

## UNIT I

### 1.1 NATURE AND SCOPE OF ECONOMICS

#### *Economics*

Economics is the science that deals with the production and consumption of goods and services and the distribution and rendering of these for human welfare.

The following are the economic goals.

- A high level of employment
- Price stability
- Efficiency
- An equitable distribution of income
- Growth

#### Definition and Scope of Engineering Economics

##### **Definition**

Engineering economics deals with the methods that enable one to take economic decisions towards minimizing costs and/or maximizing benefits to business organizations.

##### **Scope**

The issues that are covered in this book are elementary economic analysis, interest formulae, bases for comparing alternatives, present worth method, future worth method, annual equivalent method, rate of return method, replacement analysis, depreciation, evaluation of public alternatives, inflation adjusted investment decisions, make or buy decisions, inventory control, project management, value engineering, and linear programming.

## DEMAND ANALYSIS

### **Introduction & Meaning:**

Demand in common parlance means the desire for an object. But in economics demand is something more than this. According to Stonier and Hague, "Demand in economics means demand backed up by enough money to pay for the goods demanded". This means that the demand becomes effective only if it is backed by the purchasing power in addition to this there must be willingness to buy a commodity.

Thus demand in economics means the desire backed by the willingness to buy a commodity and the purchasing power to pay. In the words of "Benham" "The demand for anything at a given price is the amount of it which will be bought per unit of time at that Price". (Thus demand is always at a price for a definite quantity at a specified time.) Thus demand has three essentials – price, quantity demanded and time. Without these, demand has no significance in economics.

**LAW of Demand:**

Law of demand shows the relation between price and quantity demanded of a commodity in the market. In the words of Marshall, "the amount demand increases with a fall in price and diminishes with a rise in price".

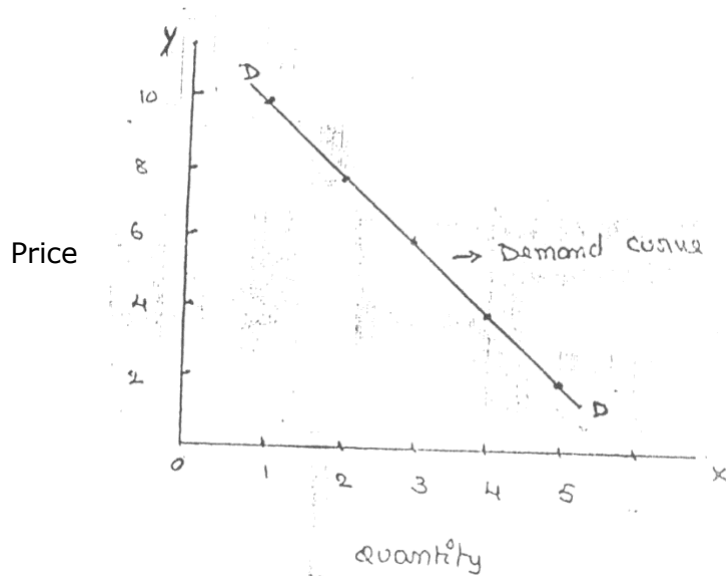
A rise in the price of a commodity is followed by a reduction in demand and a fall in price is followed by an increase in demand, if a condition of demand remains constant.

The law of demand may be explained with the help of the following demand schedule.

***Demand Schedule.***

Price of Appel (In. Rs.)	Quantity Demanded
10	1
8	2
6	3
4	4
2	5

When the price falls from Rs. 10 to 8 quantity demand increases from 1 to 2. In the same way as price falls, quantity demand increases on the basis of the demand schedule we can draw the demand curve.



The demand curve DD shows the inverse relation between price and quantity demand of apple. It is downward sloping.

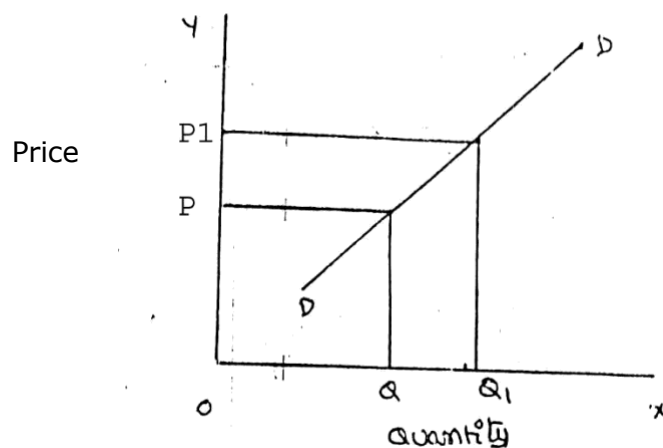
### **Assumptions:**

Law of demand is based on certain assumptions:

1. There is no change in consumers taste and preferences.
2. Income should remain constant.
3. Prices of other goods should not change.
4. There should be no substitute for the commodity
5. The commodity should not confer any distinction
6. The demand for the commodity should be continuous
7. People should not expect any change in the price of the commodity

### **Exceptional demand curve:**

Some times the demand curve slopes upwards from left to right. In this case the demand curve has a positive slope.



When price increases from OP to Op1 quantity demanded also increases from to OQ1 and vice versa. The reasons for exceptional demand curve are as follows.

### **1. Giffen paradox:**

The Giffen good or inferior good is an exception to the law of demand. When the price of an inferior good falls, the poor will buy less and vice versa. For example, when the price of maize falls, the poor are willing to spend more on superior goods than on maize if the price of maize increases, he has to increase the quantity of money spent on it. Otherwise he will have to face starvation. Thus a fall in price is followed by reduction in quantity demanded and vice versa. "Giffen" first explained this and therefore it is called as Giffen's paradox.

### **2. Veblen or Demonstration effect:**

'Veblen' has explained the exceptional demand curve through his doctrine of conspicuous consumption. Rich people buy certain good because it gives social distinction or prestige for example diamonds are bought by the richer class for the prestige it possess. If the price of diamonds falls poor also will buy is hence they will not give prestige. Therefore, rich people may stop buying this commodity.

### **3. Ignorance:**

Sometimes, the quality of the commodity is Judge by its price. Consumers think that the product is superior if the price is high. As such they buy more at a higher price.

### **1. Speculative effect:**

If the price of the commodity is increasing the consumers will buy more of it because of the fear that it increase still further, Thus, an increase in price may not be accomplished by a decrease in demand.

### **5. Fear of shortage:**

During the times of emergency of war People may expect shortage of a commodity. At that time, they may buy more at a higher price to keep stocks for the future.

### **2. Necessaries:**

In the case of necessities like rice, vegetables etc. people buy more even at a higher price.

### **Factors Affecting Demand:**

There are factors on which the demand for a commodity depends. These factors are economic, social as well as political factors. The effect of all the factors on the amount demanded for the commodity is called Demand Function.

These factors are as follows:

#### ***1. Price of the Commodity:***

The most important factor-affecting amount demanded is the price of the commodity. The amount of a commodity demanded at a particular price is more properly called price demand. The relation between price and demand is called the Law of Demand. It is not only the existing price but also the expected changes in price, which affect demand.

#### ***2. Income of the Consumer:***

The second most important factor influencing demand is consumer income. In fact, we can establish a relation between the consumer income and the demand at different levels of income, price and other things remaining the same. The demand for a normal commodity goes up when income rises and falls down when income falls. But in case of Giffen goods the relationship is the opposite.

