Notes of ENGINEERING ECONOMICS by Dr. ANAND KUMAR

According to Latest Syllabus of UPTU

NHU-501: ENGINEERING ECONOMICS

UNIT I

1.1 Introduction to Engineering Economics and Managerial Economics
1.2 Concept of Efficiency,
1.3 Theory of Demand,
1.4 Elasticity of Demand,
1.5 Supply and Law of Supply,
1.6 Indifference Curves,
1.7 Budget Line,
1.8 Welfare Analysis,
1.9 Scope of Managerial Economics,
1.10 Techniques and Applications of Managerial Economics.

1.1 INTRODUCTION TO ENGINEERING ECONOMICS AND MANAGERIAL ECONOMICS

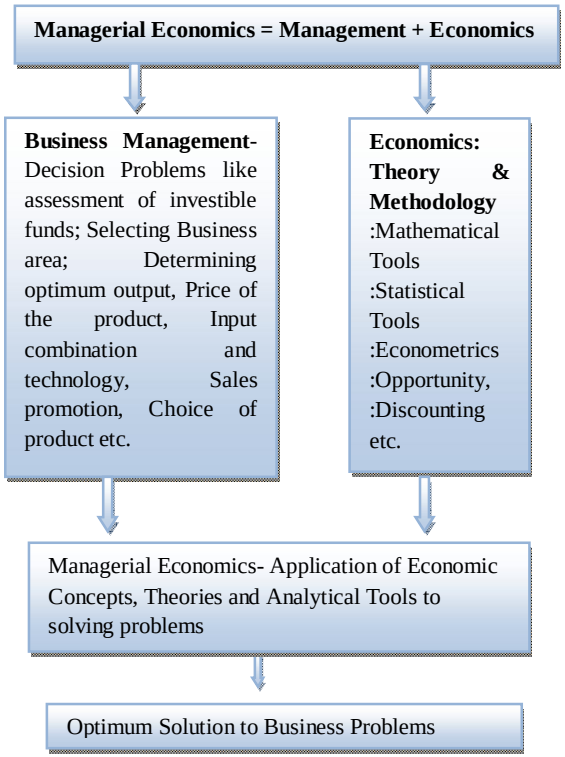
Managerial Economics

Managerial economics is that part of economic knowledge, logic, theories and analytical tools that are used for rational business decision-making. It is viewed as a special branch of economics bridging the gap between pure economics theory and managerial practice. It concentrates the decision process under uncertainties of sales, costs, capital conditions and profits and improves effectiveness of the organization. The basic purpose of managerial economics is to show how economic analysis (theories) can be used in formulating business plans.

Definition:

According to *Spencer and Seigalman*: "Managerial economics is the integration of economic theory with business practice for the purpose of facilitating decision-making and forward planning by management".

In the words of *Davis and Chang*: "Managerial economics applies the principles and methods of economics to analyze problem faced by management of a business, or other types of organizations and to help find solutions that advance the best interests of such organizations**".**



Diagrammatical representation of relationship between economics, management and managerial economics.

1.2 CONCEPT OF EFFICIENCY

Definition of 'Economic Efficiency' A broad term that implies an economic state in which every resource is optimally allocated to serve each person in the best way while minimizing waste and inefficiency. When an economy is economically efficient, any changes made to assist one person would harm another.

Example: Imagine a group of children playing together. In this group, there are 5 children. In the small room where they are playing, there are exactly five toys. This means, that each child gets one toy. This also means that there is an equal amount of toys and children. If you take away one toy and give it to another child (outside the room), everything is no longer equal. In doing this, one child benefited at the expense of another child. Therefore, there is no longer a state of **economic efficiency**.

They are as follows:

1. Production of goods is at its lowest costs.
2. One person cannot be helped by means of reallocating the goods without making another person worse off.
3. It indicates that there has been a balance between loss and benefit.

Economic efficiency is a term typically used in microeconomics when discussing product. Production of a unit of good is considered to be economically efficient when that unit of good is produced at the lowest possible cost. There are two concepts of efficiency: **Technological efficiency** occurs when it is not possible to increase output without increasing inputs. **Economic efficiency** occurs when the cost of producing a given output is as low as possible.

Technological efficiency is an engineering matter. Given what is technologically feasible, something can or cannot be done. Economic efficiency depends on the prices of the factors of production. Something that is technologically efficient may not be economically efficient. But something that is economically efficient is always technologically efficient.

There are different types of efficiency

1. **Productive efficiency:** This occurs when the maximum number of goods and services are produced with a given amount of inputs. Productive efficiency will also occur at the lowest point on the firms average costs curve.
2. **Allocative efficiency:** This occurs when goods and services are distributed according to consumer preferences. An economy could be productively efficient but produce goods people don't need this would be allocative inefficient.
3. **X inefficiency:** This occurs when firms do not have incentives to cut costs, for example a monopoly which makes supernormal profits may have little incentive to get rid of surplus labour. Therefore a firms average cost may be higher than necessary.
4. **Efficiency of scale:** This occurs when the firm's produces on the lowest point of its Long run average cost and therefore benefits fully from economies of scale.
5. **Dynamic efficiency:** This refers to efficiency over time for example a Ford factory in 1920 would be very efficient for the time period, but by comparison would now be inefficient. Dynamic efficiency involves the introduction of new technology and working practices to reduce costs over time.
6. **Social efficiency:** This occurs when externalities are taken into consideration and occurs at an output where the social cost of production (SMC) = the social benefit (SMB)
7. **Technical efficiency:** Optimum combination of factor inputs to produce a goods related to productive efficiency.
8. **Pareto efficiency:** A situation where resources are distributed in the most efficient way. It is defined as a situation where it is not possible to make one party better off without making another party worse off.
9. **Distributive efficiency:** Concerned with allocating goods and services according to who needs them most. Therefore, requires an equitable distribution.

1.3 THEORY OF DEMAND:

Generally people refer to the want or the desire for a thing as demand. But mere desire for a thing is not demand in economics. Demand in economics means effective demand which can be defined as a desire backed up by willingness and ability to pay for particular period. Therefore the demand constitutes three important things.

(1) Effective Desire for a commodity
(a) Willingness to buy
(b) Ability to pay
(2) A point of time
(3) At given price

According to *Hansen*, "By demand we mean the quantity of a commodity that will be purchase at a particular price and not merely the desire of a thing."

Law of Demand

The law of demand is based on the law of diminishing marginal utility. This law states the relationship between the quantity demanded and the price, which states that as the price of the commodity increases, the demand for that goods decreases

and vice versa. ***Marshall*** explains the laws as *"The amount demanded increases with a fall in price and diminishes with the rise in price".*

Definitions -

According to *Samuelson* "Law of demand states that people will buy more at lower prices and buy less at higher prices, ceteris paribus"

According to *Ferguson* "The quantity demanded varies inversely with the price"

Assumption of the Law

The law of demand is based upon certain assumption. Which are as follows:

1. There should be no change in the income of the consumers.

2. There should be no change in the tastes and preferences of the consumers, because the law of demand applies only when the tastes and preferences of the consumers remain constant.

