resources.

- Monopoly – As per this theory, the dominance of a single entity is studied in a particular field.
- Oligopoly – It corresponds to the dominance of small entities in a market.

## SCOPE OF MICRO ECONOMICS



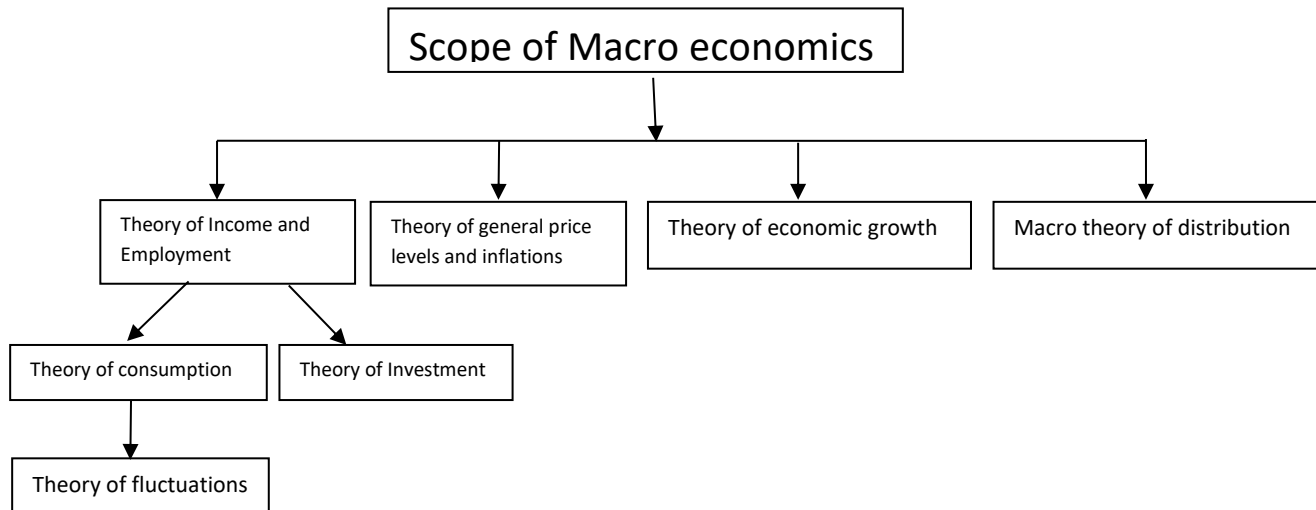
**Macro economics:** Macro economics is derived from the Greek word ‘macros’ which means large .macro economics is the study of economic systems as a whole .it is not concerned with the individual units but all such units combined together .thus macro economics is a study of aggregates like national income, total employment, total savings, total consumptions, total investment .most of the modern economics is macro economics.

‘Macro economics studies national income, not individual income, general price level instead of individual prices and national output instead of individual output.’ ----- **K.E. Boulding.**

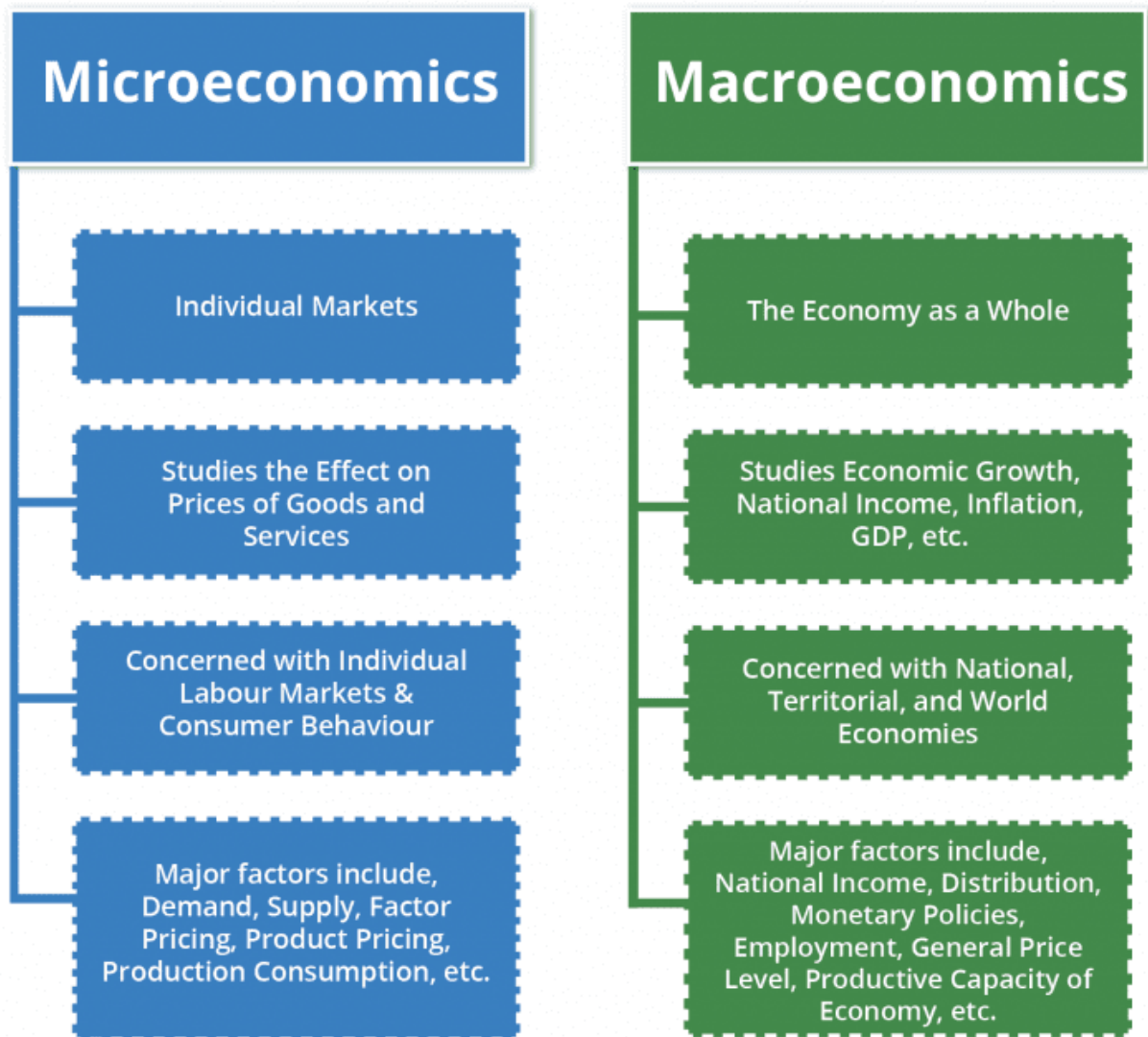
Its characteristics are:

- Growth – Factors that explain economic growth such as the increase in output per capita of a country over a long period of time are studied under this characteristic.
- Business Cycle – After the Great Depression of the 1930s, this theory emerged. It promotes the central bank and government's role in formulating monetary and fiscal policies for monitoring business cycle results.
- Unemployment – The unemployment rate caused by various factors like rising wages, a shortfall in vacancies, etc are measured under this.
- Inflation and Deflation – Inflation corresponds to an increment in the price of a commodity, while deflation corresponds to a decrement in the price of a commodity. These indicators are helpful to assess the status of the economy of a country.

**Scope of macro economics:**



## Difference between micro economics and macro economics



Micro economics	Macro Economics
1. Micro economics is the study of Individual units of the economy	1. Macro economics is the study of economy as a whole
2. It is called as 'price theory' as it explains the allocation of resources on the basis of relative prices of various goods and services.	2. It is called as income and employment theory as it explains the changing levels of national income during any particular time period.
3. Micro economics explains price determination in both commodity and factor markets.	3. Macro Economics deals with national income, total investment, total employment, total consumption, aggregate savings,

	general price level and economic growth.
4. The basic of micro economics is price mechanism which depends on demand and supply.	4. The basis for macro economics is aggregate demand and aggregate supply.

(OR)

<b>Micro economics</b>	<b>Macro Economics</b>
1. It is the study of the behaviour of the individual units, in particular, consumers, firms.	It is the study of the behaviours of the economy as a whole.
2. It is individualistic	2. It is aggregative.
3. It is concerned with the behaviour of micro variables or micro quantities such as individual demand, supply, particular commodity prices, wages, and individual industries; In short, it deals with the individual income and output.	3. It is concerned with the behaviour of macro variables or macro quantities such as national income, price levels, national output, total investments, total consumptions, and total savings in the economy; In short it deals with the national income and national outputs.
4. It primarily deals with the problems of pricing and income distribution.	It deals with the problems of the size of national income, economic growth and the general price level.
5. Theory of value and welfare are the major areas in micro economics.	5. Theory of income and employment, theory of momentary are the core topics in macro economics.
6. It is a 'price theory'.	6. It is called 'income and expenditure theory'.

## **Basic Economic Tools in Managerial Economics**

Economic theory offers a variety of concepts which can be of considerable assistance to the managers in decision making process. These tools are helpful for managers in solving business related problems. These are thus taken as guides in making decisions.

The principles are

1. The opportunity cost principle
2. Incremental Principle
3. Principle of Time Perspective
4. Discounting Principle
5. Equi-Marginal Principle

### **1. Opportunity Cost Principle**

Opportunity cost is the loss of earnings due to loss of opportunities. Opportunities are forgone due to scarcity of resources. If resources are unlimited, there would be no opportunity missed. It may be defined as the loss of expected returns from the second use of the resources forgone for availing the gains from the best possible use. Since opportunity cost is the income expected from the second best alternative uses of resources. It measures the sacrifice made for taking decision.

Examples

1. Opportunity cost of funds employed in one's own business is the interest that can be earned on those funds if they are employed in other ventures.
2. The opportunity cost of using a machine to produce one product is the foregone income which would have been possible from other products.
3. The opportunity cost of holding Rs. 1000/- as cash in hand for one year is the 10% rate of interest which has been earned had the money been kept as fixed deposit in a bank.
4. The opportunity cost of a high school graduate joining college is the income he would earn by entering the work force.
5. Capital is invested in plant and machinery. It cannot be now invested in shares or debentures. The loss of interest and dividend that would be earned is the opportunity cost.



## **2. Incremental Principle**

It is related to the marginal cost and marginal revenue concepts in economic theory. Incremental concept involves estimating the impact of decision alternatives on costs and revenues, emphasizing the changes in total cost and total revenue resulting from changes in prices, products, procedures, investments or whatever else may be at stake in the decisions.

The two basis components of incremental reasoning are :

1. Incremental cost
2. Incremental revenue

Incremental cost may be defined as the change in total cost resulting from a particular decision.

Incremental revenue is the change in the total revenue resulting from a particular decision.

## **3. Principle of Time Perspective**

The time perspective principle argues that the decision maker must give due consideration both to the short and long-run effects of decisions on revenues as well as costs, giving appropriate weights to the various time periods, before arriving at a decision. A very important requirement in decision making is to maintain the right balance between long run and short run considerations.

In the market we come across many new products, which are sold below cost or on relatively small margins in the beginning with the hope of commanding a good market and thereby making profits in the long run. If the managers did not have time perspective in their minds, they would never resort to such practices. This is called the price penetration (i.e. fixing low price initially and increasing it gradually as demand rises) concept.

For ex: Suppose there is a firm with temporary idle capacity. An order for 5000 units comes to the management's attention. The customer is willing to Rs. 4 per unit of Rs. 2000 for the whole lot but not more. The short run incremental cost (ignoring the fixed cost) is only Rs. 3, therefore the contribution to overhead and profit is Rs. 1 per unit (Rs. 5000 for the lot).