#### ***3. Prices of related goods:***

The demand for a commodity is also affected by the changes in prices of the related goods also. Related goods can be of two types:

(i). Substitutes which can replace each other in use; for example, tea and coffee are substitutes. The change in price of a substitute has effect on a commodity's demand in the same direction in which price changes. The rise in price of coffee shall raise the demand for tea;

(ii). Complementary goods are those which are jointly demanded, such as pen and ink. In such cases complementary goods have opposite relationship between price of one commodity and the amount demanded for the other. If the price of pens goes up, their demand is less as a result of which the demand for ink is also less. The price and demand go in opposite direction. The effect of changes in price of a commodity on amounts demanded of related commodities is called Cross Demand.

#### **4. *Tastes of the Consumers:***

The amount demanded also depends on consumer's taste. Tastes include fashion, habit, customs, etc. A consumer's taste is also affected by advertisement. If the taste for a commodity goes up, its amount demanded is more even at the same price. This is called increase in demand. The opposite is called decrease in demand.

#### **5. *Wealth:***

The amount demanded of commodity is also affected by the amount of wealth as well as its distribution. The wealthier are the people; higher is the demand for normal commodities. If wealth is more equally distributed, the demand for necessities and comforts is more. On the other hand, if some people are rich, while the majorities are poor, the demand for luxuries is generally higher.

#### **6. *Population:***

Increase in population increases demand for necessities of life. The composition of population also affects demand. Composition of population means the proportion of young and old and children as well as the ratio of men to women. A change in composition of population has an effect on the nature of demand for different commodities.

#### **7. *Government Policy:***

Government policy affects the demands for commodities through taxation. Taxing a commodity increases its price and the demand goes down. Similarly, financial help from the government increases the demand for a commodity while lowering its price.

#### **8. *Expectations regarding the future:***

If consumers expect changes in price of commodity in future, they will change the demand at present even when the present price remains the same. Similarly, if consumers expect their incomes to rise in the near future they may increase the demand for a commodity just now.

#### **9. *Climate and weather:***

The climate of an area and the weather prevailing there has a decisive effect on consumer's demand. In cold areas woollen cloth is demanded. During hot summer days, ice is very much in demand. On a rainy day, ice cream is not so much demanded.

**10. State of business:**

The level of demand for different commodities also depends upon the business conditions in the country. If the country is passing through boom conditions, there will be a marked increase in demand. On the other hand, the level of demand goes down during depression.

## ELASTICITY OF DEMAND

Elasticity of demand explains the relationship between a change in price and consequent change in amount demanded. "Marshall" introduced the concept of elasticity of demand. Elasticity of demand shows the extent of change in quantity demanded to a change in price.

In the words of "Marshall", "The elasticity of demand in a market is great or small according as the amount demanded increases much or little for a given fall in the price and diminishes much or little for a given rise in Price"

**Elastic demand:** A small change in price may lead to a great change in quantity demanded. In this case, demand is elastic.

**In-elastic demand:** If a big change in price is followed by a small change in demanded then the demand is "inelastic".

### Types of Elasticity of Demand:

There are three types of elasticity of demand:

1. Price elasticity of demand
2. Income elasticity of demand
3. Cross elasticity of demand

#### 1. Price elasticity of demand:

Marshall was the first economist to define price elasticity of demand. Price elasticity of demand measures changes in quantity demand to a change in Price. It is the ratio of percentage change in quantity demanded to a percentage change in price.

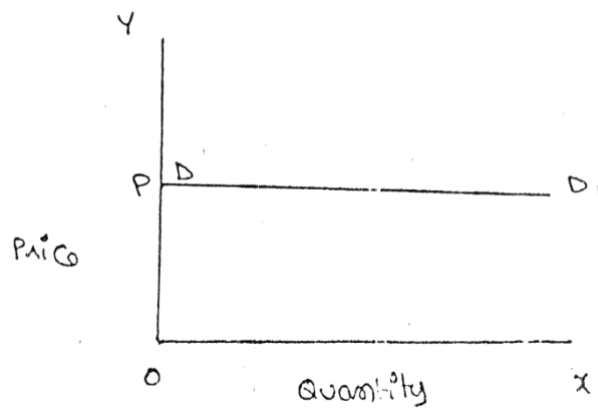
$$\text{Price elasticity} = \frac{\text{Proportionate change in the quantity demand of commodity}}{\text{Proportionate change in the price of commodity}}$$

There are five cases of price elasticity of demand

#### **A. Perfectly elastic demand:**

When small change in price leads to an infinitely large change in quantity demand, it is called perfectly or infinitely elastic demand. In this case  $E = \infty$

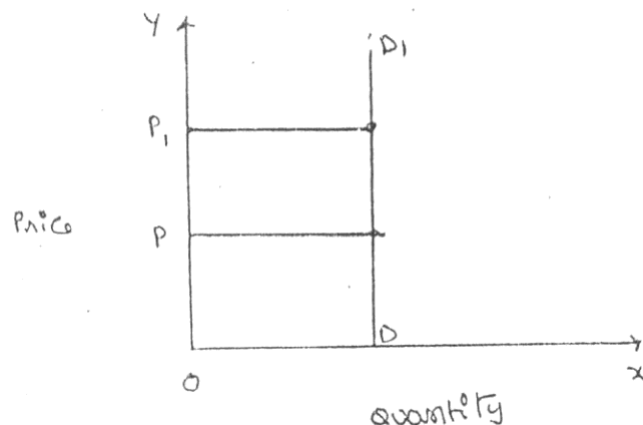




The demand curve  $DD_1$  is horizontal straight line. It shows that at "OP" price any amount is demanded and if price increases, the consumer will not purchase the commodity.

### B. Perfectly Inelastic Demand

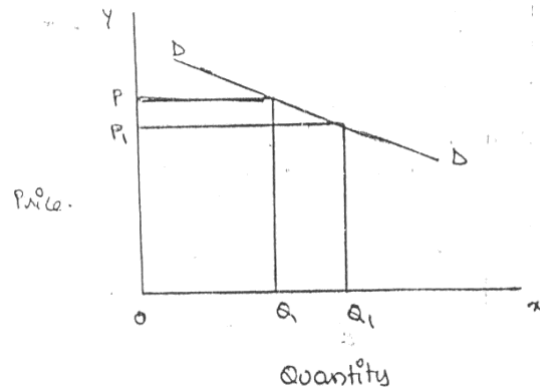
In this case, even a large change in price fails to bring about a change in quantity demanded.



When price increases from 'OP' to 'OP<sub>1</sub>', the quantity demanded remains the same. In other words, the response of demand to a change in price is nil. In this case  $E' = 0$ .