3. There should be no change in the price of the related goods.

4. There should be no change in the size of the population.

5. There should be an equal distribution of the wealth.

Explanation of the Law - The law of demand state that there is an inverse relationship between the price and the demand for the commodity. This can be explained with the help of demand schedule and demand curve.

Demand Schedule - Demand Schedule refers to the response of amount demanded to a change in the price of the commodity, it is a tabular representation of the various prices at which different quantities are demanded. It is of two types.

1. Individual Demand Schedule

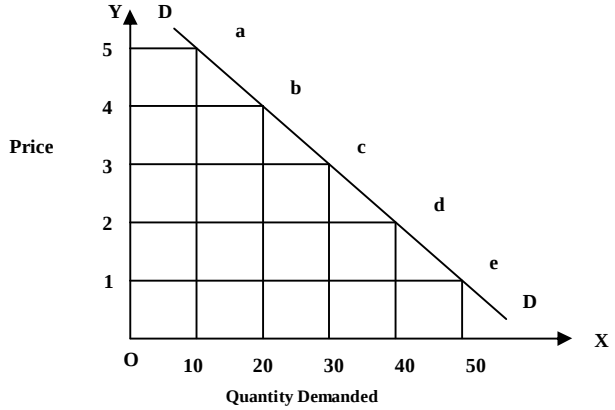
2. Market Demand Schedule

Individual Demand Schedule - Considering other things being equal individual demand schedule refers to the quantities of the commodities demanded by the consumers at various prices.

Price per Unit (P)	Quantity Demanded (Q_d)	Points (Relationship between P & Qd)
5	10	a
4	20	b
3	30	c
2	40	d
1	50	e

It is clear from the table that as the price of the commodities decreases from Rs.5 to Rs.1 the quantity demanded goes on increasing from 10 to 50. As it is apparent that when the price was Rs.5 the quantity demanded were 10 units and as the price decreases to Rs.1 the quantity demanded increases to 50 Units.

Individual Demand Curve - Individual demand curve refers to the quantity demanded by the consumers at different levels of price. It is a graphical representation of the various prices and the quantity demanded at that those prices. This has been shown by the graph given below



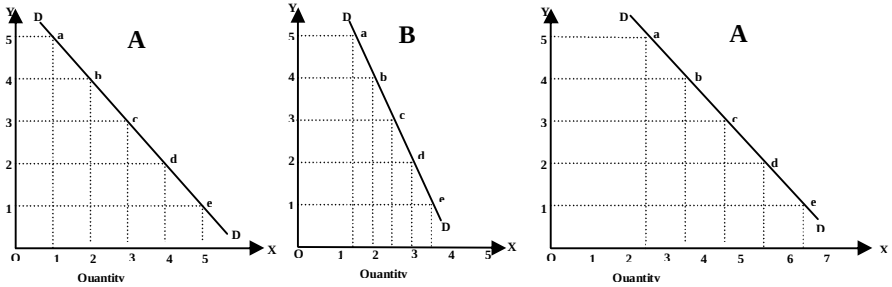
In the above given figure quantity has been shown on X-axis while price has been shown on Y-axis. DD is the demand curve. The points a, b, c, d, e, shows the price quantity relationship. The graph shows that when the price was Rs.5 the quantity demanded was10 units and no sooner, the price decrease to Rs.1 the quantity demanded increases to 5O units. The demand curve slopes downward from left to right, which indicates that there is an inverse relation between price and quantity demanded.

Market Demand Schedule - Market demand is the sum of the demands of all individuals in a given period of time. Thus, market demand is the summation of collective demand of all persons of a homogeneous commodity. Given below is the market demand schedule and demand curve.

Price per Unit (**P**)	Quantity Demanded by A Q_A	Quantity Demanded by B Q_B	Total Market Demand (A+B) $Q_M = Q_A+Q_B = Q_{(A+B)}$
5	10	15	25
4	15	20	35
3	20	25	45
2	25	30	55
1	30	35	65

In table given above, total market demand is obtained by adding the quantity demanded by A and B. Here to we can say that like individual demand, market demand also depicts the negative correlation between price and quantity demanded.

Market Demand Curve - It is a graphical representation of the total market demand which is obtained by the summation of the various individual demand of a homogenous product in the market.



The market demand curve is the horizontal summation of all individuals' demands for the commodity. In the above graphs A and B shows the individual demand curves. D1D1 and D2D2 are the demand curve for the consumers A and B and the market demand curve is DD. It is also assumed that there are two consumers in the market facing same prices of the commodity but they purchase according to their individual requirement. When we combine these points we will get Market Demand Curve.

Demand Function- The demand function for a commodity describes the relationship between quantities of the commodity which consumers demand during a specific period and the factors which influence its demand in mathematical terms. The demand function of the goods can be expressed as follows.

Dx = f (Y, Px, Ps, Pc, T, Ep, Ey, N, D, U)

Where

Dx = Demand for good x; Y = Consumers Income; Px = Price of Good x; Ps = Price of substitute for x

Pc = Price of complements of x; T = Measure of consumers tasted and preferences

Ep =Consumers expectation about the future prices; Ey = Consumers expected future income;

N = Number of Consumers; D= Distribution of consumers; U= Other determinants of Demand X

The Demand function is nothing but it shows the relationship between demand of the products and its various determinants. When these factors which affect the demand function are expressed mathematically it will take the form of demand function.

Individual demand function:

Individual demand function for a commodity can be expressed in the following general form:

$$Q_d = f(P_x, I, P_r, T, A) \text{ ---------- (1)}$$

Where P_X = Own price of the commodity X

I= Income of the individual

P_r= Prices of related commodities

T= Tastes and preferences of the individual consumer

A= Advertising expenditure made by the producers of the commodity.

$$Q_d = f(P_x) \text{ ---------- (2)}$$

This implies that quantity demanded of goods X is function of its own price, other determinants remaining constant.