#### **4. Discounting Principle**

One of the fundamental ideas in economics is that a rupee is worth less tomorrow than today. Since future prospects are unknown and incalculable, there is a lot of risk involved in all this. Today's loan is certain but a promise to repay it tomorrow is uncertain. Since the promise may not be honoured, this point could be made clear through the proverb "A bird in hand is worth two in the bush". Moreover, the return in future is less attractive than the same return today.

Suppose a person is offered a choice between a gift of Rs. 100 today or Rs. 100 next year. Naturally he will choose Rs. 100 today this is true for two reasons.

- (i) The future is uncertain and there may be uncertainty in getting Rs. 100 if the present opportunity is not availed of.
- (ii) Even if he is sure to receive the gift in future, today's Rs. 100 can be invested so as to earn interest, say 8%, so that one year later Rs. 100 will become Rs. 108.

#### **5. Equi-marginal Principle**

This principle deals with the allocation of available resources among alternative activities. According to this principle, an input should be so allocated that the value added by the last unit is the same as in all other cases.

Suppose that a firm has 100 units of labour at its disposal, the firm is engaged in four activities which need labour services, viz., A, B, C and D. It can enhance any one of these activities by adding labour but only at the cost of other activities. It should be clear that if the value of the marginal product is higher in one activity than in another, an optimum allocation has not been attained. Therefore, it would be profitable to shift labour from a low marginal value activity to a high marginal value activity, thus increasing the total value of all products taken together.

For example : If in activity A the value of marginal product of labour is Rs. 20 while that in activity B is Rs. 30, it is profitable to shift labour from activity A to activity B, thereby enhancing activity B and reducing activity A. The optimum level will be reached when the value of the marginal product is equal in all the four activities.

## **Demand Analysis**

### **What is demand?**

Every want supported by the willingness and ability to buy constitutes for a particular product or service.

In other words demand refers to the quantity of a good or service that consumers are willing and able to purchase at various prices dealing a period of time.

For example: If I want a car and I cannot pay for it, there is no demand for the car from my side.

A product or service is said to have demand when three conditions are satisfied:

- Desire to acquire it
- Willingness to pay for it
- Ability to pay the specified price for it

Unless all these conditions are fulfilled, the product is not said to have any demand.

$$\text{Demand} = \text{Desire to acquire} + \text{willingness to pay} + \text{ability to pay}$$

### **Demand analysis:**

- Demand analysis means the study of factors, which influence the demand of commodity or a service. It is only on the basis of these factors or determinants of demand one can forecast the demand.
- Under this demand analysis we study elasticity of demand and methods of its measurement, sales forecasts and different methods to forecast sales or demand, manipulating (handle skillfully) demand and appropriate change in allocation of resources.
- So analysis of demand enables the producer to adjust his production to demand to maximize the objective function.

### **Demand analysis objectives:**

1. To study and analyze the determinants of demand
2. To measure the elasticity of demand
3. To prepare sales or demand forecasts
4. Manipulating demand and
5. To make appropriate changes in allocation of resources

### Types of demand/Demand distinctions:

1. **Individual and market demand:** The quantity of a commodity which an individual is willing to buy at particular price of the commodity during a specific time period, given his money and income, his taste, and prices of other commodities is known as "*Individual demand*" for a commodity.

The total quantity which all the consumers of a commodity are willing to buy at a given price per unit, given their money income, taste, and prices of other commodities is known as "*market demand*" for the commodity.

2. **Demand for firm's product and industry's products:** The quantity of a firm's produce that can be disposed of at a given price over a time period denotes "*the demand for the firm's product*".

The aggregate of demand for the product of all firms of an industry is known as the "*market demand for industry's product*".

3. **Autonomous demand and derived demand:** Autonomous demand refers to the demand for products and services directly. The demand for the services of a super specialty hospital can be considered as "*autonomous demand*", where as the demand for the hotels around that hospital is called "*derived demand*". So the demand for a product arises out of the purchase of a parent product.

**Eg:** If there is no demand for houses, there may not be demand for steel, cement, bricks, and so on. Demand for houses is autonomous where as demand for these inputs is *derived demand*.

4. **Demand for durable and non durable(perishable) goods:**

Here the demand for goods is classified based on their durability.

Durable goods are those goods which give service relatively for a long period (or) these goods which will meet your current needs.

Eg: clothes, shoes, houses, furniture, refrigerators, scooters

etc.

Non-durable goods are those goods which can be used or consumed only once and their total utility is exhausted in a single use.

Eg: milk, vegetables, fish, rice, wheat, sugar etc.

5. **Short term and long term demand:**

Short term demand refers to the demand for such goods are demanded over a short period.

Eg: fashion consumer goods, goods for seasonal use

Long term demand refers to the demand which exists over a long period.

Eg: generic (groceries) goods

6. **Joint & composite demand:** When two or more goods are jointly demanded at the same time to satisfy a single want, it is called *joint or complementary demand*.

Eg: car and petrol, pen and ink, tea and sugar etc.

The demand for a commodity that has several alternative uses is known as *composite demand*.

Eg: coal is demand by railways, factories, households etc.

7. **Direct demand and indirect demand:** Demand for goods that are directly used for consumption by the ultimate consumer is known as *direct demand*.

Eg: bread, tea, readymade shirts, scooters etc.

The demand for goods is not used by consumer directly. They are used by producers for producing other goods. So, indirect demand is also known as *producer goods demand*.

Eg: plant, machinery, tools, steel etc.

8. **Total market and market segment demand:** The total market demand will be aggregate demand for the product from all the segments.

Market segment demand refers to demand for the product in that specific market segment.

[The market may be segment on the basis of age, sex, geographical conditions etc.]

### **Demand function:**

The demand function is an algebraic expression of the relationship between demand for a commodity and various determinants that affect this quantity.

There are also two types of demand functions. They are:

1. **Individual demand function:** An individual demand function refers to the quantities of a commodity demanded at various prices, given his income, prices of related goods and tastes.

It is expressed as:

$$D=f(p)$$

2. **Market demand function:**

An individual demand function is the basis of demand theory. But it is the market demand function i.e., the main interest to

managers. It refers to the total demand for a good or service of all the buyers taken together.

The market demand function may be expressed mathematically as:

$$D_x = f(P_x, P_r, M, T, A, U)$$

Where

$D_x$  = quantity demanded for commodity

$f$  = functional relation

$P_x$  = price of commodity

$P_r$  = prices of related commodities i.e. substitutes and complementaries

$M$  = money income of the consumer

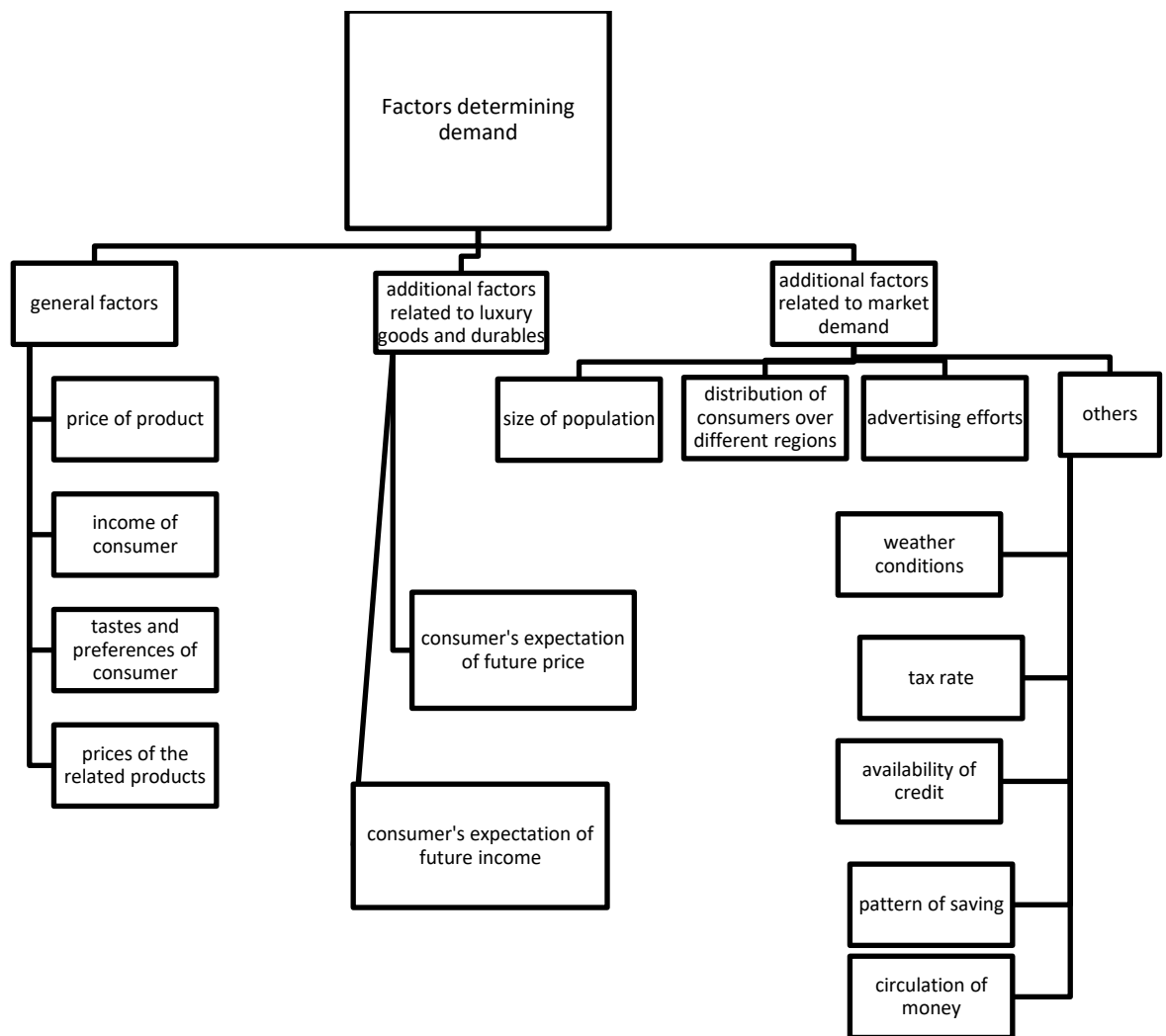
$T$  = taste of the consumer

$A$  = advertisement effect

$U$  = unknown variables

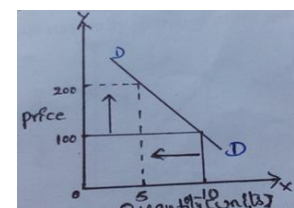
### **Factors determining demand:**

The demand for a particular product depends on several factors. The following factors determine the demand for a given product.



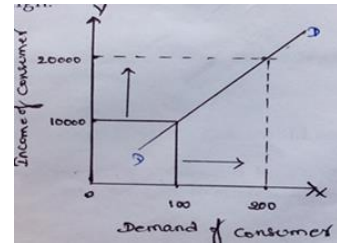
1. Price of product: Demand for a product is inversely related to its price. In other words, if price rises, the demand falls and vice versa. This is the price of demand function showing the price effect on demand.

Price of the product(Rs)	Quantity(units)
100	10
200	5



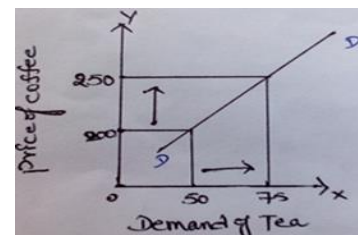
2. Income of the consumer: It is the ability to buy a commodity depends upon the income of the consumer. When the income of the consumer increases, they buy more and when the income of the consumer decreases, they buy less. A rich consumer demands more and more goods because his purchasing power is high.