### C. Relatively elastic demand:

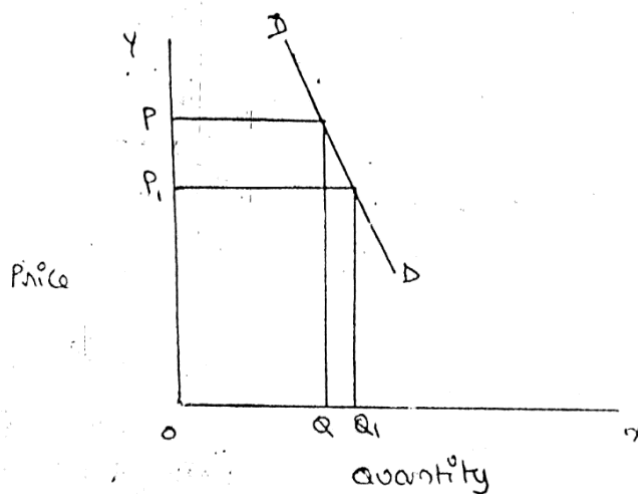
Demand changes more than proportionately to a change in price. i.e. a small change in price leads to a very big change in the quantity demanded. In this case  $E > 1$ . This demand curve will be flatter.



When price falls from 'OP' to 'OP', amount demanded in crease from "OQ' to "OQ1' which is larger than the change in price.

#### **D. Relatively in-elastic demand.**

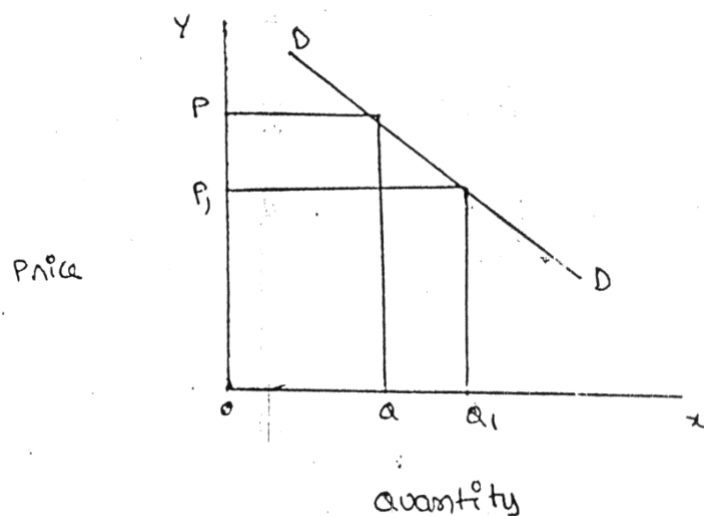
Quantity demanded changes less than proportional to a change in price. A large change in price leads to small change in amount demanded. Here  $E < 1$ . Demanded curve will be steeper.



When price falls from "OP' to 'OP1 amount demanded increases from OQ to OQ1, which is smaller than the change in price.

#### **E. Unit elasticity of demand:**

The change in demand is exactly equal to the change in price. When both are equal  $E=1$  and elasticity is said to be unitary.



When price falls from 'OP' to 'OP1' quantity demanded increases from 'OP' to 'OP1', quantity demanded increases from 'OQ' to 'OQ1'. Thus a change in price has resulted in an equal change in quantity demanded so price elasticity of demand is equal to unity.

## **2. Income elasticity of demand:**

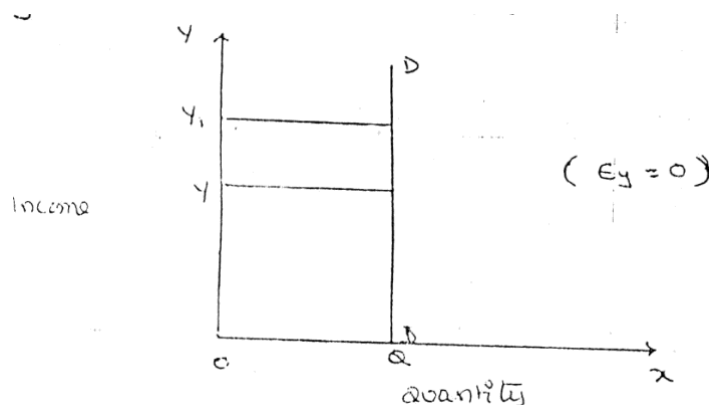
Income elasticity of demand shows the change in quantity demanded as a result of a change in income. Income elasticity of demand may be stated in the form of a formula.

$$\text{Income Elasticity} = \frac{\text{Proportionate change in the quantity demand of commodity}}{\text{Proportionate change in the income of the people}}$$

Income elasticity of demand can be classified in to five types.

### **A. Zero income elasticity:**

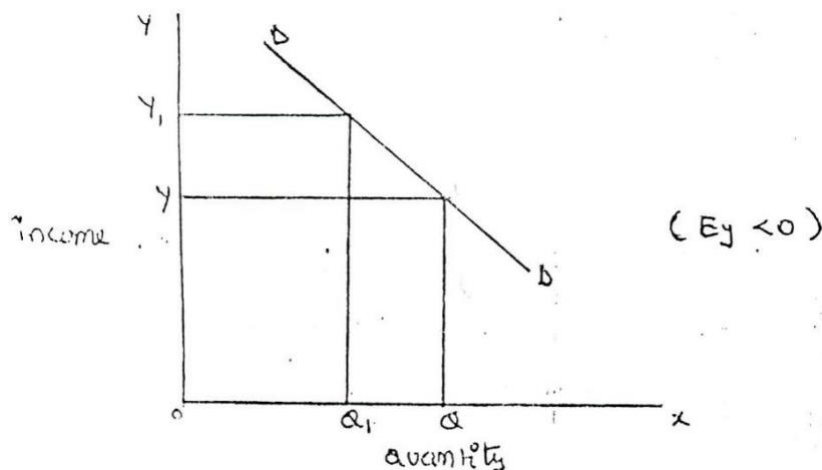
Quantity demanded remains the same, even though money income increases. Symbolically, it can be expressed as  $E_y = 0$ . It can be depicted in the following way:



As income increases from OY to OY<sub>1</sub>, quantity demanded never changes.

### B. Negative Income elasticity:

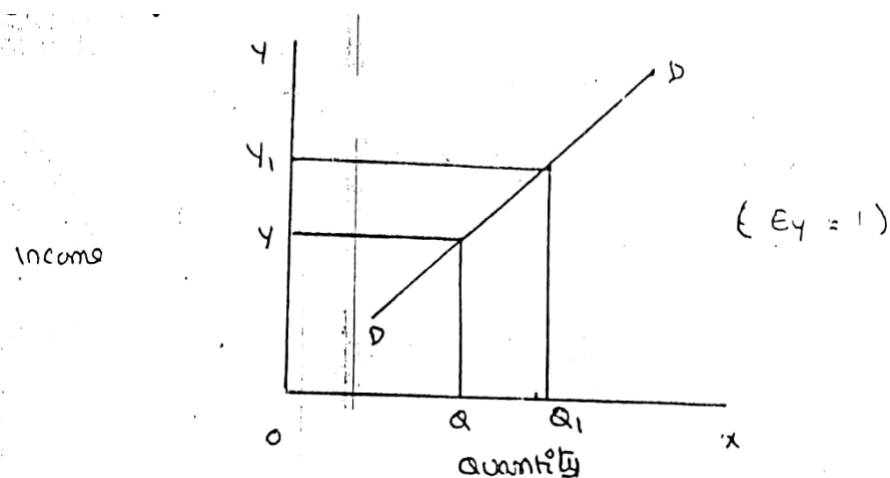
When income increases, quantity demanded falls. In this case, income elasticity of demand is negative. i.e.,  $E_y < 0$ .



When income increases from OY to OY<sub>1</sub>, demand falls from OQ to OQ<sub>1</sub>.