Generally, demand function is considered to be of a linear form. The specific demand function of a linear form is written as

$$Q_d = a - b P_x \text{ ---------- (3)}$$

Where **a** constant intercept term on the X-axis and **b** is the co-efficient negative implies that there is a negative relationship between price and quantity demanded of a commodity.

$$Q_d = 70 - 5P \text{ ---------- (4)}$$

The above demand equation (4) is interpreted as one rupee fall in price of sugar will cause its quantity demanded to increase by 5 units of sugar and vice-versa.
It is this demand function that we have plotted on a graph and shown in figure,
Demand schedule of an individual consumer,

Price (Rs.) **P**	Quantity demanded Q_d	Points at **P** & Q_d are intersects to each other
12	10	a
10	20	b
8	30	c
6	40	d
4	50	e
2	60	f

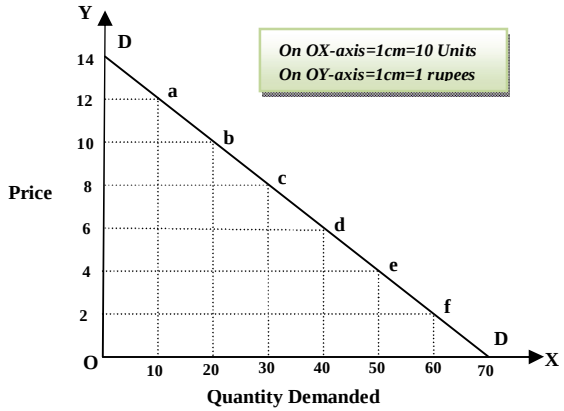


Figure: The demand curve of an individual ***(Q_d = 70-5P)***

By plotting 10 units of the commodity against price 12, we get (**a**) point a in above figure, likewise other points are plotted representing other combinations of price and quantity demanded of the commodity and are shown in above figure, by joining these various points, we get a curve a DD, which is known as the demand curve. Thus, this demand curve is a graphic representation of quantities of a good which will be demanded by the consumer at various possible prices in a given period of time. The demand curve is downward-slope due to inverse relationship between price and demand.

Individual demand function and market demand function.

Q_A =40-2P---------- (1)

Likewise, demand functions of individual B and C are as under:

Q_B =25.5-0.75P---------- (2)

Q_C =36.5-1.25P---------- (3)

Note that market demand (QM) is the sum of the demands of individuals who want to purchase the commodity.

Thus,

$Q_M = Q_A + Q_B + Q_C$ =40.0-2P +25.5-0.75P +36.5-1.25P = 102-4P

If P is in rupees, the market demand function shows that the commodity by one rupee will result in fall in the quantity demanded by 4 units.

Why Demand Curve Slopes Downwards - There are several reasons responsible for the downwards sloping of the demand curve. Some of the reasons are listed below.

1. **Law of Diminishing Marginal Utility** - The law of demand is based on the law of diminishing marginal utility which states that as the consumers purchases more and more units of the commodity, the utility derived from each successive units goes on diminishing.
2. **Substitution Effect** - In this as the price of a commodity falls, prices of its substitute goods remain the same, the consumer will buy more of that commodity.
3. **Income Effect** - As per the income effect, it is found that as the price of the commodity falls the real income of the consumer goes up. Real income is that income which is measured in terms of goods and services. Therefore no sooner the income of the consumers rises they purchase other goods also and the demands of that particular commodity falls which was earlier consume by the consumers.
4. **New Consumers** - When the price of a commodity falls, many others consumers who were not consuming that commodity previously will start to consume the commodity, as a result the total market demand goes up.
5. **Several Uses** - Some commodities can be put to several uses which lead to downward slope of the demand curve. When the price of such commodities goes up they will be used for important purpose so their demand will be

limited. On the other hand when the price falls the commodity will extend its demand.

6. Psychological Effects - When the price of the commodity falls, people favour to buy more which is natural and psychological. Therefore the demand increases with the fall in prices.

Importance of Law of Demand

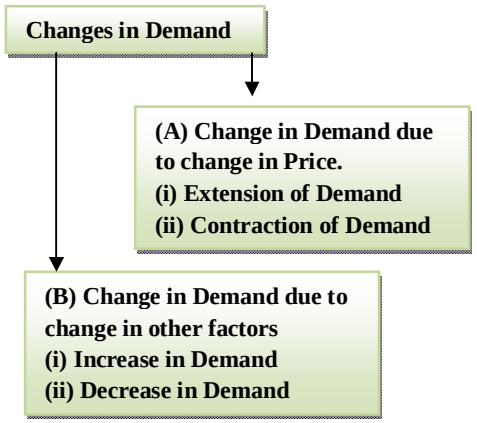
1. Price Determination - A monopolist gets the help of law of demand in fixing his price. He is able to know how much amount demanded for his commodity shall go up or down with the change in price. The demand schedule tells him the demand at different prices in the whole market. He is able to decide the most profitable amount of output for himself.

2. Helpful to Finance Minister - The Finance Minister also takes the help of the Law of Demand. The Finance Minister can know the effect of his taxes on the amount demanded for different commodities. If increasing the rate of taxation of a commodity reduces its sale to a large extent, it is not good policy to tax this commodity. Only such commodities should be taxed as have relatively inelastic demand.

3. Important for Planning - The demand schedule has a great importance for the Planning Commission, which while framing the plan, keeps in mind not only the demand schedule but also the effect of prices on a commodity. In such cases it is necessary to know whether a given change in the price of the commodity will have the desired effect on the demand for commodity within the country or abroad. This can be known from the study of the demand schedules for the commodity.

4. Importance for the Producers- The law of Demand provided guidelines to the producers regarding the production of those goods whose prices have been reduced. Generally the law of demands states that other things being equal with the rise in price, quantity demanded falls and with the fall in prices, quantity demanded increase.

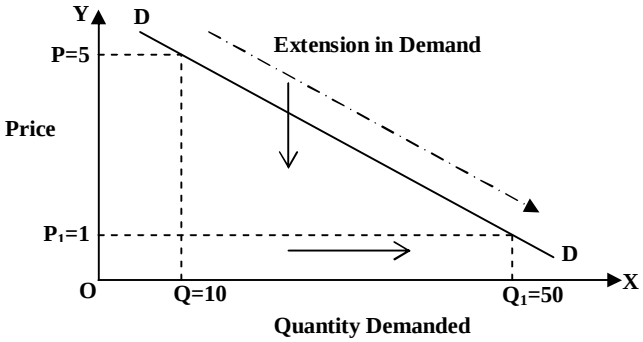
Analysis of Change in Demand - Variation in demand means change in demand of a commodity due to change in the prices as well as change in factors. This has been depicted as follows.



(A) Change in Demand Due to Change in Price - In this case there will be extension and contraction of demand, which are as follows.

1. Extension of Demand - Extension of demand refers to a situation in which there is an extension of demand due to reduction in the prices of the goods.