Income of consumer (Rs)	Demand of consumer (units)
10000	100
20000	200



3. Taste and preferences: The demand for a product depends upon tastes and preferences of the consumer. If the consumers develop taste for a commodity, they buy whatever may be the price. A favorable in consumer preference will cause great demand to increase. Likewise an unfavorable change in consumer preferences will cause the demand to decrease.
4. Prices of related goods: The demand for product "X" is determined by the prices of its related products: substitutes and complementaries.
- (i) Substitutes: Commodities are substitutes when one can be replaced by another.  
Eg: tea and coffee

Price of coffee(Rs)	Demand of tea (units)
200	50
250	75

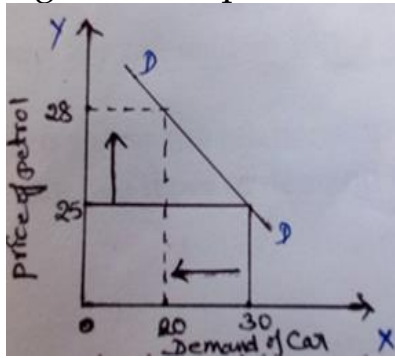


- (ii) Complementaries: Commodities are complements when a change in the demand for some other commodity in the 'same direction'.

Price of petrol (Rs)	Demand of car
25	30
28	20



Eg: cars and petrol, refrigerator and voltage stabilizer etc.



If there is an increase in the price of a substitute, the demand for product 'X' will go up and vice versa. Similarly, if the price of complementary goods goes up, the demand for product 'x' will fall.

5. Consumer's expectation: A consumer's expectation about the future changes in price and income may also affect his demand. If a consumer expects a rise in prices he may buy large quantities of that particular commodity. Similarly, if he expects its prices to fall in future, he will tend to buy less at present. Similarly, expectation of rising income may induce him to increase his current consumption.
6. Size of population: The size of population is also another important factor that affects the market demand. With the increase in population, people naturally demand more goods for the survival.

Population (in lakhs)	Demand of goods(units)
100	1000
200	2000

7. Advertising efforts: Advertisement helps in increasing demand by informing the potential consumers about the availability of the product, by showing the superiority of the product, and by influencing consumer choice against the rival products.
8. Distribution of consumer's over different regions: it is also another important factor determine the demand based on social, economic and demographical reasons.
9. Others
  - (i) Weather conditions: the demand for certain items purely depends on climatic and weather conditions. They are seasonal factors.

Eg: Demand for cool drinks in summer.

Demand for sweaters in winter season.

- (ii) Tax rate: The tax rate also affects the demand. High tax rate would generate low demand for goods.
- (iii) Availability of credit: The purchasing power is influenced by the availability of credit. If there is availability of credit cheap, the consumers try to spend more on consumer durables, thereby demand for certain products increase.
- (iv) Pattern of saving: Demand is also influenced by the pattern of saving. If people begin to save more, their demand will decrease and if saving is less, their demand will increase.
- (v) Circulation of Money: It also affects the demand. If more money circulates among the people, more of a thing is demanded by the people because they have more purchasing power and viceversa.

### **Law of demand:**

Law of demand explains the relationship between change in quantity demanded and change in price. It states that higher the price, the lower would be quantity demanded in the market; and lower the price, the higher would be the quantity demanded in the market. In other words, the law of demand says that the price and the quantity demanded are inversely related, all other things being equal.

*According to Marshall*, "The amount demanded increases with a fall in price, and diminishes with a rise in price". Thus it expresses an inverse relation between price and demand. The law refers to the direction in which quantity demanded changes with a change in price.

### **Assumptions of law of demand:**

1. Income level should be remain constant
2. Taste of the buyer should not change
3. Prices of other goods should remain constant
4. No new substitute for the commodity
5. Price rise in future should not be expected

Given these assumptions, the law of demand is explained in terms of demand schedule and a demand curve.

**Demand schedule:** It is a table or a chart which shows the relationship between price and demand of a commodity or service unit of time. There are two types of demand schedules.

1. Individual demand schedule
2. Market demand schedule

**Individual demand schedule:**

This is a tabular statement showing the different quantities of a commodity demanded by a consumer or house hold with a given period of time at different prices.

Daily demand schedule of a household for apples:

Price (per kg)	Apples demanded (in kg)
10	1
8	2
6	3
4	4
2	5

**Market demand schedule:** for obtaining the market demand schedule, quantities demanded by different buyers at each price are added up.

Daily market schedule for apples:

Price (per kg)	Qty demanded by household 1	Qty demanded by household 2	Qty demanded by household 3	Qty demanded by household 4	Market demand (in kg)
10	1	2	0	0	3
8	2	3	1	0	6
6	3	4	2	1	10
4	4	5	3	2	14
2	5	6	4	3	18

**Demand curve:**

The graphical representation of demand schedule is the demand curve I.e. the whole of a line showing price-demanded relationship is called demand curve. Demand curves are two types:

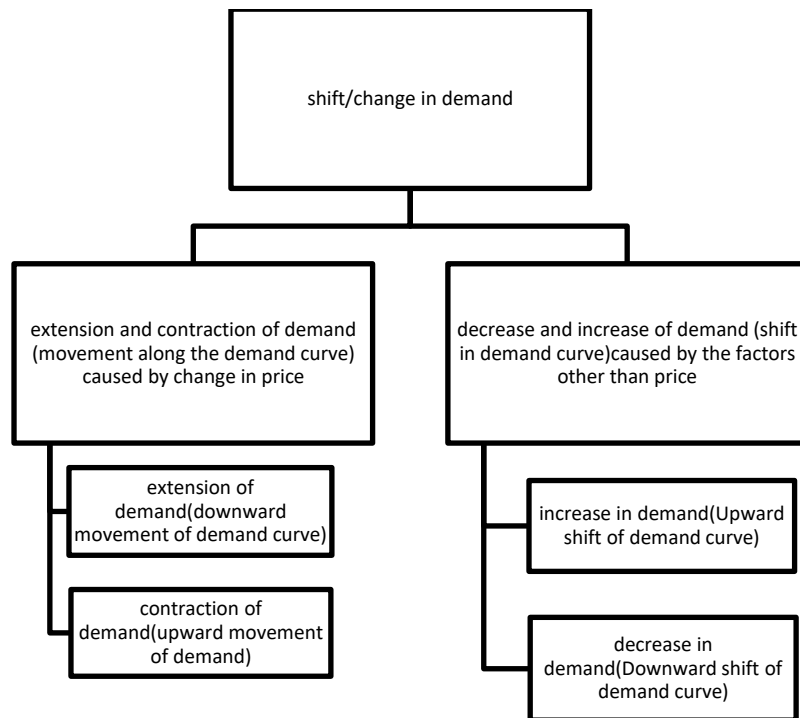
1. Individual demand curve
2. Market demand curve

**Individual demand curve:** individual demand curve represents the graphical representation of various quantities of a commodity demanded by a single consumer per period of time at various quantities of commodity, keeping all the other factors affecting the demand constant.

**Market demand curve:** market demand curve represents the diagrammatic presentation of various quantities of commodity demanded by all the existing consumers per period of time at various prices of the commodity keeping all the factors affecting demand constant. It is a summation of all the consumers purchasing the commodity at various price levels.

**Change in demand:** the increase or decrease in demand due to change in the factors other than price is called change in demand. Change in demand leads to a shift in demand curve to the right or the left.

**Shift in Demand:** the Extension or contraction of in demand due to change in the price is called shift in demand.



### **Increase in demand or upward shift of demand curve:**

If the consumers are willing and able to buy more quantity of goods at the same price, the result will be an increase in demand. The demand curve will shift to the right.

Price in Rs	Dx in units
10	20
10	25

This shift may be due to:

- Increase in consumer income.
- Increase in the price of substitutes
- Increase in taste of consumer etc.

### **Decrease in demand or downward shift of demand curve:**

A decrease in demand occurs when buyers are ready to buy less of a product at the same price because of factors like fall in income, fall in the price of substitute and fall in tastes by consumers and rise in price of complementary goods and so on. A decrease in demand will shift the demand curve to the left.

P <sub>x</sub> in Rs.	D <sub>x</sub> in Units
10	20
10	15

### **Extension of demand:**

An extension is the downward movement along a demand curve which indicates that a higher quantity is demanded for a given fall in the price of the good.

P <sub>x</sub> in Rs	D <sub>x</sub> in Units
10	20
8	25

**Contraction of demand:** A contraction is the upward movement along a demand curve, which indicates that a lower quantity is demanded for a given increase in the price of the good.

Price in Rs	D <sub>x</sub> in Units
10	20
12	15

### **Exception to the law of demand (or) operation of the law of demand:**

According to law of demand, more of a commodity will be demanded at lower prices, than at higher prices, other things being equal. The law of demand is valid in most of the cases. However there are certain cases where this law does not hold good. The following are the important Exceptions to the law of demand.

- I. **Conspicuous goods:(Veblen goods)** : some consumers measure the utility of a commodity by its price .i.e. ,if the commodity is expensive they think that it has got more utilities .As such they buy less of this commodity at low price and more of it at high price. Diamonds are often given an example of this case. Higher the price of diamonds, higher is the prestige value attached to them and hence higher is the demand for them.
- II. **Giffen goods (Giffen's paradox)**: people whose income are low purchase more of a commodity such as broken, bread etc (which is their staple food) when its price rises. Conversely when its price falls, instead of buying more. They buy less of this commodity and use the savings for the purchase better goods such as meat. This phenomenon is called giffen's paradox and such goods are called inferior or giffen goods.
- III. **In case of ignorance of price changes**: At times, the customer may not keep track of changes in price. In such a case, he tends to buy even if there is increase in price.
- IV. **Where there is a shortage of necessities feared**: If the customers fear that there could be shortage of necessities, then this law does not hold good. They may tend to buy more than what they require. Immediately, even if the price of product increases.
- V. **Necessities of life**: Normally, the law of demand does not apply on necessities of life such as food, cloth etc. even the price of these goods increases, and the consumer does not reduce their demand. Rather he purchases them even the prices of these goods increase often by reducing the demand for comfortable goods. This is also a reason that the demand curve slopes upwards to the right. In case of these exceptions, the demand curve slopes upwards. An exceptional demand curve is shown in below figure:

### **Why does the demand curve slope downwards?**

He law of demand states that ,other things remaining the same an individual consumer will buy more units of a commodity at a lower price and less of that commodity at a higher price. General , The demand curve

slopes downwards from left to right. Some of the reasons for the downward slope of demand curve are :

### **Traditional view:**

Law of diminishing marginal utility: As one goes on consuming more and more units of a commodity its utility to him goes on diminishing.

Diverse uses of a commodity: A commodity tends to be put to more use when it becomes cheaper, thus, the existing buyers purchase more and some new consumers enter the market thus more demand is created when price falls.

Change in the no. of consumers: When the price of a commodity is reduced then many other consumers who were not consuming the commodity earlier will start purchasing it now. Thus the existing buyers purchase more and some new consumers enter the market.

### **Modern view:**

Income effect: A fall in the price of a superior good will lead to a rise in the consumers real income. The consumer can therefore buy more of it. On the contrary, rise in the price of a superior good will result in a decline in the consumer real income: The consumer will therefore, buy less of it.

Substitution effects: A fall in the price of a good, while the prices of its substitutes remain unchanged, will make it attractive to the buyers who will now demand more of it. On the contrary, a rise in the price of a commodity, while the price of its substitutes remains unchanged, will make it unattractive to the purchasers who will now purchase less of it.

## **Forecasting**

**Forecast:** A prediction, projection, or estimate of some future activity, event, or occurrence.

### **Types of Forecasts**

- Economic forecasts to Predict a variety of economic indicators, like money supply, inflation rates, interest rates, etc.
- Technological forecasts to Predict rates of technological progress and innovation.
- Demand forecasts to predict the future demand for a company's products or services.

### **What is Forecasting? Meaning**



**Forecasting** is a process of predicting or estimating the future based on past and present data.

Forecasting provides information about the potential future events and their consequences for the organisation.

It may not reduce the complications and uncertainty of the future. However, it increases the confidence of the [management](#) to make important decisions.