### c. Unit income elasticity:

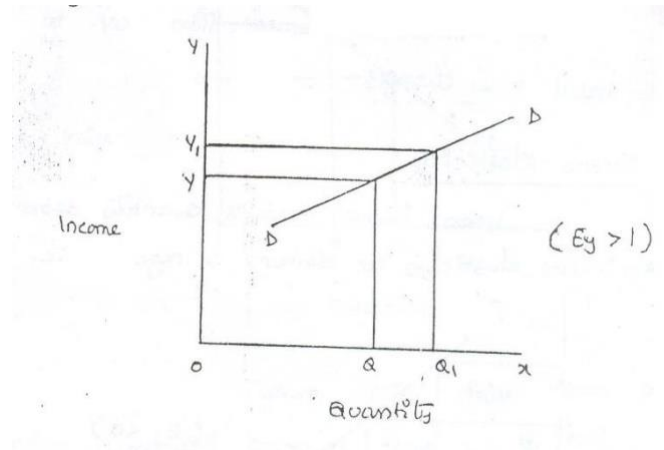
When an increase in income brings about a proportionate increase in quantity demanded, and then income elasticity of demand is equal to one.  $E_y = 1$



When income increases from OY to OY<sub>1</sub>, Quantity demanded also increases from OQ to OQ<sub>1</sub>.

#### d. Income elasticity greater than unity:

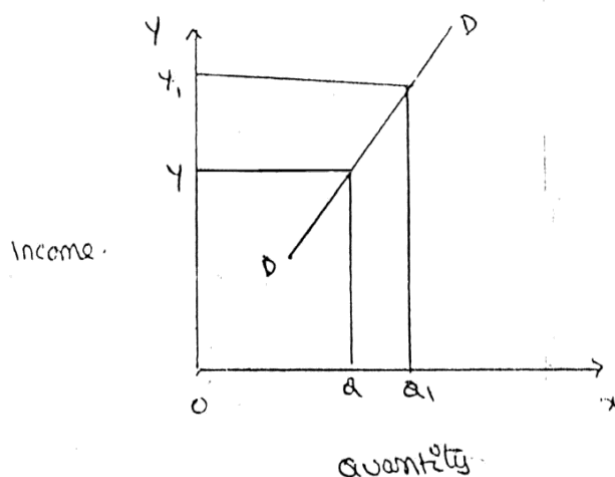
In this case, an increase in income brings about a more than proportionate increase in quantity demanded. Symbolically it can be written as  $E_y > 1$ .



It shows high-income elasticity of demand. When income increases from  $OY$  to  $OY_1$ , Quantity demanded increases from  $OQ$  to  $OQ_1$ .

#### E. Income elasticity less than unity:

When income increases quantity demanded also increases but less than proportionately. In this case  $E < 1$ .



An increase in income from  $OY$  to  $OY_1$ , brings about an increase in quantity demanded from  $OQ$  to  $OQ_1$ , But the increase in quantity demanded is smaller than the increase in income. Hence, income elasticity of demand is less than one.

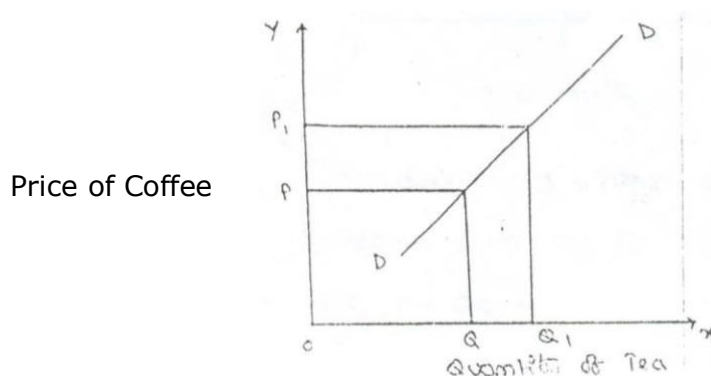
### 3. Cross elasticity of Demand:

A change in the price of one commodity leads to a change in the quantity demanded of another commodity. This is called a cross elasticity of demand. The formula for cross elasticity of demand is:

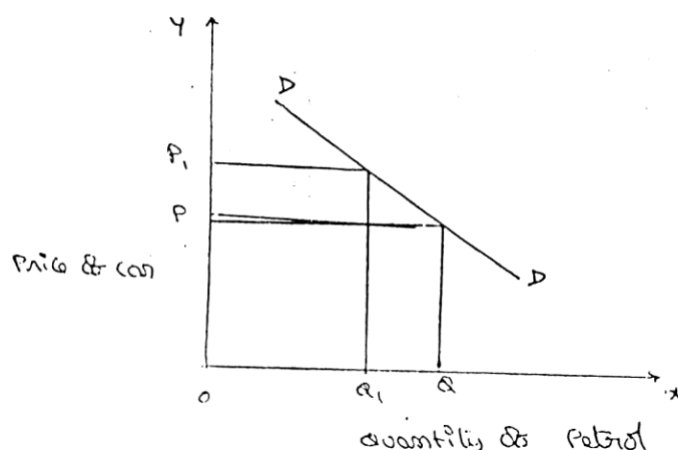
$$\text{Cross elasticity} = \frac{\text{Proportionate change in the quantity demand of commodity "X"}}{\text{Proportionate change in the price of commodity "Y"}}$$

**a. In case of substitutes**, cross elasticity of demand is positive. Eg: Coffee and Tea

When the price of coffee increases, Quantity demanded of tea increases. Both are substitutes.



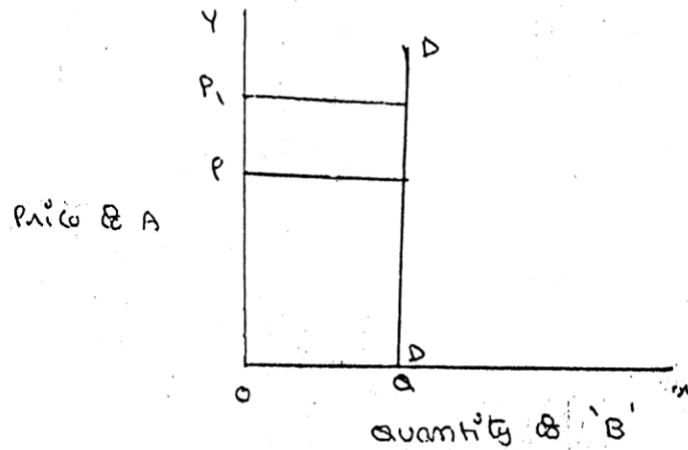
**b. In case of complements**, cross elasticity is negative. If increase in the price of one commodity leads to a decrease in the quantity demanded of another and vice versa.



$$E_c = \frac{\% \Delta Q_1}{\% \Delta P_1} \text{ (Negative)}$$

When price of car goes up from OP to OP1, the quantity demanded of petrol decreases from OQ to OQ1. The cross-demanded curve has negative slope.

**c. In case of unrelated commodities**, cross elasticity of demanded is zero. A change in the price of one commodity will not affect the quantity demanded of another.



Quantity demanded of commodity "b" remains unchanged due to a change in the price of 'A', as both are unrelated goods.

### **Factors influencing the elasticity of demand**

Elasticity of demand depends on many factors.