Price **P**	Quantity Demanded (Q_d)
5	10
1	50

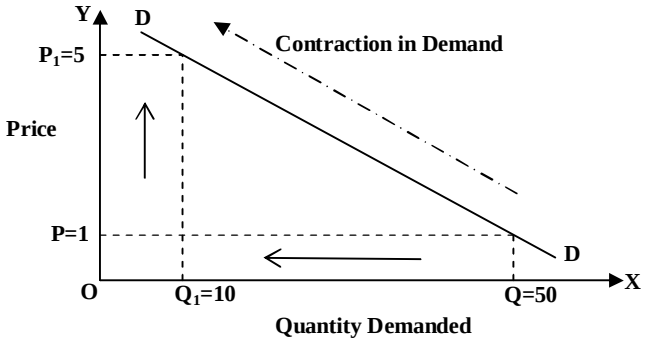


The above chart depicts that when the price of the commodity falls to Rs. 1 the quantity demanded increase to 50 units. In the graph draw above DD is the demand curve. When the price is Rs. 5, quantity demanded is 10kg and the consumer at Point A. When the price falls to Rs.1, demands extends to 50 kg and the consumer

move to point B. Movement along the demand curve from A to B is the extension of demand.

2. Contraction of Demand - Contraction of demand refers to a fall in demand due to rise in prices.

Price **P**	Quantity Demanded (Q_d)
1	50
5	10

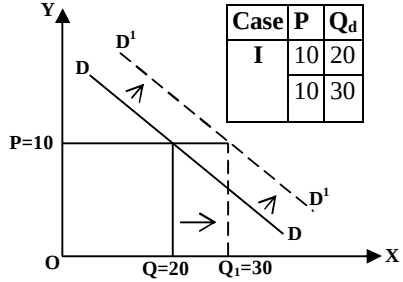


It is clear from the above given table and the graph that when the price of the commodity is increased there is decrease in the quantity demand of that commodity, as it is apparent that when price was Rs.1 the demand was 5 units and as soon the price increases to Rs.5 the quantity demanded diminishes to 1 units. In the graph DD is the demand curve, where in the demand has been shown on X axis and Price on the Y axis. Due to the change in the price of the commodity the consumers moves to a point movement along the demand curve from the lower point i.e. from B to a higher point i.e. A, which is called contraction in demand.

Change in Demand Due to Change in Other Factor -There are various factors other than price, which affect the demand in the market like fashion, customs, habits etc. and the effect of change in those factors results in:

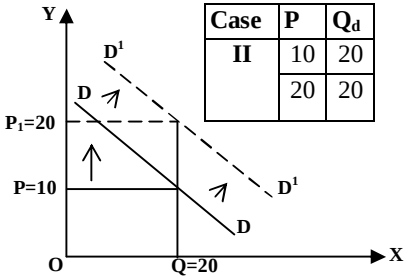
1. Increase in Demand - Increase in demand refers to a situation when there is more demand at the same price or the same demand at higher prices. In such a case, there will be a shift in demand curve in the upward direction.

I: When P constant & Q increases;



Case	P	Q_d
I	10	20
	10	30

II: When P increases & Q constant

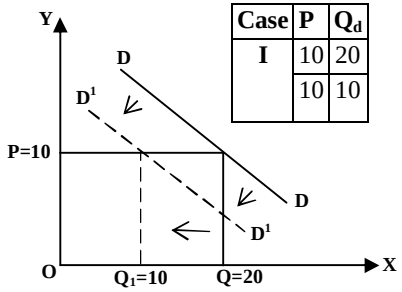


Case	P	Q_d
II	10	20
	20	20

It is clear that in the first case there is same price i.e. Rs.10 but initially the demand is 20, which increases to 30. In the second case, we see that when price changes i.e. increases from Rs.10 to Rs.20, demand remains the same. Thus same price more demand and more price but the same demand. In both the cases we call it increase in demand; in the graph given DD is the original demand curve. When the price of a commodity is OP_1 the consumer is at point OQ_1. Now due to change in any factor other than price, the demand curve shifts to D^1D^1. New demand curve indicates that the price being same the demand for commodity increases from OQ to OQ_1. In the same way, the demand curve signifies that as the price increases i.e. from OP to OP_1 the demand remains the same.

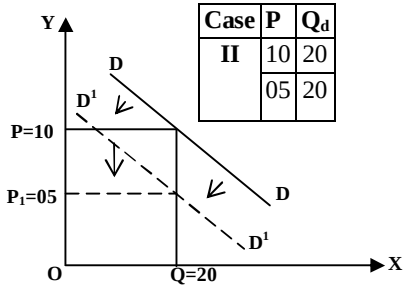
2. Decrease in Demand - Decrease in demand means that either less quantity is demanded at the same price or same quantity at a lower price. In such case the demand curve shifts downward.

I: When P constant & Q decreases;



Case	P	Q_d
I	10	20
	10	10

II: When P decreases & Q constant



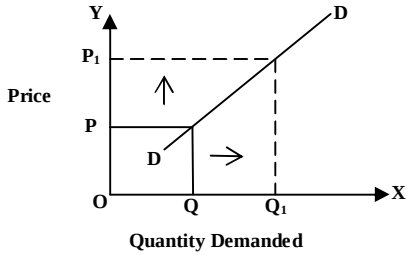
Case	P	Q_d
II	10	20
	05	20

The table shows that in first case when there is same price, demand for a commodity shifts downward from 20 to 10. This is called decrease in demand. On the other hand in the second case, we see that as price decreases from Rs.10 to Rs.5, demand for a commodity remains constant. This is also the same type of situation of decrease in demand. The graph shows DD which is the original demand curve. The demand curve signifies the fact that at the same price demand decreases OQ to OQ_1 at the same price of OP. When the price of a commodity is OP, the demand for a commodity is OQ. Now suppose due to change in factors, the demand curve shifts to D^1D^1 which indicates the situation of decrease in demand.

EXCEPTION TO THE LAW:

The law of demands state that when the price falls the quantities demanded increase and with the rise of price the demand decrease, ceteris paribus. But there are certain exceptions to this law, in certain cases with the increase in price, quantity demanded also increases and with the fall in price quantity demanded is also decreases. In such a case demand curve slopes upward from left to right. It is called the positive slope. ***Robert Giffen*** was the first person to expose this rare occasion which is also known as ***GIFFEN's Paradox***. Sir Robert Giffen who observed that when price of bread increased, the low paid British workers in the early 19th century purchased more bread and not less of it and this is contrary to the law of demand described, above. The reason given for this is that these British workers consumed a diet of mainly bread and when the price of bread went up they were compelled to spend more on given quantity of bread. Therefore, they could not afford to purchase as much meat as before. Thus, they substituted even bread for meat in order to maintain their intake of food. The graph given below shows the direct relationship between the price and demand.

GIFFEN's Paradox



In the given graph, DD is the positive sloping demand curve. When the price is OP the quantity demanded is OQ. As the price rises to OP_1 quantity also rises to OQ_1. Therefore the positive sloping demand curve shows the direct relationship between price and demand.

According to *Prof. Benham*, there are certain circumstances in which the demand curve may slope upward which are summaries as under.