Forecasting is the basis of premising. Forecasting uses many statistical techniques. Therefore, it is also called as **Statistical Analysis**.

### **Features of Forecasting:**

Peculiarities, characteristics or features of forecasting are as follows:-

1. Forecasting is concerned with future events.
2. It shows the probability of happening of future events.
3. It analyses past and present data.
4. It uses statistical tools and techniques.
5. It uses personal observations.

### **Steps in Forecasting:**

Procedure, stages or general steps involved in forecasting are given below:-

1. **Analysing and understanding the problem:** The manager must first identify the real problem for which the forecast is to be made. This will help the manager to fix the scope of forecasting.
2. **Developing sound foundation:** The management can develop a sound foundation, for the future after considering available information, experience, type of business, and the rate of development.
3. **Collecting and analysing data:** Data collection is time consuming. Only relevant data must be kept. Many statistical tools can be used to analyse the data.
4. **Estimating future events:** The future events are estimated by using trend analysis. Trend analysis makes provision for some errors.
5. **Comparing results:** The actual results are compared with the estimated results. If the actual results tally with the estimated results, there is nothing to worry. In case of any major difference between the actuals and the estimates, it is necessary to find out the reasons for poor performance.
6. **Follow up action:** The forecasting process can be continuously improved and refined on the basis of past experience. Areas of weaknesses can be improved for the future forecasting. There must be regular feedback on past forecasting.

### **Importance of Forecasting:**

Merits, significance or importance of forecasting involves following points:-

1. Forecasting provides relevant and reliable information about the past and present events and the likely future events. This is necessary for sound planning.
2. It gives confidence to the managers for making important decisions.
3. It is the basis for making planning premises.

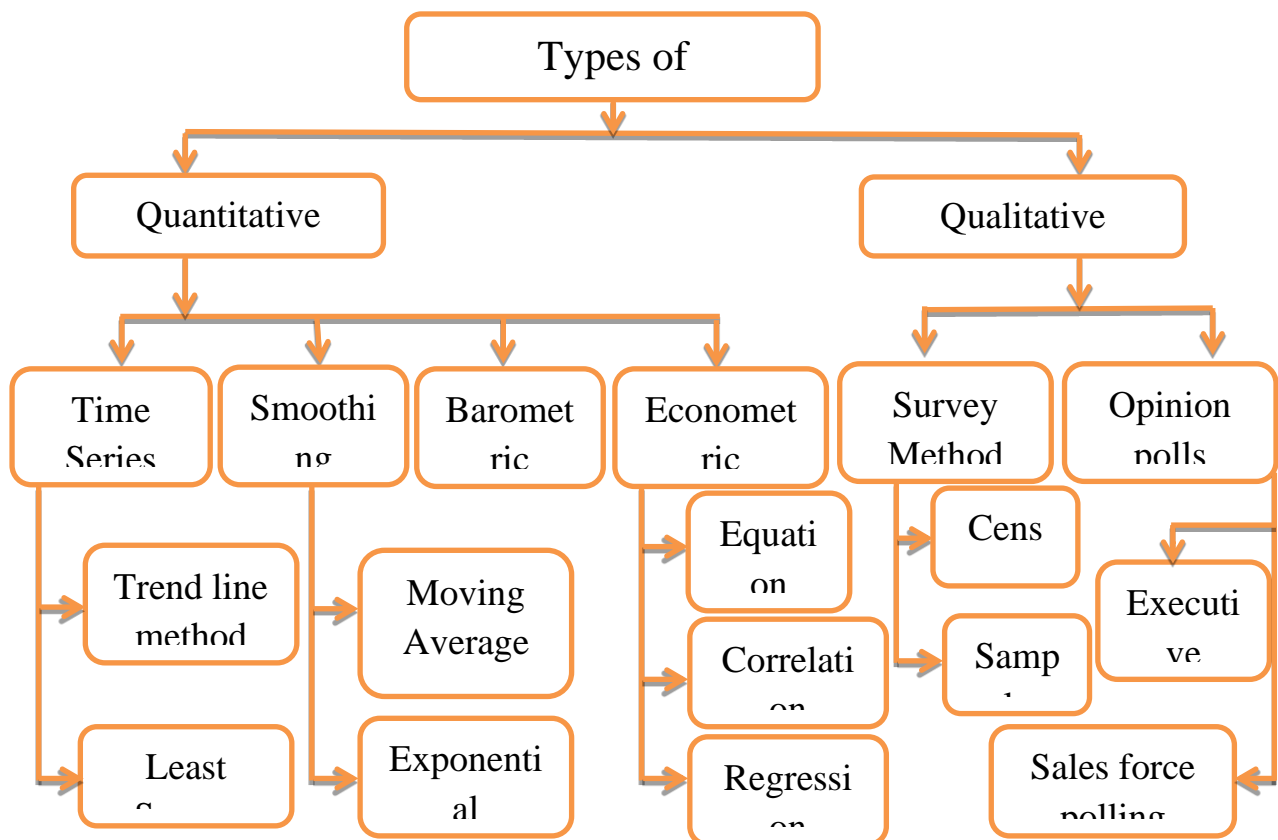
4. It keeps managers active and alert to face the challenges of future events and the changes in the environment.

### **Limitations of Forecasting:**

Demerits, criticism or limitations of forecasting involves following points:-

1. The collection and analysis of data about the past, present and future involves a lot of time and money. Therefore, managers have to balance the cost of forecasting with its benefits. Many small firms don't do forecasting because of the high cost.
2. Forecasting can only estimate the future events. It cannot guarantee that these events will take place in the future. Long-term forecasts will be less accurate as compared to short-term forecast.
3. Forecasting is based on certain assumptions. If these assumptions are wrong, the forecasting will be wrong. Forecasting is based on past events. However, history may not repeat itself at all times.
4. Forecasting requires proper judgement and skills on the part of managers. Forecasts may go wrong due to bad judgement and skills on the part of some of the managers. Therefore, forecasts are subject to human error.

### **TYPES OF FORECASTING METHODS**

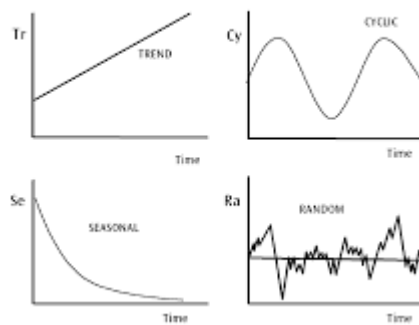


**Qualitative methods:** These types of forecasting methods are based on judgments, opinions, intuition, emotions, or personal experiences and are subjective in nature. They do not rely on any rigorous mathematical computations.

1. **Survey Method:** the most direct method of forecasting demand in the short run is called survey method. Surveys are conducting collect information about future purchase plans of the probable buyers of the product.
  - Census Method: also called complete enumeration method or Door to door survey. When the total population of potential buyers is surveyed is known as census method.
  - Sample Method: also called Test Marketing. When only a portion of the total population of potential buyers is surveyed is known as sample method.
2. **Opinion Polls Method:** the firm can forecast the sales by polling experts within and outside the firm. It includes,
  - Executive Method: also called expert method or Delphi method. In this method instead of depending upon the opinions of buyers and salesmen, firms can obtain views of specialists or experts or top management of firm in their respective field is known as executive method.
  - Sales force polling: also called collective opinion method. The opinion collected from the salesmen in each region instead of consumers. It referred as “Grass Roots approach”.  
The sales people are closes to the market and they can provide valuable information for firm’s future sales projection.

**Quantitative methods:** These types of forecasting methods are based on mathematical (quantitative) models, and are objective in nature. They rely heavily on mathematical computations.

1. **Time series analysis:** Under this method forecast the future values of the time series by examining past observations of the data.
  - A. **Trend line method:** Future trend is projected by drawing graph of the past data or under this method estimating trend is elementary, easy and quick. It involves merely the plotting of annual sales on graph and then estimating just by observation where trend line lies. The line can be extended towards a future period and corresponding sales forecast read from the graph.  
There are variations in the data. The variations caused in the data may be due to cyclical, seasonal, secular and irregular variations.



**Secular Trend:** The secular trend is the main component of a time series which results from long term effects of socio-economic and political factors. This trend may show the increase or decrease in a time series over a long period. This is the type of tendency which continues to persist for a very long period. In simple words it refers to a long run increase or decrease in time series data.

**Cyclical Trend:** These are long term oscillations occurring in a time series. These oscillations are mostly observed in economics data and the periods of such oscillations are generally extended from five to twelve years or more. These oscillations are associated with the well known business cycle, which has four phases (i) *Peak* (ii) *Recession* (iii) *Trough/Depression* (iv) *Expansion*.

In simple words these are the variations caused by economic cycles like boom, recession, trough/depression, recovery etc.

**Seasonal variations:** These are short term movements occurring in data due to seasonal factors. The short term is generally considered as a period in which changes occur in a time series with variations in weather or festivities.

Eg: it is commonly observed that the consumption of ice-cream during summer is generally high and hence an ice-cream dealer's sales would be higher in some months of the year while relatively lower during winter months. Employment, output, exports, etc., are subject to change due to variations in weather. Similarly, the sale of garments, umbrellas, greeting cards and fire-works are subject to large variations during festivals like Valentine's Day, Eid, Christmas, New Year's, etc.

In simple words due to change in weather, firm's sales graph makes upward and downward movement.

***Irregular or Random variations:*** These are sudden changes occurring in a time series which are unlikely to be repeated. They are components of a time series which cannot be explained by trends, seasonal or cyclic movements. These variations are sometimes called residual or random components. These variations, though accidental in nature, can cause a continual change in the trends, seasonal and cyclical oscillations during the forthcoming period. Floods, fires, earthquakes, revolutions, epidemics, strikes etc., are the root causes of such irregularities.

In simple words variations caused due to wars, Floods, fires, earthquakes, revolutions, epidemics, strikes etc.

**B. Least square method:** under this method, a trend line can be fitted to the time series data with the help of statistical techniques such as least square method. When the trend in sales overtime is given by straight line, the equation of this line is of the form  $Y = a + bX$

Where 'a' and 'b' are the constants representing the intercept and slope respectively of the estimated straight line.