#### **1. Nature of commodity:**

Elasticity or in-elasticity of demand depends on the nature of the commodity i.e. whether a commodity is a necessity, comfort or luxury, normally; the demand for Necessaries like salt, rice etc is inelastic. On the other hand, the demand for comforts and luxuries is elastic.

#### **2. Availability of substitutes:**

Elasticity of demand depends on availability or non-availability of substitutes. In case of commodities, which have substitutes, demand is elastic, but in case of commodities, which have no substitutes, demand is in elastic.

### **3. Variety of uses:**

If a commodity can be used for several purposes, than it will have elastic demand. i.e. electricity. On the other hand, demanded is inelastic for commodities, which can be put to only one use.

### **4. Postponement of demand:**

If the consumption of a commodity can be postponed, than it will have elastic demand. On the contrary, if the demand for a commodity cannot be postpones, than demand is in elastic. The demand for rice or medicine cannot be postponed, while the demand for Cycle or umbrella can be postponed.

### **5. Amount of money spent:**

Elasticity of demand depends on the amount of money spent on the commodity. If the consumer spends a smaller for example a consumer spends a little amount on salt and matchboxes. Even when price of salt or matchbox goes up, demanded will not fall. Therefore, demand is in case of clothing a consumer spends a large proportion of his income and an increase in price will reduce his demand for clothing. So the demand is elastic.

### **6. Time:**

Elasticity of demand varies with time. Generally, demand is inelastic during short period and elastic during the long period. Demand is inelastic during short period because the consumers do not have enough time to know about the change is price. Even if they are aware of the price change, they may not immediately switch over to a new commodity, as they are accustomed to the old commodity.

### **7. Range of Prices:**

Range of prices exerts an important influence on elasticity of demand. At a very high price, demand is inelastic because a slight fall in price will not induce the people buy more. Similarly at a low price also demand is inelastic. This is because at a low price all those who want to buy the commodity would have bought it and a further fall in price will not increase the demand. Therefore, elasticity is low at very him and very low prices.



## **Importance of Elasticity of Demand:**

The concept of elasticity of demand is of much practical importance.

### ***1. Price fixation:***

Each seller under monopoly and imperfect competition has to take into account elasticity of demand while fixing the price for his product. If the demand for the product is inelastic, he can fix a higher price.

### ***2. Production:***

Producers generally decide their production level on the basis of demand for the product. Hence elasticity of demand helps the producers to take correct decision regarding the level of output to be produced.

### ***3. Distribution:***

Elasticity of demand also helps in the determination of rewards for factors of production. For example, if the demand for labour is inelastic, trade unions will be successful in raising wages. It is applicable to other factors of production.

### ***4. International Trade:***

Elasticity of demand helps in finding out the terms of trade between two countries. Terms of trade refers to the rate at which domestic commodity is exchanged for foreign commodities. Terms of trade depends upon the elasticity of demand of the two countries for each other goods.

### ***5. Public Finance:***

Elasticity of demand helps the government in formulating tax policies. For example, for imposing tax on a commodity, the Finance Minister has to take into account the elasticity of demand.

### ***6. Nationalization:***

The concept of elasticity of demand enables the government to decide about nationalization of industries.

## ***What is Supply?***

Supply, in the context of economics, refers to the total amount of a specific good or service that is available to consumers.

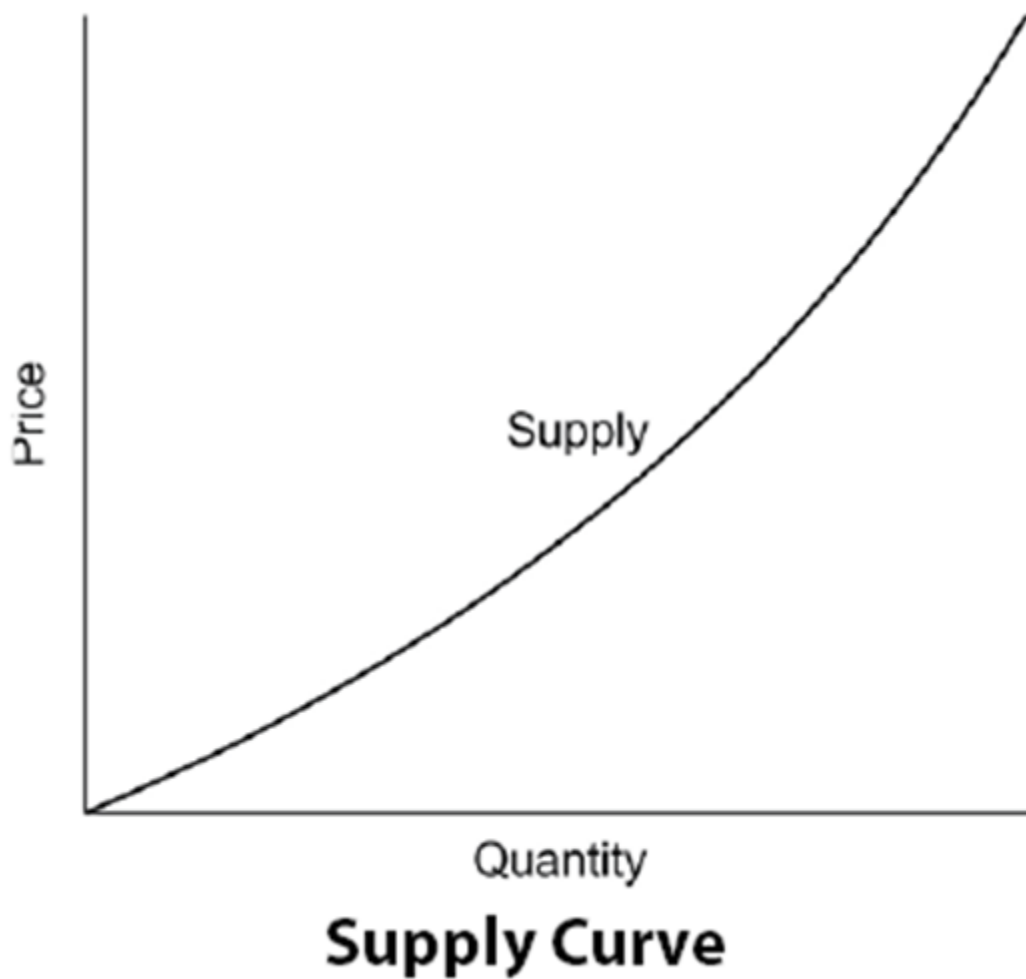
## ***Determinants of Supply***

The supply of a particular commodity in an economy depends on several factors, such as:

- Price of the commodity.
- Price of the other related goods.
- Number of sellers in the market.
- Sellers' price expectations.
- Level of production
- State of technology, etc.