1. **War and Emergency** - During the period of war, if there is a fear of shortage people may start buying for hoarding and building stocks, even at high prices. On the other hand if there is a depression they will buy less at low prices.
2. **Articles of Distinction** - Articles of distinction command more demand when their prices are high. It includes jeweler, diamonds, gems, etc. The rich people demand more of such commodities even at high prices. In case their price goes down, they no longer remain the articles of distinction and so have less demand.
3. **Ignorance** - Sometimes, people buy more of a commodity at a higher price out of sheer ignorance.
4. **Purchase in Anticipation** - It has been noticed that sometimes people buy more at a higher price in anticipation of further rise in prices and the consequent expectation of profit in the future.
5. **Necessities of Life** - In case of necessaries like wheat, rice, and cloth people purchase more at a higher rate. Therefore the demand for such commodities is inelastic.

Classification of Demand

1. **Price Demand** - Price demand refers to the various quantities of commodity which the consumers will buy per unit at a certain prices. The quantity demanded changed with the change in price. There is an inverse relationship between the price and the quantity demanded.
2. **Income Demand** - The income demand indicates the relationship between the income and the demand of the consumers. The income demand shows how much quantity a consumer will buy at different levels of his income. Generally there is a positive relationship between the income and the demand. But in case of inferior goods the relationships between the goods become negative.
3. **Cross Demand** - Cross demand refers to the relationship between the quantity demanded of good A and the price of the related goods B, other things remaining the same. Therefore from cross demand we mean the change in the quantity demanded of a commodity without any change in its price but due to the change in the price of related goods i.e. goods B.

4. **Direct and Indirect Demand** - The demand for consumers goods which satisfies human wants is called direct demand whereas when the same goods satisfies human wants indirectly, it is known as indirect demand. The demand for a factor of production is a case of indirect demand.
5. **Joint and Composite Demand** - The demand for one commodity leading to the demand for another commodity is known as composite demand. For example demand for pen and ink. On the other hand demand is said to be composite when a thing is demanded for two or many other purposes. The demand for coal and rubber is composite as they are used for many purposes.

DETERMINANTS OF DEMAND OR FACTORS AFFECTING DEMAND:

1. **Price of Commodity**
2. **Price of Related Goods:** These goods are two types, viz substitute goods and complementary goods. Substitute goods are those which can replace each other in use like tea and coffee while the complementary goods are those which are jointly demanded as petrol and car.
3. **Income of the Consumers** - The demand for the normal goods rises, with an increase in income and falls with a fall in income. In case of inferior goods the demand falls with an increase in income and arises with decreases in income.
4. **Distribution of Wealth** - If there is an equal distribution of wealth in the society; the demand will be higher and in case of inequality demand will be less.
5. **Tastes and Preferences** - Tastes and preferences of the consumers also influences the demand to a greater extent they include fashions, habits, customs and advertisements, climate etc.
6. **Government Policies** - The government imposes taxes on various commodities which lead to an increase in the prices of the commodities.
7. **State of Business** - If the country is passing through the period of boom, there will be an increase in the market demand. During the period of depression, the market demand will be on the lower side.
8. **Population Growth** - Increase in population leads to an increase in demand for types of goods whereas decrease in population means less demand for such commodities.

1.4 ELASTICITY OF DEMAND:

Concept of Elasticity:

Elasticity is the proportional (or percent) change in one variable due to the proportional change in another variable. The formula for elasticity is:

$$e = \frac{\text{Percentage change in x}}{\text{Percentage change in y}}$$

Elasticity can either be a positive or a negative value.

Concept of Elasticity of Demand (e_d):

Elasticity of demand is defined as the percentage change in quantity demanded caused by one-percent change in the demand determinant (e.g. price of the product, income of the consumer) under consideration, keeping other determinants constant.

$$e_d = \frac{\%\ \text{change in Quantity Demanded } (Qd)}{\%\ \text{change in Demand Determinant}}$$

$(Px,\ I,\ Pr,\ T,\ A,\ Y,\ Ep,\ D,\ N,\ \text{etc.})$

However elasticity of demand is mainly of four types.

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

PRICE ELASTICITY OF DEMAND

Price elasticity of demand is defined as the percentage change in quantity demanded of a product due to the percentage change in its price, other things remaining constant. It can also be denoted as:

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

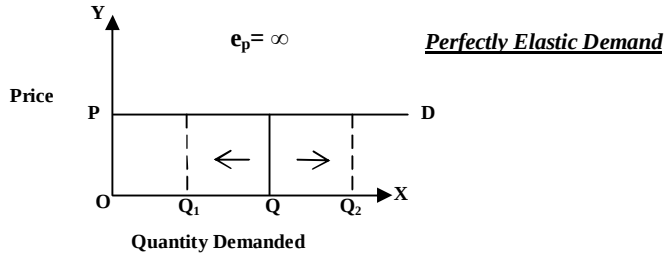
$$e_p = \frac{\frac{\Delta q}{q} \times 100}{\frac{\Delta p}{p} \times 100} = \frac{\Delta qp}{\Delta pq}$$

Assume that the demand for petrol reduces by 2% as a result of an increase in petrol prices by 10%. The price elasticity of demand for petrol is:

$$\frac{-2\%}{10\%} = -0.20$$

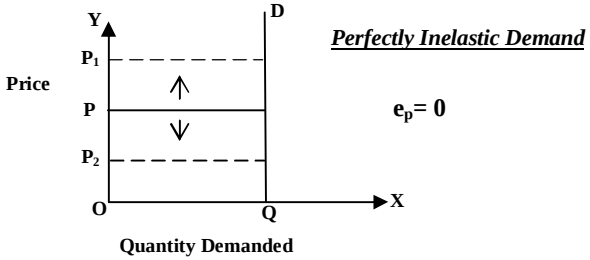
Degrees of Price Elasticity - Different commodities have different price elasticity's. Some of the degrees are discussed below.

1. Perfectly elastic demand –Perfectly elastic demand is said to happen when a little change in price leads to an infinite change in quantity demanded. A slight fall in price will attract more consumers but the elasticity of demand will remain infinite.



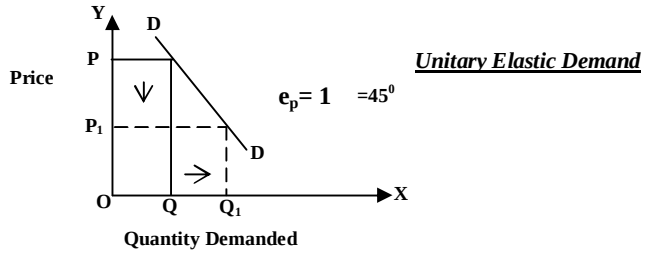
In the adjacent grapn quantıty and price has been shown on X and Y-axis. The graph shows that at the ruling price OP the demand is infinite. A slight rise in price will contract the demand to zero. A slight fall in price will attract more consumers but the elasticity of demand will remain infinite.