The value of 'a' and 'b' is calculated with the help of following two equations.

$$\begin{aligned}\Sigma Y &= Na + b \Sigma X \\ \Sigma XY &= a \Sigma X + b \Sigma X^2\end{aligned}$$

Where N is the number of years

Y is sales

X is the year number

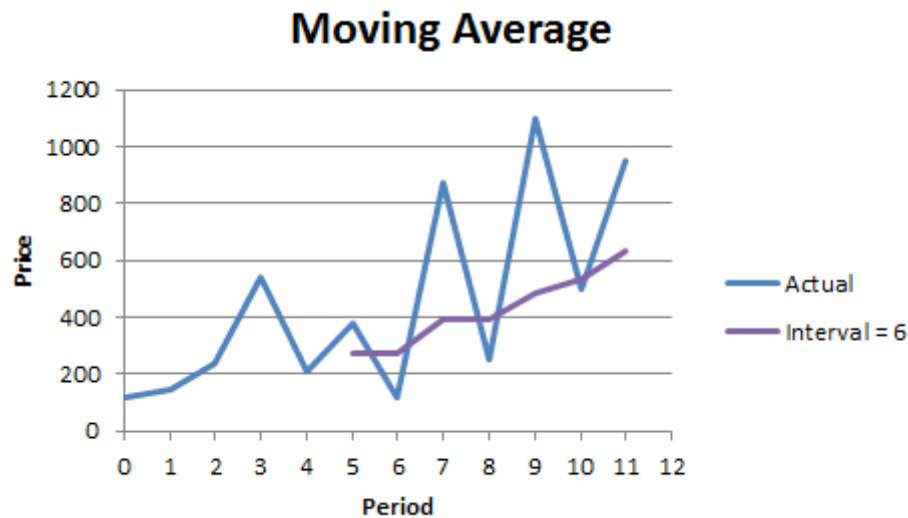
**2. Smoothing Technique:** this method predicts values of time series on the basis of averages of its past values only. This method is useful when time series data is influenced by irregular and seasonal variations. There are two smoothing techniques;

**A. Moving Average method:**

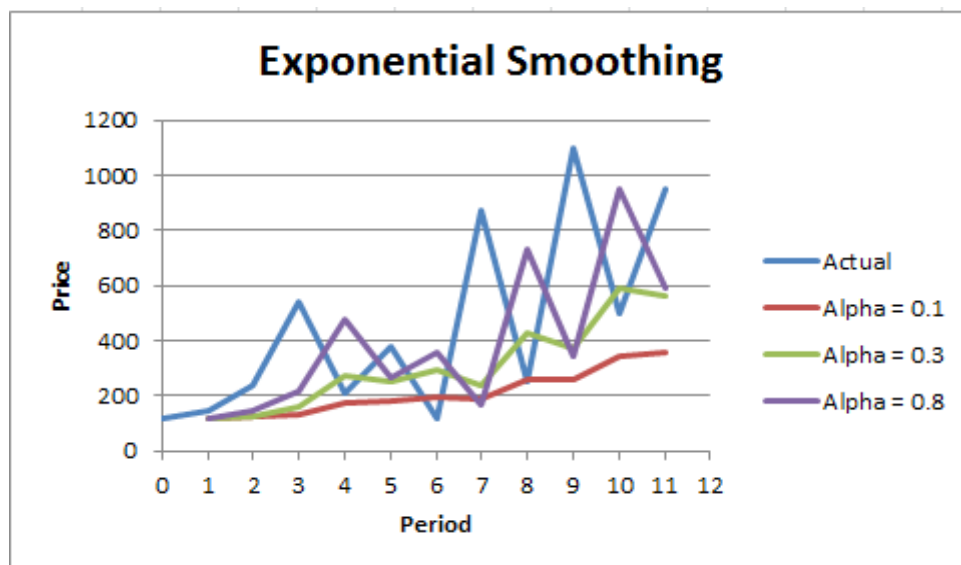
Moving average is the simplest type of technique of [forecasting](#). Basically, moving average is calculated by adding up the last 'n' period's values and then dividing that number by 'n'. So the moving average value is considering as the forecast for next period.

It can be used to quickly identify whether selling is moving in an uptrend or a downtrend depending on the pattern captured by the

moving average. I.e. A moving average is used to smooth out irregularities (peaks and valleys) to easily recognize trends.



**B. Exponential smoothing:** this technique is used for short run forecast. It is an improvement over the moving averages method. All time periods are assigned weights in order that nearest one gets higher weight and distant one gets lower weight. The reason for this future is more dependent on the recent past than on the distant past. This method is known to be effective where there is randomness and no seasonal variations in the data.



The formula used for exponential smoothing is:

$$S_{t+1} = \alpha S_t + (1 - \alpha) S_{m_t}$$

Where

$S_{t+1}$  = exponentially smoothed average for New Year

$S_t$  = Actual data in the most recent past

$Sm_t$  = most recent smoothed forecast

$\alpha$  = smoothing constant.

3. **Barometric method:** Barometric methods are used to forecast or anticipate short term changes in economic activity by using economic indicators. These indicators are time series that tend to precede changes in the level of economic activity.

These indicators can be grouped into three types on the basis of their timings with respect to the happening of the events.

Following are the types of indicators:

- Leading indicators
- Coincident indicators
- Lagging indicators

**Leading economic indicator:** These indicators which move ahead of the happening. In other words when an even that has already happened is used to predict the future event, then the already happened event would act as a leading indicator.

Ex: The data relating to working women would act as a leading indicator for the demand of working women hostels.

**Coincident indicators:** These are indicators which move in step or coincide with movement's in general economic activity or business cycle. Or these are those indicators that take place simultaneously to the happening.

Ex: Disappointing industrial production numbers would reflect poor state of the economy.

**Lagging indicator:** These indicators consist of those indicators which follow a change after some time lag or these indicators are those which take place after the happening.

Ex: Data on industrial wages overtime is a lagging series when compared with series of price index for industrial workers.

4. **Econometric method:** this method involves estimating demand by using several simultaneous equations which are generally behavioural equations, mathematical identities and market clearing equations.

**A. Equation Method:** the simplest way to forecast demand by econometric method is equation method. The first step is to identify the factors which affect demand of a commodity. the firm usually indicates demand in quantity(Q) as a function of different determinants like price(p), income of the consumer(Y), price of related commodity(Pr), taste and preference of the consumer(T), etc. this is given as follows:

$$Q = f (P,Y,Pr,T)$$

Manager use these factors to analyse the future demand and try to achieve optimal level of demand by bringing balance amongst these factors.

**B. Correlation Method:** this method used to indicate the nature of relationship between two variables.

When one variable increases with the increase in other variable, it is called positive correlation. Ex: Age of husband and wife.

When one variable decreases with increase in the value of other variable, it is called negative correlation. Ex: increase in price and decrease in demand.

Manager can use correlation analysis in demand forecasting with the help of relationship between demand and various factors affecting etc.

**C. Regression method:** while correlation explains nature of relationship between two variables, regression tries to explain the extent of this relationship. The word regression means “to regress” which means going back.

Under this method past data of two variables is collected and converted into an equation to forecast demand for future.

$$Y = a + bX$$

Where,

Y is Demand

A is fixed demand

B is rate of change of demand

X is the value of related variable like price, income of consumer, price of related good etc.



## Elasticity of Demand

The term elasticity is defined as the rate of responsiveness in the demand of a commodity for given change in the price or any other determinants of demand.

According to Marshall “the elasticity of demand in a market is great or small according as the amount demanded increases much or little for a given fall in price.

Elasticity of demand is a quantitative measurement of the change in demand on account of a given change in price or any other determinants.”

Then elasticity of demand means the degree of sensitiveness or responsiveness of demand to a change in price, however small or great.

The same is expressed in the form of a small formula,

Price Elasticity ( $E_p$ ) =

$$\frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

### **Types of Elasticity of demand:**

1. Price Elasticity of demand
2. Income Elasticity of demand
3. Cross Elasticity of demand
4. Advertising Elasticity of demand

**Price Elasticity of demand:** According to Marshall, Price Elasticity of Demand is the degree of responsiveness of demand to the change in price of that commodity. Price elasticity is always negative which indicates that the customer tends to buy more with every fall in the price. The relationship between the price and the demand is inverse.

It is measured as follows.

$$E_d = \frac{\text{Percentage Change in Quantity Demanded of Product X}}{\text{Percentage Change in Price of Product X}}$$

The same is expressed as

$$E_{dp} = \frac{(Q_2 - Q_1)/Q_1}{(P_2 - P_1)/P_1}$$

**Income Elasticity of demand:** Income Elasticity of Demand is the degree of responsiveness of demand to the change in income of the consumer. Income elasticity is normally positive which indicates that the customer tends to buy more and more with every increase in the income. The relationship between the income and the demand is direct.

It is measured as follows.

$$\text{Income Elasticity of Demand} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}}$$

The same is expressed as

$$E_{di} = \frac{(Q_2 - Q_1)/Q_1}{(I_2 - I_1)/I_1}$$

**Cross Elasticity of demand:** Cross Elasticity of Demand is the degree of responsiveness of demand to the change in price of related commodity, which may be substitute or complement. Cross elasticity is always positive for substitutes (which means that the demand for tea goes up if there increase in the price of coffee) and negative for complements (which means that if there is an increase in the price of sugar, the demand for coffee tends to fall).

It is measured as follows.

$$\text{cross-price elasticity of demand} = \frac{\text{percentage change in quantity demanded of good X}}{\text{percentage change in price of some other good Y}}$$

The same is expressed as.

$$E_{dcr} = \frac{(Q_2 - Q_1)/Q_1}{(P_2Y - P_1Y)/P_1Y}$$

**Advertising Elasticity of demand:** it refers to increase in the sales revenue because of change in the advertising expenditure. In other words, there is a direct relationship between the amount of money spent on advertising and its impact on sales. Advertising elasticity is always positive.

It is measured as follows.

$$\frac{\text{percentage change in quantity demanded}}{\text{percentage change in advertising expenses}}$$

The same is expressed as.

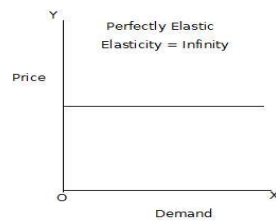
$$E_{da} = \frac{(Q_2 - Q_1)/Q_1}{(A_2 - A_1)/A_1}$$

**Types of price elasticity of demand:**

1. **Perfectly Elastic Demand ( $E=\infty$ ):** Demand is said to be perfectly elastic if negligible change in price would lead to infinite change in

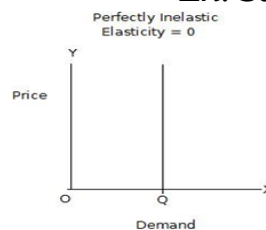
the quantity demanded. Visibly, no change in price causes in infinite change in demand. The shape of demand curve is horizontal.

Ex: Imaginary



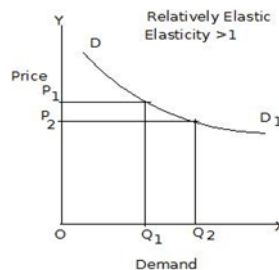
2. **Perfectly inelastic demand ( $E=0$ ):** When the demand for a commodity does not change despite change in price, the demand is said to be perfectly inelastic. The shape of demand curve is vertical.

Ex: Salt



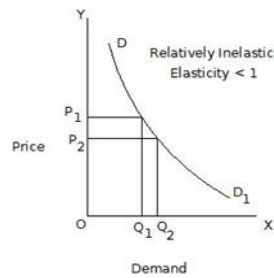
3. **Relatively Elastic Demand ( $E>1$ ):** When the percentage change in the quantity demanded for a commodity is more than percentage change in price, it is called relatively elastic demand. For example, if 10% change in price results, 20% change in quantity demanded. The shape of demand curve is more of flat.

Ex: Petrol



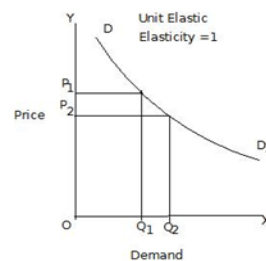
4. **Relatively Inelastic Demand ( $E<1$ ):** When the percentage change in the quantity demanded of a commodity is less than percentage change in the price, it is called relatively inelastic demand. For example, when 20% change in price causes 10% change in demand. The shape of demand curve is more of steep.

Ex: Sugar



5. **Unitary Elastic Demand ( $E=1$ ):** When the percentage change in the quantity demanded is equal to the percentage change in price, the demand for a commodity is said to be unitary elastic demand. For example, 10% change in price causes 10% change in demand. The shape of demand curve is rectangular hyperbola.

Ex: Cloths

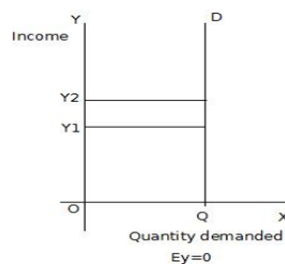


### Types of Income Elasticity of Demand:

There are five types of income elasticity of demand as follows:

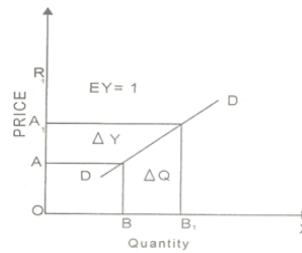
1. **Zero income elasticity ( $E_y=0$ ):** If the rise in income, the quantity demanded remains unchanged, the income elasticity is called zero income elasticity.