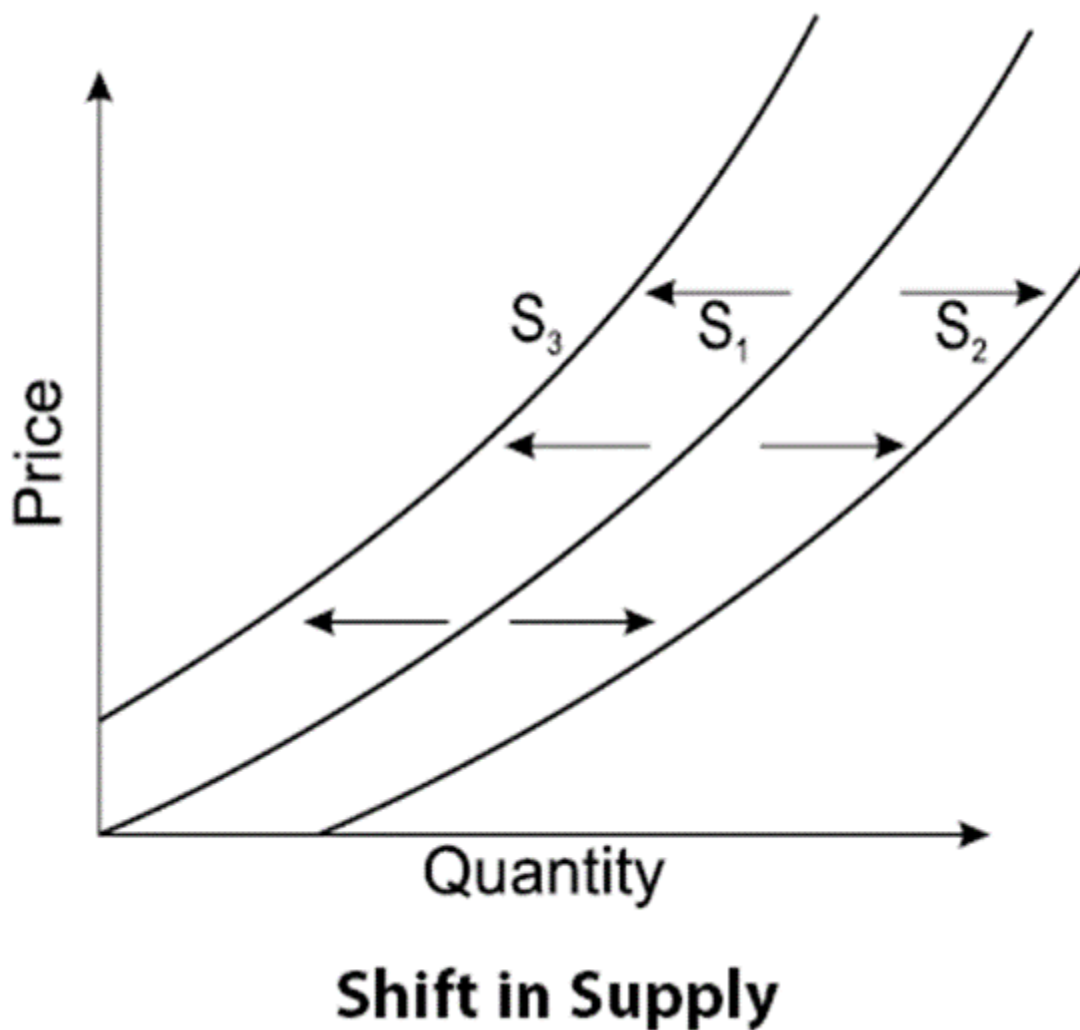
## ***Supply Curve***

- Supply Curve is the graphical representation of the relationship between the price of a commodity and the quantity of the commodity that a seller is willing and able to supply.
- The independent variable (Price) is represented along the Y-axis and the dependent variable (Quantity) is represented along the X-axis.
  - The Supply Curve, usually, rises upward from left to right.



### *Law of Supply*

The Law of Supply states that the other factors remaining constant, **price and quantity supplied** of any good or service are **directly related** to each other. In other words, when the price paid by buyers for a good rises, then suppliers increase the supply of that good in the market.



## *Assumptions to Law of Supply*

The supply of a commodity depends on multiple factors and not just the price. However, in order to put things simply, the Law of Supply makes some assumptions as explained below:

- **Cost of Production Remains Constant:** Any change in the cost of production will change the price of the product and hence its supply in the market. However, the Law of Supply assumes that the cost of production remains constant for the time being.
- **Technology Remains Constant:** Any change in technology used for production will affect the price of the product and hence its supply in the market. Thus, to keep aside this effect, the Law of Supply assumes that the technology employed for production remains constant.

- **Transport Cost Remains Constant:** Any change in transport cost will lead to a change in the total cost of production, thus affecting the supply of a commodity. Hence, the Law of Supply assumes that the transport cost remains constant.
- **Prices of Related Goods Remain Constant:** Any change in the price of the related goods (Substitute Goods and Complementary Goods) would mean that the producer will be inclined to produce the commodity that has a higher price. This will affect the supply of the commodity. Hence, the Law of Supply assumes that prices of related goods remain constant.

## *Price Elasticity of Supply*

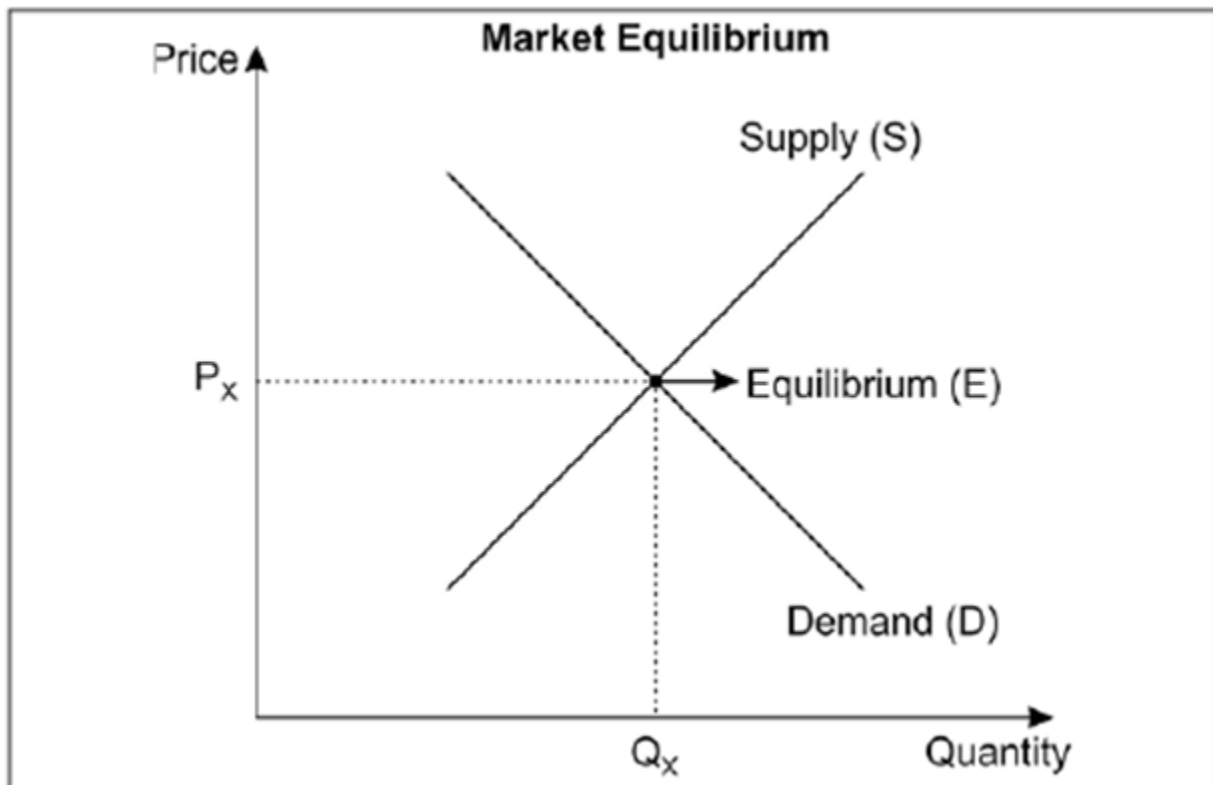
- The Price Elasticity of Supply measures the responsiveness of quantity supplied to changes in the price of any good or service.

$$\text{Price Elasticity of Supply (Es)} = \frac{\% \text{ age change in quantity supplied}}{\% \text{ age change in price}}$$

- There can be the following **types of Price Elasticity of Supply**
  - **Elastic Supply (Es > 1):** Supply is said to be elastic when a given percentage change in price leads to a larger change in quantity supplied.
  - **Inelastic Supply (Es < 1):** Supply is said to be inelastic when a given percentage change in price causes a smaller change in quantity supplied.
  - **Unit Elasticity of Supply (Es = 1):** If the price and quantity supplied change by the same magnitude, then we have unit elasticity of supply.