2. Perfectly Inelastic Demand - Under perfectly inelastic demand, irrespective of any rise or fall in price of a commodity the quantity demanded remains the same. In this case, the elasticity of demand will be equal to zero. However, it is difficult to mark such rare occasion because even the demand for essentials of life does show degree of responsiveness to change in price.



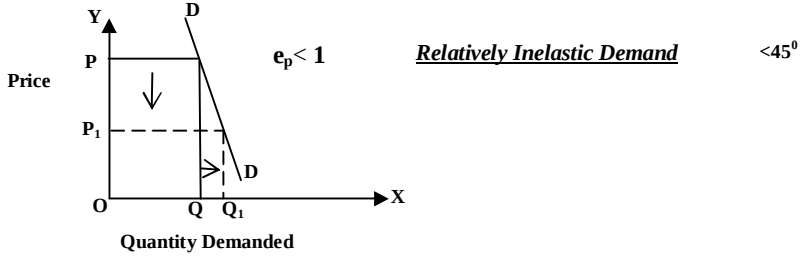
In the adjacent graph quantity and price has been shown on X and Y axis. DD shows the perfectly inelastic demand. At price OP, the quantity demanded is OQ. When the price falls to OP_2 from OP, the demand remains the same. However, it is difficult to mark such rare occasion because even the demand for essentials of life does show degree of responsiveness to change in price.

3. Unitary Elastic Demand - The demand is said to be unitary elastic when a given proportionate change in the price level brings about an equal proportionate change in the quantity demanded. The elasticity of demand in this case is exactly one.



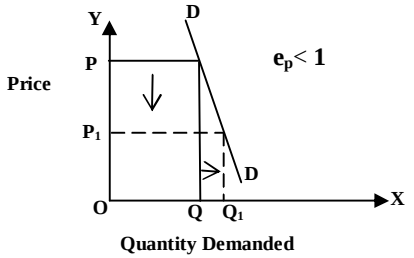
In the adjacent graph quantity and price has been shown on X and Y-axis. DD shows the unitary elastic demand. When the price is OP, the quantity demanded is OQ. Now the price falls to OP_1, the quantity demanded increases to OQ_1. The graph shows that there is a proportionate change in quantity demanded due to proportionate change in the price of the goods.

4. Relatively Elastic Demand – Relatively elastic demand refers to situation in which a small change in price leads to a big change in quantity demanded. In such a case the elasticity of demand is said to be more than one.



In the adjacent graph quantity and price has been shown on X and Y axis. DD is the demand curve, which indicates that when price is OP the quantity demanded is OQ and when the price falls from OP to OP_1 the quantity demanded increases to OQ to OQ_2 i.e. quantity demanded changes more than change in price.

5. Relatively Inelastic Demand - Under the relatively inelastic demand a given percentage change in price produces a relatively less percentage change in quantity demanded, in such a case elasticity of demand is said to be less than one. But this change is relatively less.



In the adjacent graph quantity and price has been shown on X and Y axis. DD is the demand curve which shows relatively inelastic demand. When the price falls from OP to OP_1 quantity demanded also increases from OQ to OQ_1. But this change is relatively less.

Factors Determining Elasticity of Demand

1. Necessaries of Life - For necessaries of life demand are elastic or inelastic because people buy the required amount of goods whatever their prices. For example necessaries such as rice, salt, cloth are purchased whether they are costly or cheap.

2. Substitutes - Demand is elastic for those goods which have substitute and inelastic for those goods which have no substitute. For example tea and coffee are substitutes. The change in the price of tea affects the demand for coffee, hence the demand for every purpose.

3. Number of Use - Demand is elastic; if a commodity has more uses and inelastic if it has only one use.

4. Price Level - The demand is elastic for moderate prices but inelastic for lower and higher prices. The rich and poor do not bother about the prices of the goods that they buy. For example rich buy silk and diamonds etc. at any price. But the poor buy coarse cloth etc. whatever their prices may be.

5. Income Level - The demand is inelastic for higher and lower income groups and elastic for middle income group.

6. Time period: Demand is more elastic in the long run than in the short run. Longer the time period considered, more would be the chances of consumers substituting the product under consideration with a cheaper substitute.

7. Habit formation: Some products are consumed more due to habit of consumers like cigarettes and alcohol. The demand for such products is relatively inelastic, since the consumers form a habit of consuming them.

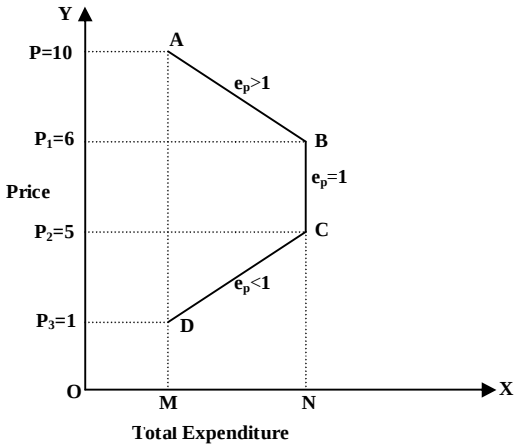
MEASUREMENT OF PRICE ELASTICITY OF DEMAND

Given below are some of the methods for measuring the price elasticity of Demand.

1. Total Expenditure Method - Elasticity of Demand can be measured from the changes in the expenditure of the consumers on the commodity as its price changes. Known also as the outlay method, it was given by ***Marshall***.

These three cases can be shown with the help of a table and graph.

Price (P)	Quantity Demanded (Q_d)	Total Expenditure ($P\ Q_d$)	Elasticity of Demand
10	1	10	Greater than Unity $e_p>1$
9	2	18	
8	3	24	
7	4	28	
6	5	30	Equal than Unity ($e_p=1$)
5	6	30	
4	7	28	Less than Unity $e_p<1$
3	8	24	
2	9	18	
1	10	10	



In the table given above, the price of the commodity goes down from Rs.10 to Rs. 1.suppose the amount demanded increases from 1kg to10kg.we can easily calculate the resulting change in total outlay. These changes can be easily classified into three parts as shown in the table given below. In the table three separate cases of price elasticity of demand are easily traced out.