Ex: Necessaries (Food)



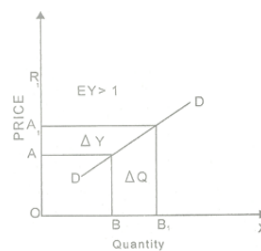
2. **Income elasticity equal to unity ( $E_y=1$ ):** Income elasticity is unity when the demand for a commodity increases in the same proportion as the rise in income.

Ex: Cloths



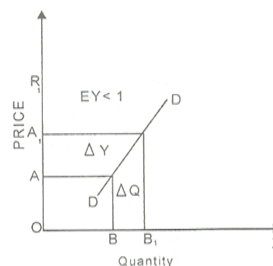
3. ***Income elasticity greater than unity ( $E_y > 1$ )***: The income elasticity of demand is greater than the unity when the demand for a commodity increases more than percentage rise in income.

Ex: Consumer Durables (AC, TV, Washing Machine  
Etc.)



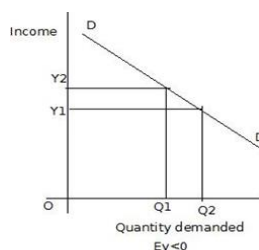
4. ***Income elasticity less than unity ( $E_y < 1$ )***: Income elasticity of demand is less than the unity when the demand for a commodity increases less than proportionate to the rise in income.

Ex: Sugar



5. ***Negative income elasticity ( $E_y < 0$ )***: In the case of inferior goods, the income elasticity of demand is negative. The consumer will reduce his purchase of it when income rises and vice versa.

## Ex: Inferior Goods



### **Factor determining the elasticity of demand**

**Nature of goods:** Elasticity of demand depends on the nature of goods. The elasticity of demand for a commodity depends upon the necessity of it for a human life. Goods may be necessary for human life, comfort or luxurious. Necessary goods are extremely essential so the demand for these goods is inelastic. But the consumption of comfort and luxury goods enhances man's efficiency and social prestige. So their consumption is less important and can be very well postponed. Thus the elasticity of demand for such commodities is elastic.

**Possibility of postponing consumption:** The demand for those goods whose consumption can be postponed for some time is said to be elastic. On the other hand if the commodities cannot be postponed and need to be fulfilled the demand for them is inelastic.

Medicine for a patient, books for a student and milk for a child cannot be postponed. They are to be satisfied first. That is why the demand for those commodities is inelastic.

**Alternative use:** The demand for those goods having only one use is said to be inelastic. In other words goods having alternative uses are elastic. For example electricity can be used for a number of purposes like heating, lighting, cooking, cooling etc.

**Availability of substitutes:** The demand for a commodity having perfect substitute is relatively more elastic, because if there is an increase in the price of commodity, people will start using other commodities.

Ex: Gas, kerosene, electricity, coal and wood are used as fuel. The increase in the price of one commodity will induce the consumer to use other commodity.

The demand for a commodity having no substitute is will be inelastic such as salt. Any increase or decrease in the price of salt will not affect its demand.

**Proportion of income spent:** Elasticity of demand also depends on the proportion of income spent on different goods. The demand for those goods on which a negligible amount (small part of income) of the total

income of the consumer is spent is said to be inelastic. Ex: needle, thread, ink, button etc.

The demand for those goods on which a significant amount of the total income of the consumer is spent is said to be more elastic. Ex: woollen suits, luxuries etc.

Time period: the demand for a commodity is based on time period. The demand is elastic in the long period and inelastic in the short period because in the short period, generally demand does not change immediately due to price changes. However, it is true in the long period.

Change in income: the demand for various goods are affected in different degrees due to change in income. In case of increase in the income of consumers, the demand for luxuries will increase. If the income falls, the demand for luxuries will fall. As such demand for luxuries is more elastic in relation to change in income,

In case of comforts it is less elastic and in case of necessities it is probably inelastic.

Force of habit: A repeated and constant use of a commodity by a person forms habit. A habit can't be avoided. Thus in such a case the consumption of the commodity can't be abstained in spite of the rise in price.

The consumer has to satisfy his habit regardless of change in price. Thus the demand for habitual commodities is fairly inelastic.

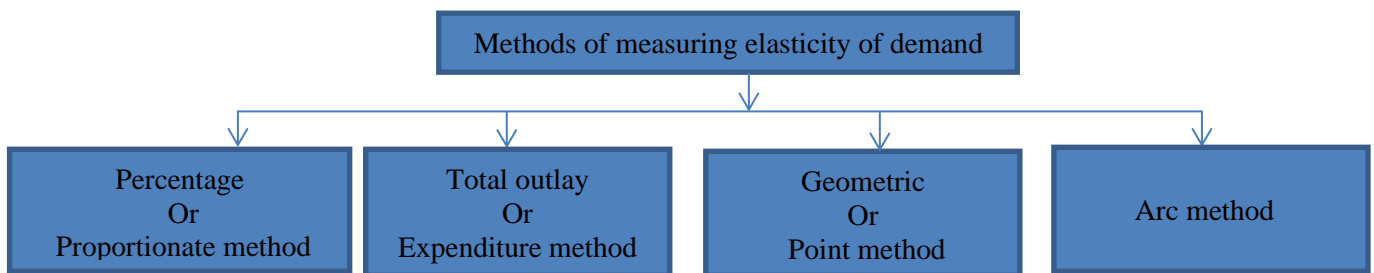
Income level (Distribution of income): Elasticity of demand depends on income level. The rich and the poor are not equally affected at the change in price. Poor people are more affected than the rich. Because of high income rich people buy the same amount of an expensive commodity in response to a rise in price.

For example with a rise in price of Horlicks, poor people buy other milk powder relatively cheaper than Horlicks. Thus for rich people the demand for Horlicks is inelastic whereas for poor people the demand for the Horlicks is elastic.

Joint demand: the demand for jointly demanded goods is less elastic. Ex: petrol and car. Similarly the demand for salt is inelastic because consumers do not use it alone.

Price-level: If the price is either too high or too low, the demand will be less elastic or inelastic. When the prices are moderate, elasticity will be greater.

## Methods of measuring elasticity of demand



1. Percentage or proportionate method: in this the elasticity of demand is measured by the percentage or proportionate change in demand due to change in price.

Formula:-

Elasticity of demand (% method) = % change in demand/% change in price.

Elasticity of demand (proportionate method) = proportionate change in demand/proportionate change in price.

If  $E_d > 1$ , demand is elastic

If  $E_d < 1$ , demand is inelastic

If  $E_d = 1$ , demand is unity elastic.

2. Total outlay (expenditure) method: Marshall evolved the total outlay, total revenue or total expenditure method as a measure of elasticity. By comparing the total expenditure of a purchaser both before and after the change in the price. Total outlay is price multiplied by the quantity of a commodity purchased.

$$\text{Formula } T_o = TQ \times P$$

Where TO is total outlay

TQ is total quantity

P is price of the commodity

Q is quantity of the commodity.

S.No	Price (in Rs)	Demand	Total out lay (in Rs)	Elasticity
1	1.50	2	3.00	N=1
2	1.00	3	3.00	
3	0.80	4	3.20	N>1
4	0.70	5	3.50	
5	0.50	6	3.00	N<1
6	0.40	7	2.80	

This method provides three types of results:

- i. Unitary elasticity ( $E=1$ ): if small change in price, total outlay is unaffected then elasticity of demand is unity.



- ii. Elastic demand ( $E > 1$ ): if small reductions in price, increases total outlay (or) if small increase in price reduces total outlay, then demand is elastic.
  - iii. Inelastic demand ( $E < 1$ ): if small reductions in price, leads to a fall in total outlay (or) if small increase in price, increases total outlay, and then demand is inelastic.
3. **Geometric or point method:** Graphic method is otherwise known as point method or Geometric method. This method was popularized by method. According to this method elasticity of demand is measured on different points on a straight line demand curve. The price elasticity of demand at a point on a straight line is equal to the lower segment of the demand curve divided by upper segment of the demand curve.

Thus at midpoint on a straight-line demand curve, elasticity will be equal to unity; at higher points on the same demand curve, but to the left of the mid-point, elasticity will be greater than unity, at lower points on the demand curve, but to the right of the mid-point, elasticity will be less than unity.

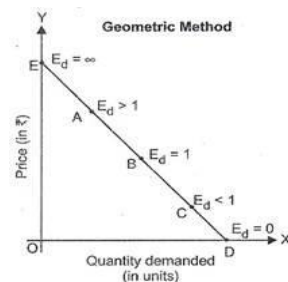


Fig. 4.2

4. **Arc method:** Since point method gives different results for the same change in price, economists have devised Arc method for measurement of elasticity between two points on the same demand curve. So elasticity of demand is measured in between two points at two price levels on the same demand curve or line, it is known as Arc elasticity.

$$\text{Arc elasticity of Demand} = \frac{\frac{\text{Change in quantity demanded}}{\text{Original quantity} + \text{new quantity}}}{\frac{\text{Change in Price}}{\text{Original price} + \text{New price}}}$$

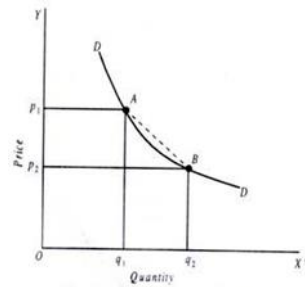


Fig. 13.4(a). Arc Elasticity of Demand

Note: if there is no difference between the two point and they merge into each other, Arc elasticity becomes point elasticity.

### Significance of elasticity of demand:

Concept of elasticity of demand is very useful to the producers and policy makers alike. It is very valuable tool to decide the extent of increase or decrease in price for a desired change in the quantity demanded for the products or services in the firm or the economy.

The following are its applications:

- A) To fix the prices of factors of production (land, labour, capital, org and technology).
- B) To fix the prices of goods and services provided rendered.
- C) To formulate and revise government policies.
  - I. Tax policies
  - II. Raising bank deposits
  - III. Public utilities
  - IV. Revaluation and devaluation of currencies
  - V. Formulate government policies.
- D) Demand forecasting
- E) To planning the levels of output and price.

## Theory of production

Meaning: Production in day to day life is understood as creating something or a making good. But in economics it has separate meaning. In simple terms production is conversion of inputs (resources) in to output (goods).

Ex: the input of land, labour, seeds, irrigation, fertilizers and machines and equipment's result in the production of wheat.

Definition: according to James bates J. Parkinson "production is organised activity of transforming resources in to finished products in the form of goods and services; and the objective of products is to satisfy the demand of such transformed resources".

Production process:



Production function: The production function expresses a functional relationship between physical inputs and physical outputs of a firm at any particular time period. The output is thus a function of inputs. Mathematically production function can be written as

$$Q = f(A, B, C, D)$$

Where "Q" stands for the quantity of output and A, B, C, D are various input factors such as land, labour, capital and organization. Here output is the function of inputs. Hence output becomes the dependent variable and inputs are the independent variables.

### **Importance of production function:**

1. When inputs are specified in physical units, production function helps to estimate the level of production.
2. It becomes is equates when different combinations of inputs yield the same level of output.
3. It indicates the manner in which the firm can substitute on input for another without altering the total output.
4. When price is taken into consideration, the production function helps to select the least combination of inputs for the desired output.
5. It considers two types' input-output relationships namely 'law of variable proportions' and 'law of returns to scale'. Law of variable propositions explains the pattern of output in the short-run as the units of variable inputs are increased to increase the output. On the other hand law of returns to scale explains the pattern of output in the long run as all the units of inputs are increased.

6. The production function explains the maximum quantity of output, which can be produced, from any chosen quantities of various inputs or the minimum quantities of various inputs that are required to produce a given quantity of output.

Production function can be fitted the particular firm or industry or for the economy as whole. Production function will change with an improvement in technology.