## *Market Equilibrium*

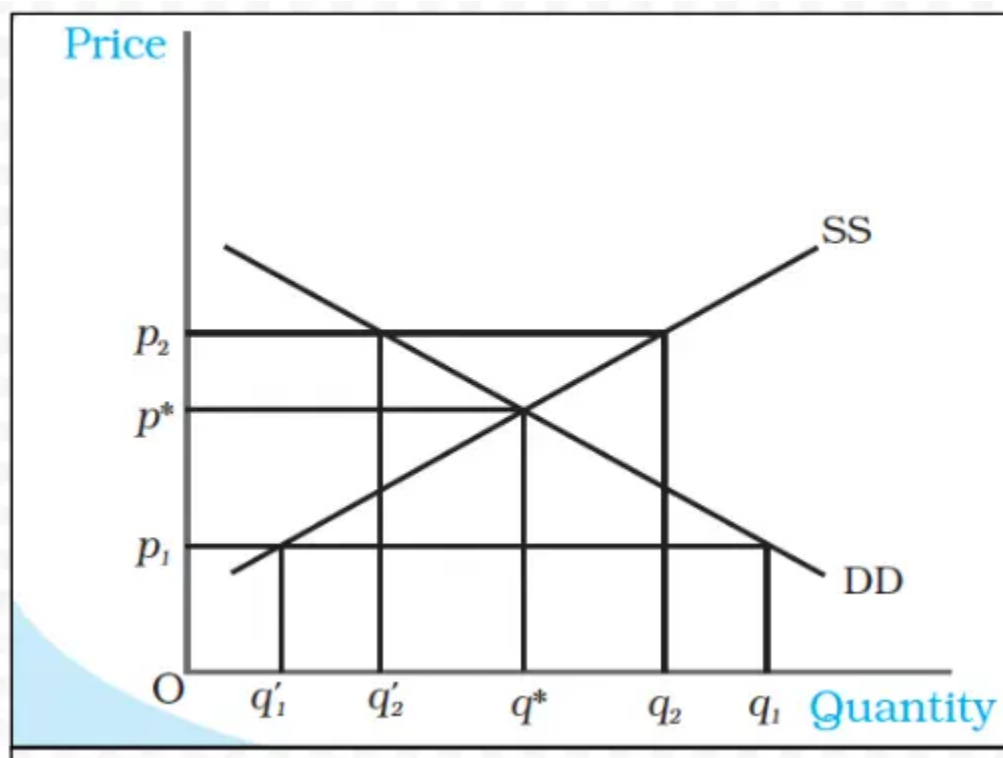
- Market Equilibrium refers to a state in which the **supply** of a particular commodity and its **demand** becomes **equal**.
- The market forces, automatically, drive both the producers and the consumers to the price at which **Demand Curve** and **Supply Curve intersect each other**.
- The price at which the Market Equilibrium is achieved is called the **“Equilibrium Price” or “Market-Clearing Price”**.



## *Shifts in Demand and Supply*

If, for any reason, there is a shift from the equilibrium supply or demand, the market equilibrium gets disturbed. In such cases, market forces, automatically, work in such a manner to bring the supply and demand to a new equilibrium point.

This **automatic mechanism** of the market **to achieve a new equilibrium** point can be seen as follows:



## Excess Demand

If market demand exceeds market supply at a price, excess demand exists in the market at that price.

Suppose, the prevailing price is  $p_1$ , at which the market demand is  $q_1$ , whereas the market supply is  $q_1'$ . Thus, there is **excess demand** in the market, equal to  $q_1 - q_1'$ . Since the supply lags behind the demand in such a situation, **some consumers will be unable to obtain** the commodity or obtain it in insufficient quantity.

Such **consumers will be willing to pay more** than the prevailing price  $p_1$  to get the commodity. This **will increase the market price** of the commodity, thus **reducing its demand and increasing its supply**. As a result, the market moves towards the point where the supply becomes equal to the demand (both  $q^*$ ).

## Excess Supply

If at a given price, the market supply is greater than the market demand, there is an **excess supply** in the market at that price.

Suppose, the prevailing price is  $p_2$ , at which the market supply is  $q_2$ , whereas the market demand is  $q_2'$ . Thus, there is an excess supply in the market, equal to  $q_2 - q_2'$ . Since the demand lags behind the supply in such a situation, **some firms will not be able to sell their goods**.

Such **firms will lower their selling price** to sell the pending inventory. This **will reduce the market price** of the commodity, thus **increasing its demand and reducing its supply**. As a result, the market moves towards the point where the supply becomes equal to the demand (both  $q^*$ ).

The Law of Demand and Supply is fundamental to economic theory, offering essential insights into how markets operate. By explaining the relationship between prices, quantities demanded, and quantities supplied, these principles help explain a wide range of economic phenomena and inform decision-making by consumers, producers, and policymakers alike.



## **Demand Forecasting**

### **Introduction:**

The information about the future is essential for both new firms and those planning to expand the scale of their production. Demand forecasting refers to an estimate of future demand for the product.

It is an 'objective assessment of the future course of demand'. In recent times, forecasting plays an important role in business decision-making. Demand forecasting has an important influence on production planning. It is essential for a firm to produce the required quantities at the right time.

It is essential to distinguish between forecasts of demand and forecasts of sales. Sales forecast is important for estimating revenue cash requirements and expenses. Demand forecasts relate to production, inventory control, timing, reliability of forecast etc. However, there is not much difference between these two terms.

### **Types of demand Forecasting:**

Based on the time span and planning requirements of business firms, demand forecasting can be classified in to

1. Short-term demand forecasting and
2. Long – term demand forecasting.

#### ***1. Short-term demand forecasting:***

Short-term demand forecasting is limited to short periods, usually for one year. It relates to policies regarding sales, purchase, price and finances. It refers to existing production capacity of the firm. Short-term forecasting is essential for formulating a suitable price policy. If the business people expect of rise in the prices of raw materials or shortages, they may buy early. This price forecasting helps in sale policy formulation. Production may be undertaken based on expected sales and not on actual sales. Further, demand forecasting assists in financial forecasting also. Prior information about production and sales is essential to provide additional funds on reasonable terms.