- If with a small fall in the price of the commodity total expenditure remains the same, then the elasticity of demand within the range of price change is equal to one.
- If with a small fall in the price of the commodity total expenditure on it also falls, the elasticity of demand in that range of price change in said to be less than one. That is, if total outlay and price move in the same direction elasticity of demand is taken to be less than one.
- If a small fall in price results in an increase of total expenditure on the commodity, the elasticity of demand in this range of price variation is said to be greater than one. In such cases total outlay and price move in the opposite directions

2. Proportionate Method - This method is also associated with the name of ***Dr. Marshall***. According to this method, "*price elasticity of demand is the ratio of percentage change in the amount demanded to the percentage change in price of the commodity.*" It is known as flux method, percentage method and arithmetic method.

$$e_p = \frac{\%\ \text{Change in demand for a commodity}}{\%\text{change in Price of a commodity}}$$

$$e_p = \frac{\frac{\Delta q}{q} \times 100}{\frac{\Delta p}{p} \times 100} = \frac{\Delta qp}{\Delta pq}$$

Application of price elasticity of demand

Elasticity of demand plays an important role in the pricing decisions of business organizations and the government when it regulates prices. It also helps in judging the effect of devaluation of a currency on export earnings of a country. In the following paragraphs, various applications and uses of elasticity of demand are explained:

(i) Pricing decisions of business organizations: The reason to consider price elasticity is that the change in the price of product would change the quantity demanded of that product depending on its coefficient of price elasticity. Thus, price elasticity plays an important role in fixing the price of a product

(ii) Pricing regulation by governments*:* Prominent among such products are agricultural products, demand for which is highly inelastic in nature. By restricting the supply of agricultural products, governments can raise these product prices.

(iii) 'Paradox' of plenty: In agricultural sector, the theory of price elasticity explains the paradox of plenty. An increase in the supply of crops as a result of good harvest season leads to a fall in their prices. As a result, the income of farmers falls and sometimes they are unable to meet their expenditures on crop production. Hence, to ensure that farmers do not lose during the time of overproduction of crops, the government declares the minimum price for crops. Minimum price is the price at which the government is prepared to buy the crops from the farmers.

(iv) Use in international trade: In case a country faces a poor balance of payments position due to rising imports and stagnant exports, the government of that country has to decide whether to devalue its currency or not.

(v) Fiscal policy*:* If the government wants to raise its income through fiscal policies, price elasticity plays a major role; the government mainly raises its income through imposing taxes. The government can increase its revenue through increasing indirect taxes only when they impose taxes on those products whose demand is inelastic.

1.5 SUPPLY AND LAW OF SUPPLY

The supply of a product refers to the various quantities of the product, which a seller is willing and able to sell at different prices in a given period of time. Consumers demand goods and services for consumption, while producers produce and supply the same. The term 'supply' is often confused with the 'stock' of the commodity available with the producer. However, the two terms are totally different stock is the total quantity of a commodity held by the seller, which he can bring out for sale in the market at short notice. Supply is that part of stock which is actually

brought in the market for sale. Thus, stock is potential supply, i.e. total quantity produced during a given period less the quantity already sold out plus accumulated production from previous period. If the price is high, larger quantities of a commodity are offered for sale. On the other hand, if the prices are not favourable, the commodities are held back and only small quantities are brought for sale. A large part of agricultural and industrial produce is kept in cold storages and godowns and is offered for sale, when it can fetch better prices. A part of the production may be withheld for self-consumption. In case of perishable goods like vegetable, fruit, etc., the value of stock may not be much different from quantity supplied at a particular time. In other cases, the two may be different due to hoarding of stock for speculation to earn more profits. In brief, the term stock indicates a fixed quantity, while the term 'supply' implies that the amount offered can be increased or decreased.

Factors Affecting Supply:

Supply refers to various quantities of a commodity which a producer will actually offer for sale at a particular time at various corresponding prices. Some of the important factors which affect the quantity supplied of a commodity in isolation are as follow

1. Price

The higher the price of the commodity, more of the commodity will be offered for sale on account of rise in its profitability and vice-versa. The direct relationship between price and supply of a commodity is also referred to as the 'law of supply'.

2. Prices of Related Goods

For instance, if the price of a substitute good goes up, the producers will be tempted to produce that good to get higher profit. On the other hand, the rise in the price of a complement (say, petrol) will reduce the supply of the commodity (e.g., cars).

3. Cost of Production

Prices of the factors of production (raw materials, land, labour, capital, etc.) used in the production of a commodity constitute the cost of production. Goods produced on large scale, reduce the cost of production. Better organisation and management is one such important cause to reduce the cost of production.

4. State of Technology

An improvement in technology increases the knowledge about the means of production and raises factor productivities. Hence, improvements in the methods of production reduce the cost of production and increase the profits. Discoveries and innovations also bring new variety of products.

5. Goal of Producer

The goal of the producer may be to maximise total profits or to maximise sales to capture the market or to improve status, goodwill and prestige in the market. Public enterprises whose goal is to increase production and generate more employment to maximise social welfare supply larger amount of commodity than profit motivated private firms.

6. Natural Factors

The supply of agricultural goods to a great extent depends upon the natural conditions like rain, fertility of land, improved seeds, irrigation facilities, climate etc. are favourable, supply will increase. On the contrary, earthquakes, heavy rains, floods, droughts adversely affect agricultural production.

7. Means of Transportation, Communication, Banking and Insurance

Proper development of infrastructure ensures adequate supply of the commodities. In case of short supply, goods can be brought from surplus areas to the deficient ones.

8. Length of Time

The supply of commodity remains more or less fixed in the market period, particularly, in case of perishable goods. In short period, the supply of a commodity can be increased by utilizing the capacity fully by altering the factor proportion. In the long period, the output level can be adjusted fully.

9. Other Factors

Some other factors which affect the supply of a commodity are expected changes in prices, taxation and other policies of the Government, fear of war, strikes, lockouts, weather business conditions, degree of competition in the market, agreement among the firms to earn large profits, nature of commodity, number of firms, etc.

LAW OF SUPPLY

The law of supply shows a direct relationship between price and supply of a commodity.

The law states that as the price of a commodity increases, the quantity of the commodity supplied increases and vice-versa, assuming all other factors influencing supply remains unchanged.

In this statement, change in price is the cause and change in supply is the effect. Thus, price rise leads to supply rise and not otherwise. A hypothetical supply schedule is given in the following table.

See Classroom lecture

The law of supply operates on account of the following reasons:

(a) Law of Diminishing Marginal Productivity: As we produce more and more beyond a certain limit, the additional return to the variable factor diminishes. Marginal and average cost of production increase as a result. This implies that more quantity of the commodity can be produced and supplied only at a higher price so as to cover higher cost of production.

(b) Profit Maximisation: Producers supply a commodity to secure maximum profits. An increase in the price of a commodity raises the level of profit, with conditions of cost remaining the same. So producers increase the supply of the commodity by releasing big quantities from their stocks. Similarly, lower price forces the producers to decrease the supply of the commodity by building up their inventories with the expectation that the price may rise in the future yielding larger profits.

Exceptions to the Law of Supply:

There are a few exceptions to the law of supply. Some of the exceptions are as follows:

(a) Non-Maximisation of Profits

(b) Factors Other than Price not Remaining Constant

(c) Subsistence Farming

1.6 INDIFFERENCE CURVES

History: The theory of indifference curves was developed by **Francis Ysidro Edgeworth**, who explained in his book "Mathematical Psychics: an Essay on the Application of Mathematics to the Moral Sciences," 1881, the mathematics needed for its drawing; later on, **Vilfredo Pareto** was the first author to actually draw these curves, in his book "Manual of Political Economy," 1906, and others in the first part of the 20th century. The theory can be derived from **William Stanley Jevons's ordinal utility theory**, which posits that individuals can always rank any consumption bundles by order of preference.