**Assumptions of production function:**

- a. The production function is related to a particular period of time.
- b. There is no change in technology.
- c. The producer is using the best techniques available.
- d. The factors of production are divisible.
- e. Production function can be fitted to a short run or to long run.

The following table explain production function:

	Labour in hours	Land in Acres	Output (in units)
A	0	0	0
B	1	2	10
C	2	4	22
D	3	6	36
E	4	8	48

The table shows certain factor combinations and their corresponding output levels. 1 hour of labour and 2 acres of land produce 10 units and so on. The technical relationship between input (labour in hours and land in acres) and output in units is termed as production function.

**Cobb-Douglass production function:**

Production function of the linear homogenous type is invented by Juntwicksell and first tested by C. W. Cobb and P. H. Douglass in 1928. This famous statistical production function is known as Cobb-Douglas production function. Originally the function is applied on the empirical study of the American manufacturing industry from 1899 to 1922. Cobb – Douglas production function takes the following mathematical form.

$$Y = (AK^X L^{1-X})$$

Where Y=output

K=Capital

L=Labour

A=positive constant

‘X’ and ‘1-X’ indicates elasticity’s of production

That is 'X' and '1-X' is measure the percentage of response of output to percentage change in labour and capital respectively.

The function estimated for the USA by Cobb and Douglass is

$$Y = (1.01K^{0.75} L^{0.25})$$

The production function shows that one percent change in labour input, capital remaining constant is associated with 0.75 percentage change in output.

Similarly one percentage change in capital, labour remaining constant is associated with a 0.25 percent change in output.

**Assumptions:**

1. The function assumes that output is the function of two factors viz. capital and labour.
2. It is a linear homogenous production function of the first degree
3. The function assumes that the logarithm of the total output of the economy is a linear function of the logarithms of the labour force and capital stock.
4. There are constant returns to scale
5. All inputs are homogenous
6. There is perfect competition
7. There is no change in technology.

**Isoquants:**

The term Isoquants is derived from the words 'ISO' and 'quant' – 'ISO' means equal and 'quant' implies quantity. Isoquant therefore, means equal quantity. A family of ISO-product curves or isoquants or production difference curves can represent a production function with two variable inputs, which are substitutable for one another within limits.

ISO quants are the curves, which represent the different combinations of inputs producing a particular quantity of output. Any combination on the isoquant represents the same level of output.

For a given output level firm's production become,

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

Where 'Q' is the units of output is a function of the quantity of two inputs 'L' and 'K'.

Thus an isoquant shows all possible combinations of two inputs, which are capable of producing equal or a given level of output. Since each combination yields same output, the producer becomes indifferent towards these combinations.

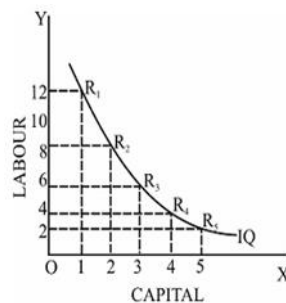
**Assumptions:**

1. There are only two factors of production, viz. labour and capital.
2. The two factors can substitute each other up to certain limit
3. The shape of the isoquant depends upon the extent of substitutability of the two inputs.
4. The technology is given over a period.

An isoquant may be explained with the help of an arithmetical example.

Combinations	Labour (units) (quintals)	Capital (Units)	Output
A	1	10	50
B	2	7	50
C	3	4	50
D	4	4	50
E	5	1	50

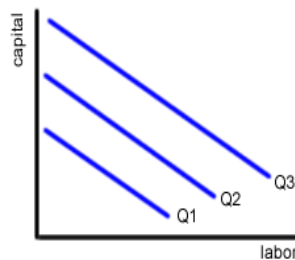
Combination 'A' represent 1 unit of labour and 10 units of capital and produces '50' quintals of a product all other combinations in the table are assumed to yield the same given output of a product say '50' quintals by employing any one of the alternative combinations of the two factors labour and capital. If we plot all these combinations on a paper and join them, we will get continuous and smooth curve called ISO-product curve as shown below.



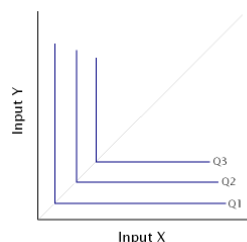
From the table diagram, it can be observed that the producer sacrifices less quantity of labour for additional unit of capital.

### Types of ISO Quant:

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



2. **Input-Output Isoquant:** This assumes strict complementarity [that is, zero substitutability] of the factors of production. The isoquant take the shape of a right angle. This type of isoquant is also called 'Leontief isoquant' after Leontief, who invented the input-output analysis.



3. **Kinked Isoquant:** This assumes limited substitutability of K and L. There are only a few processes for producing any one commodity. Substitutability of factors is possible only at the kinks. This form is also called 'activity analysis-isoquant' or 'linear-programming isoquant', because it is basically used in linear programming.

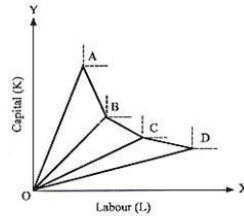
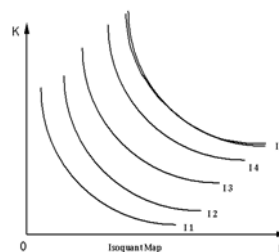


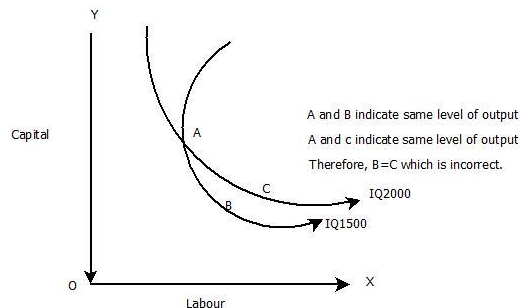
Fig. 7.7: Kinked Isoquant

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

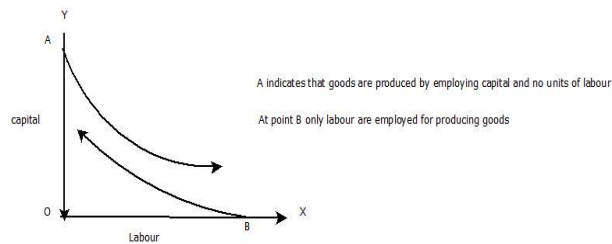


### Properties/Characteristics of Isoquants:

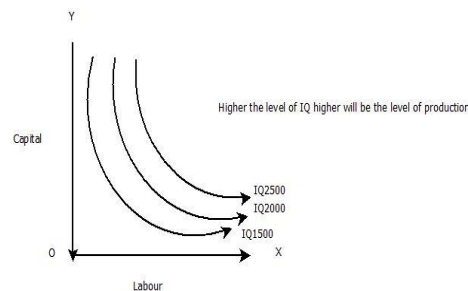
1. **Two isoquants do not intersect each other:** Two isoquants do not intersect each other because if producer wants to operate at a higher level of output, he has to switch over to another isoquant with a higher level of output and vice versa.



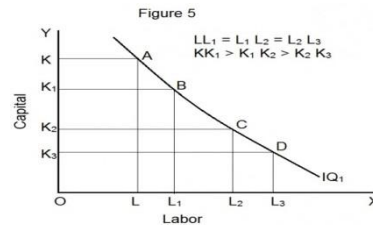
2. **No isoquant can touch either axis:** If an isoquant touches the X-axis it would mean that the commodity can be produced with OB units of labour and without any unit of capital. Point A on the Y-axis implies that the commodity can be produced with OA units of capital and without any unit of labour. However, this is wrong because the firm cannot produce a commodity with one factor alone.



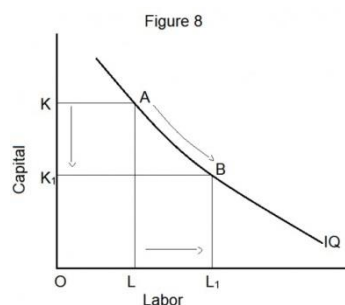
3. **A higher IQ implies a higher level of output:** i.e., with the same quantity of one input and larger quantity of other input, the larger output will be produced.



4. **Isoquants are convex to the origin:** An isoquant must always be convex to the origin. This is because of the operation of the principle of diminishing marginal rate of technical substitution. MRTS is the rate at which marginal unit of an input can be substituted for another input making the level of output remain the same.



5. **Isoquants are negatively sloped:** An isoquant slopes downwards from left to right. The logic behind this is the principle of diminishing marginal rate of technical substitution. In order to maintain a given output, a reduction in the use of one input must be offset by an increase in the use of another input.



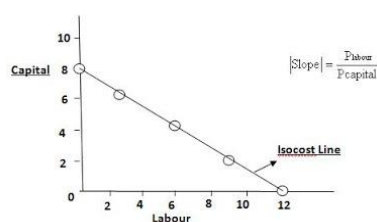


## The Isocost Line:

The isocost line is an important component when analysing producer's behaviour. The isocost line illustrates all the possible combinations of two factors that can be used at given costs and for a given producer's budget. In simple words, an isocost line represents a combination of inputs which all cost the same amount.

Now suppose that a producer has a total budget of Rs 120 and for producing a certain level of output, he has to spend this amount on 2 factors A and B. Price of factors A and B are Rs 15 and Rs. 10 respectively.

Combinations	Units of Capital	Units of Labour	Total expenditure
	Price = 15 Rs	Price = 10Rs	( in Rupees)
A	8	0	120
B	6	3	120
C	4	6	120
D	2	9	120
E	0	12	120



The isocost line shows all the possible combinations of two factors Labour and capital.

## Law of production:

### I. Law of variable proportions

The law of variable proportions states that as the quantity of one factor is increased, keeping the other factors fixed, the marginal product of that factor will eventually decline. This means that up to the use of a certain amount of variable

factor, marginal product of the factor may increase and after a certain stage it starts diminishing. When the variable factor becomes relatively abundant, the marginal product may become negative.

**Assumptions:** The law of variable proportions holds well under the following conditions:

1. **Constant State of Technology**: First, the state of technology is assumed to be given and unchanged. If there is improvement in the technology, then the marginal product may rise instead of diminishing.
2. **Fixed Amount of Other Factors**: Secondly, there must be some inputs whose quantity is kept fixed. It is only in this way that we can alter the factor proportions and know its effects on output. The law does not apply if all factors are proportionately varied.
3. **Possibility of Varying the Factor proportions**: Thirdly, the law is based upon the possibility of varying the proportions in which the various factors can be combined to produce a product. The law does not apply if the factors must be used in fixed proportions to yield a product.

**Illustration of the Law:** The law of variable proportion is illustrated in the following table and figure. Suppose there is a given amount of land in which more and more labour (variable factor) is used to produce wheat.

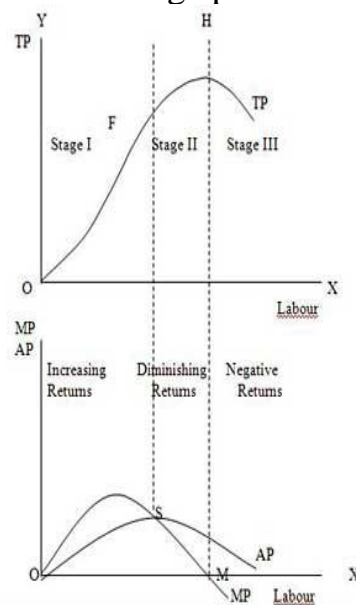
Units of Labour	Total Product	Marginal Product	Average Product
1	2	2	2
2	6	4	3
3	12	6	4
4	16	4	4
5	18	2	3.6
6	18	0	3
7	14	-4	2
8	8	-6	1

It can be seen from the table that up to the use of 3 units of labour, total product increases at an increasing rate and beyond the third unit total product increases at a diminishing rate. This fact is shown by the marginal product which the addition is made to Total Product as a result of increasing the variable factor i.e. labour. It can be seen from the table that the marginal product of labour initially rises and beyond the use of three units of labour, it starts diminishing. The use of six units of labour does not add anything to the total production of wheat. Hence, the marginal product of labour has fallen to zero. Beyond the use of six units of labour, total product diminishes and therefore marginal product of labour becomes negative. Regarding the average product of labour, it rises up to the use of third unit of labour and beyond that it is falling throughout.