#### ***2. Long – term forecasting:***

In long-term forecasting, the businessmen should know about the long-term demand for the product. Planning of a new plant or expansion of an existing unit depends on long- term demand. Similarly a multi product firm must take into account the demand for different items. When forecast are made covering long periods, the probability of error is high. It is very difficult to forecast the production, the trend of prices and the nature of competition. Hence quality and competent forecasts are essential.

Prof. C. I. Savage and T.R. Small classify demand forecasting into time types. They are 1. Economic forecasting, 2. Industry forecasting, 3. Firm level forecasting. Economics forecasting is concerned with the economics, while industrial level forecasting is used for inter-industry comparisons and is being supplied by trade association or chamber of commerce. Firm level forecasting relates to individual firm.

### **Methods of forecasting:**

#### Methods of Demand Forecasting

1. Survey methods
2. Statistical methods
3. Expert opinion methods
4. Test marketing
5. Controlled experiments
6. Judgmental approach

Statistical method is used for long run forecasting. In this method, statistical and mathematical techniques are used to forecast demand. This relies on past data.

#### 1. Trend projection method:

these are generally based on analysis of past sales patterns. These methods dispense with the need for costly market research because the necessary information is often already available in company files. This method is used in case the sales data of the firm under consideration relate to different time periods, i.e., it is a time – series data. There are five main techniques of mechanical extrapolation.

##### a. Trend line by observation:

this method of forecasting trend is elementary, easy and quick. It involves merely the plotting of actual sales data on a chart and then estimating just by observation where the trend line lies. The line can be extended towards a future period and corresponding sales forecast is read from the graph.

##### b. Least squares methods:

this technique uses statistical formulae to find the trend line which best fits the available data. The trend line is the estimating equation, which can be used for forecasting demand by extrapolating the line for future and reading the corresponding values of sales on the graph.

##### C. Time series analysis:

where the surveys or market tests are costly and time – consuming, statistical and mathematical analysis of past sales data offers another methods to prepare the forecasts, that is, time series analysis.

##### D. Moving average method:

this method considers that the average of past events determine the future events. In other words, this method provides consistent results when the past events are consistent and unaffected by wide changes.

E. Exponential smoothing:

this is a more popular technique used for short run forecasts. This method is an improvement over moving averages method, unlike in moving averages method, all time periods here are given varying weight, that is, value of the given variable in the recent times are given higher weight and the values of the given variable in the distant past are given relatively lower weights for further processing.

a. Barometric Technique:

Simple trend projections are not capable of forecasting turning points. Under Barometric method, present events are used to predict the directions of change in future. g. Simultaneous equation method: in this method, all variable are simultaneously considered, with the conviction that every variable influence the other variables in an economic environment.

a. Correlation and regression methods:

correlation and regression methods are statistical techniques. Correlation describes the degree of association between two variable such as sales and advertisement expenditure. When the two variable tend to change together, then they are said to be correlated.

Expert opinion methods:

Well informed persons are called experts; experts constitute yet another source of information. These persons are generally the outside experts and they do not have any vested interest in the results of a particular survey. As expert is good at forecasting and analysis the future trend in a give product or service at a given level of technology. The service of an expert could be advantageously used when a firm uses general economic forecasting or special industry fore casting prepared outside the firm.

Test marketing:

It is likely that opinions given by buyers, salesman or other experts may be, at times, misleading. This is the reason why most of the manufactures favour to test their product or service in a limited market as test – run before they launch their product nationwide.

Controlled experiments:

Controlled experiment refer to such exercise where some of the major determinants of demand are manipulated to suit to the customers with different tastes and preferences, income groups, and such others, it is further assumed that all other factors remain the same.

Judgmental approach:

When none of the above methods are directly related to the given product or service, the management has no alternative other than using its own judgment. Even when the above methods are used, the forecasting process is supplemented with the factor of judgment for the following reasons

- Historical data for significantly long period is not available

- Turning point in terms of policies or procedures or causal factors cannot be precisely determined
  - Sale fluctuation are wide and significant
  - The sophisticated statistical techniques such as regression and so on, may not cover all the signing.
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### **1. Survey Method:**

Under this method, information about the desires of the consumer and opinion of exports are collected by interviewing them. Survey method can be divided into four type's viz., Option survey method; expert opinion; Delphi method and consumers interview methods.

#### ***a. Opinion survey method:***

This method is also known as sales-force composite method (or) collective opinion method. Under this method, the company asks its salesman to submit estimate of future sales in their respective territories. Since the forecasts of the salesmen are biased due to their optimistic or pessimistic attitude ignorance about economic developments etc. these estimates are consolidated, reviewed and adjusted by the top executives. In case of wide differences, an average is struck to make the forecasts realistic.

This method is more useful and appropriate because the salesmen are more knowledge. They can be important source of information. They are cooperative. The implementation within unbiased or their basic can be corrected.

#### ***B. Expert opinion method:***

Apart from salesmen and consumers, distributors or outside experts may also e used for forecasting. In the United States of America, the automobile companies get sales estimates directly from their dealers. Firms in advanced countries make use of outside experts for estimating future demand. Various public and private agencies all periodic forecasts of short or long term business conditions.

#### ***C. Delphi Method:***

A variant of the survey method is Delphi method. It is a sophisticated method to arrive at a consensus. Under this method, a panel is selected to give suggestions to solve the problems in hand. Both internal and external experts can be the members of the panel. Panel members one kept apart from each other and express their views in an anonymous manner. There is also a coordinator who acts as an intermediary among the panelists. He prepares the questionnaire and sends it to the panelist. At the end of each round, he prepares a summary report. On the basis of the summary report the panel members have to give suggestions. This method has been used in the area of technological forecasting. It has proved more popular in forecasting. It has provided more popular in forecasting non-economic rather than economic variables.

#### ***D. Consumers interview method:***

In this method the consumers are contacted personally to know about their plans and preference regarding the consumption of the product. A list of all potential buyers would be drawn and each buyer will be approached and asked how much he plans to buy the listed product in future. He would be asked the proportion in which he intends to buy. This method seems to be the most ideal method for forecasting demand.

#### **2. Statistical Methods:**

Statistical method is used for long run forecasting. In this method, statistical and mathematical techniques are used to forecast demand. This method relies on past data.

##### ***a. Time series analysis or trend projection methods:***

A well-established firm would have accumulated data. These data are analyzed to determine the nature of existing trend. Then, this trend is projected in to the future and the results are used as the basis for forecast. This is called as time series analysis. This data can be presented either in a tabular form or a graph. In the time series past data of sales are used to forecast future.

##### ***b. Barometric Technique:***

Simple trend projections are not capable of forecasting turning points. Under Barometric method, present events are used to predict the directions of change in future. This is done with the help of economics and statistical indicators. Those are (1) Construction Contracts awarded for building materials (2) Personal income (3) Agricultural Income. (4) Employment (5) Gross national income (6) Industrial Production (7) Bank Deposits etc.

##### ***c. Regression and correlation method:***

Regression and correlation are used for forecasting demand. Based on past data the future data trend is forecasted. If the functional relationship is analyzed with the independent variable it is simple correlation. When there are several independent variables it is multiple correlation. In correlation we analyze the nature of relation between the variables while in regression; the extent of relation between the variables is analyzed. The results are expressed in mathematical form. Therefore, it is called as econometric model building. The main advantage of this method is that it provides the values of the independent variables from within the model itself.