**Three Stages of the Law of Variable Proportions:** These stages are illustrated in the following figure where labour is measured on the X-axis and output on the Y-axis.

**Stage 1. Stage of Increasing Returns:**

In this stage, total product increases at an increasing rate up to a point. This is because the efficiency of the fixed factors increases as additional units of the variable factors are added to it. In the figure, from the origin to the point F, slope of the total product curve TP is increasing i.e. the curve TP is concave upwards up to the point F, which means that the marginal product MP of labour rises. The point F where the total product stops increasing at an increasing rate and starts increasing at a diminishing rate is called the point of inflection. Corresponding vertically to this point of inflection marginal product of labour is maximum, after which it diminishes. This stage is called the stage of increasing returns because the average product of the variable factor increases throughout this stage. This stage ends at the point where the average product curve reaches its highest point.



### **Stage 2. Stage of Diminishing Returns:**

In this stage, total product continues to increase but at a diminishing rate until it reaches its maximum point H where the second stage ends. In this stage both the marginal product and average product of labour are diminishing but are positive. This is because the fixed factor becomes inadequate relative to the quantity of the variable factor. At the end of the second stage, i.e., at point M marginal product of labour is zero which corresponds to the maximum point H of the total product curve TP. This stage is important because the firm will seek to produce in this range.

### **Stage 3. Stage of Negative Returns:**

In stage 3, total product declines and therefore the TP curve slopes downward. As a result, marginal product of labour is negative and the MP curve falls below the X-axis. In this stage the variable factor (labour) is too much relative to the fixed factor.

## **II. Law of return to scale**

The law of returns to scale describes the relationship between outputs and scale of inputs in the long-run when all the inputs are increased in the same proportion. In the words of Prof. Roger Miller, “Returns to scale refer to the relationship between changes in output and proportionate changes in all factors of production.

To meet a long-run change in demand, the firm increases its scale of production by using more space, more machines and labourers in the factory.

### **Assumptions:**

- (1) All factors (inputs) are variable but enterprise is fixed.
- (2) A worker works with given tools and implements.
- (3) Technological changes are absent.
- (4) There is perfect competition.
- (5) The product is measured in quantities.

When all inputs are changed in the same proportion (or scale of production is changed), the total product may respond in three possible ways:

- 1) Increasing returns to scale
- 2) Constant returns to scale, and
- 3) Diminishing returns to scale

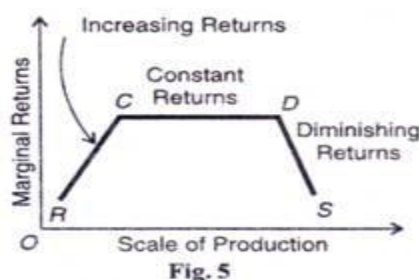
**Table 2 : Returns to Scale in Physical Units**

Unit	Scale of Production	Total Returns	Marginal Returns	
1.	1 Workers + 2 Acres Land	8	8	} Increasing Returns
2.	2 Workers + 4 Acres Land	17	9	
3.	3 Workers + 6 Acres Land	27	10	
4.	4 Workers + 8 Acres Land	38	11	} Constant Returns
5.	5 Workers + 10 Acres Land	49	11	
6.	6 Workers + 12 Acres Land	59	10	} Diminishing Returns
7.	7 Workers + 14 Acres Land	68	9	
8.	8 Workers + 16 Acres Land	76	8	

### Increasing return to scale:

—the law of increasing returns to scale operates when the percentage increase in the total product is more than the percentage increase in all the factor inputs employed in the same proportion. The table reveals that in the beginning with the scale of production of (1 worker + 2 acres of land), total output is 8. To increase output when the scale of production is doubled (2 workers + 4 acres of land), total returns are more than doubled. They become 17. Now if the scale is trebled (3 workers + 6 acres of land), returns become more than three-fold, i.e., 27. It shows increasing returns to scale. In the figure RS is the returns to scale curve where R to C portion indicates increasing returns.

—Many economies set in and increase in return is more than increase in factors.



### Constant return to scale:

—Law of constant returns to scale operates when a given percentage increase in the factor inputs in the same proportion causes equal percentage increase in total output. If the scale of production is increased further, total returns will increase in such a way that the marginal returns become constant. In the table, for the 4th and 5th units of the scale of production, marginal returns are 11, i.e., returns to scale are constant. In the figure, the portion from C to D of the RS curve is horizontal which depicts constant returns to scale. It means that increments of each input are constant at all levels of output.

—Economies of scale are counter balanced by diseconomies of scale.

### Diminishing return to scale:

—the law of diminishing returns to scale occurs when a given percentage increase in all factor inputs in equal proportion causes less than percentage increase in

output. The table shows that when output is increased from the 6th, 7th and 8th units, the total returns increase at a lower rate than before so that the marginal returns start diminishing successively to 10, 9 and 8. In the figure, the portion from D to S of the RS curve shows diminishing returns.

Output increases in a smaller proportion. Diseconomies outweigh economies of scale

### **ECONOMIES OF SCALE:**

Production may be carried on a small scale or on a large scale by a firm. When a firm expands its size of production by increasing all the factors, it secures certain advantages known as economies of production. Marshall has classified these economies of large-scale production into internal economies and external economies.

Internal economies are those, which are opened to a single factory or a single firm independently of the action of other firms. They result from an increase in the scale of output of a firm and cannot be achieved unless output increases. Hence internal economies depend solely upon the size of the firm and are different for different firms.

External economies are those benefits, which are shared in by a number of firms or industries when the scale of production in an industry or groups of industries increases. Hence external economies benefit all firms within the industry as the size of the industry expands.

#### **Internal Economies:**

##### **A). Technical Economies.**

Technical economies arise to a firm from the use of better machines and superior techniques of production. As a result, production increases and per unit cost of production falls. A large firm, which employs costly and superior plant and equipment, enjoys a technical superiority over a small firm. Another technical economy lies in the mechanical advantage of using large machines. The cost of operating large machines is less than that of operating small machine. More over a larger firm is able to reduce its per unit cost of production by linking the various processes of production. Technical economies may also be associated when the large firm is able to utilize all its waste materials for the development of by-products industry. Scope for specialization is also available in a large firm. This increases the productive capacity of the firm and reduces the unit cost of production.

##### **B). Managerial Economies:**

These economies arise due to better and more elaborate management, which only the large size firms can afford. There may be a separate head for manufacturing, assembling, packing, marketing, general administration etc. Each department is under the charge of an expert. Hence the appointment of experts, division of

administration into several departments, functional specialization and scientific co-ordination of various works make the management of the firm most efficient.

**C). Marketing Economies:**

The large firm reaps marketing or commercial economies in buying its requirements and in selling its final products. The large firm generally has a separate marketing department. It can buy and sell on behalf of the firm, when the market trends are more favourable. In the matter of buying they could enjoy advantages like preferential treatment, transport concessions, cheap credit, prompt delivery and fine relation with dealers. Similarly it sells its products more effectively for a higher margin of profit.

**D). Financial Economies:**

The large firm is able to secure the necessary finances either for block capital purposes or for working capital needs more easily and cheaply. It can barrow from the public, banks and other financial institutions at relatively cheaper rates. It is in this way that a large firm reaps financial economies.

**E). Risk bearing Economies:**

The large firm produces many commodities and serves wider areas. It is, therefore, able to absorb any shock for its existence. For example, during business depression, the prices fall for every firm. There is also a possibility for market fluctuations in a particular product of the firm. Under such circumstances the risk-bearing economies or survival economies help the bigger firm to survive business crisis.

**F). Economies of Research:**

A large firm possesses larger resources and can establish its own research laboratory and employ trained research workers. The firm may even invent new production techniques for increasing its output and reducing cost.

**G). Economies of welfare:**

A large firm can provide better working conditions in-and out-side the factory. Facilities like subsidized canteens, crèches for the infants, recreation room, cheap houses, educational and medical facilities tend to increase the productive efficiency of the workers, which helps in raising production and reducing costs.

**External Economies:**

Business firm enjoys a number of external economies, which are discussed below:

**A). Economies of Concentration:**

When an industry is concentrated in a particular area, all the member firms reap some common economies like skilled labour, improved means of transport and communications, banking and financial services, supply of power and benefits from subsidiaries. All these facilities tend to lower the unit cost of production of all the firms in the industry.

**B). Economies of Information**

The industry can set up an information centre which may publish a journal and pass on information regarding the availability of raw materials, modern machines, export potentialities and provide other information needed by the firms. It will benefit all firms and reduction in their costs.

**C). Economies of Welfare:**

An industry is in a better position to provide welfare facilities to the workers. It may get land at concessional rates and procure special facilities from the local bodies for setting up housing colonies for the workers. It may also establish public health care units, educational institutions both general and technical so that a continuous supply of skilled labour is available to the industry. This will help the efficiency of the workers.

**D). Economies of Disintegration:**

The firms in an industry may also reap the economies of specialization. When an industry expands, it becomes possible to spilt up some of the processes which are taken over by specialist firms. For example, in the cotton textile industry, some firms may specialize in manufacturing thread, others in printing, still others in dyeing, some in long cloth, some in dhotis, some in shirting etc. As a result the efficiency of the firms specializing in different fields increases and the unit cost of production falls.

Thus internal economies depend upon the size of the firm and external economies depend upon the size of the industry.

**DISECONOMIES OF LARGE SCALE PRODUCTION**

Internal and external diseconomies are the limits to large-scale production. It is possible that expansion of a firm's output may lead to rise in costs and thus result diseconomies instead of economies. When a firm expands beyond proper limits, it is beyond the capacity of the manager to manage it efficiently. This is an example of an internal diseconomy. In the same manner, the expansion of an industry may result in diseconomies, which may be called external diseconomies. Employment of additional factors of production becomes less efficient and they are obtained at a higher cost. It is in this way that external diseconomies result as an industry expands.

The major diseconomies of large-scale production are discussed below:

**Internal Diseconomies:**

**A). Financial Diseconomies:**

For expanding business, the entrepreneur needs finance. But finance may not be easily available in the required amount at the appropriate time. Lack of finance retards the production plans thereby increasing costs of the firm.

**B). Managerial diseconomies:**

There are difficulties of large-scale management. Supervision becomes a difficult job. Workers do not work efficiently, wastages arise, decision-making becomes difficult, coordination between workers and management disappears and production costs increase.

**C). Marketing Diseconomies:**



As business is expanded, prices of the factors of production will rise. The cost will therefore rise. Raw materials may not be available in sufficient quantities due to their scarcities. Additional output may depress the price in the market. The demand for the products may fall as a result of changes in tastes and preferences of the people. Hence cost will exceed the revenue.

**D). Technical Diseconomies:**

There is a limit to the division of labour and splitting down of production processes. The firm may fail to operate its plant to its maximum capacity. As a result cost per unit increases. Internal diseconomies follow.

**E). Diseconomies of Risk-taking:**

As the scale of production of a firm expands risks also increase with it. Wrong decision by the management may adversely affect production. In large firms are affected by any disaster, natural or human, the economy will be put to strains.

**External Diseconomies:**

When many firm get located at a particular place, the costs of transportation increases due to congestion. The firms have to face considerable delays in getting raw materials and sending finished products to the marketing centres. The localization of industries may lead to scarcity of raw material, shortage of various factors of production like labour and capital, shortage of power, finance and equipment's. All such external diseconomies tend to raise cost per unit.