Introduction: Modern economists disregarded the concept of 'cardinal measure of utility'. They were of the opinion that utility is a psychological phenomenon and it is next to impossible to measure the utility in absolute terms. According to them, a consumer can rank various combinations of goods and services in order of his preference. For example, if a consumer consumes two goods, Apples and Bananas, then he can indicate:

1. Whether he prefers apple over banana; or
2. Whether he prefers banana over apple; or
3. Whether he is indifferent between apples and bananas, i.e. both are equally preferable and both of them give him same level of satisfaction.

This approach does not use cardinal values like 1, 2, 3, 4, etc. Rather, it makes use of ordinal numbers like 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, etc. which can be used only for ranking. It means, if the consumer likes apple more than banana, then he will give 1^{st} rank to apple and 2^{nd} rank to banana. Such a method of ranking the preferences is known as 'ordinal utility approach'.

Before we proceed to determine the consumer's equilibrium through this approach, let us understand some useful concepts related to Indifference Curve Analysis.

Definition: An **indifference curve** is a graph showing combination of two goods that give the consumer equal satisfaction and utility. Each point on an indifference curve indicates that a consumer is indifferent between the two and all points give him the same utility.

Meaning of Indifference Curve:

When a consumer consumes various goods and services, then there are some combinations, which give him exactly the same total satisfaction. The graphical representation of such combinations is termed as indifference curve. Let us understand this with the help of following indifference schedule, which shows all the combinations giving equal satisfaction to the consumer.

Table 2.4: Indifference Schedule

Combination of Apples and Bananas	Apples (A)	Bananas (B)
P	1	15
Q	2	10
R	3	6
S	4	3
T	5	1

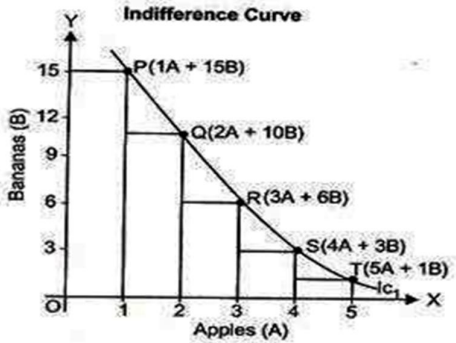


Fig. 2.4

As seen in the schedule, consumer is indifferent between five combinations of apple and banana. Combination 'P' (1A + 15B) gives the same utility as (2A + 10B), (3A + 6B) and so on. When these combinations are represented graphically and joined together, we get an indifference curve 'IC1' as shown in Fig. 2.4.

In the diagram, every point on IC1, represents an equal amount of satisfaction to the consumer. So, the consumer is said to be indifferent between the combinations located on Indifference Curve 'IC1'. The combinations P, Q, R, S and T give equal satisfaction to the consumer and therefore he is indifferent among them. These combinations are together known as 'Indifference Set'.

Monotonic Preferences:

Monotonic preference means that a rational consumer always prefers more of a commodity as it offers him a higher level of satisfaction.

Example: Consider 2 goods:

Apples (A) and Bananas (B).

(a) Suppose two different bundles are: 1st: (10A, 10B); and 2nd: (7A, 7B).

Consumer's preference of 1st bundle as compared to 2nd bundle will be called monotonic preference as 1st bundle contains more of both apples and bananas.

(b) If 2 bundles are: 1st: (1 OA, 7B); 2nd: (9A, 7B).

Consumer's preference of 1st bundle as compared to 2nd bundle will be called monotonic preference as 1st bundle contains more of apples, although bananas are same.

Indifference Map:

Indifference Map refers to the family of indifference curves that represent consumer preferences over all the bundles of the two goods. However, every higher or lower level of satisfaction can be shown on different indifference curves. It means, infinite number of indifference curves can be drawn.

In Fig. 2.5, IC_1 represents the lowest satisfaction, IC_2 shows satisfaction more than that of IC_1 and the highest level of satisfaction is depicted by indifference curve IC_3. However, each indifference curve shows the same level of satisfaction individually.

It must be noted that 'Higher Indifference curves represent higher levels of satisfaction' as higher indifference curve represents larger bundle of goods, which means more utility because of monotonic preference.

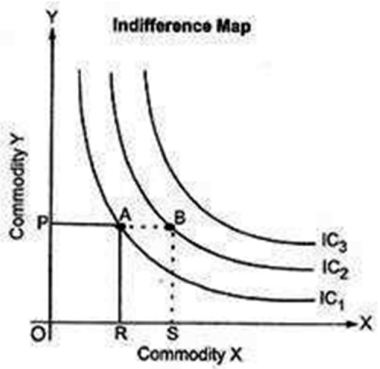


Fig. 2.5

Marginal Rate of Substitution (MRS):

MRS refers to the rate at which the commodities can be substituted with each other, so that total satisfaction of the consumer remains the same. For example, in the example of apples (A) and bananas (B), MRS of 'A' for 'B', will be number of units of 'B', that the consumer is willing to sacrifice for an additional unit of 'A', so as to maintain the same level of satisfaction.

MRS_{AB} = Units of Bananas (B) willing to Sacrifice / Units of Apples (A) willing to Gain

$$MRS_{AB} = \Delta B/\Delta A$$

MRS_{AB} is the rate at which a consumer is willing to give up Bananas for one more unit of Apple. It means, MRS measures the slope of indifference curve.

The concept of MRSAB is explained through Table 2.6 and Fig. 2.6

Table 2.6: MRS between Apple and Banana:

Combination	Apples (A)	Banana (B)	MRS_{AB}
P	1	15	–
Q	2	10	5B:1 A
R	3	6	4B:1A
S	4	3	3B:1A
T	5	1	2B:1 A

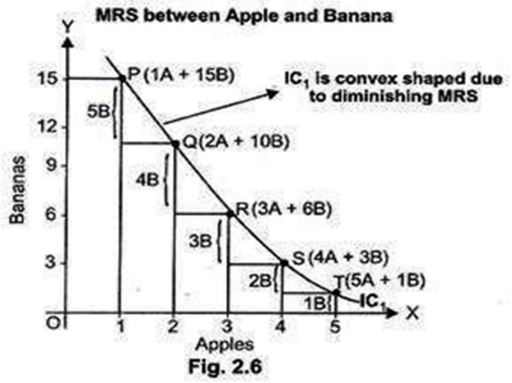


Fig. 2.6

As seen in the given schedule and diagram, when consumer moves from P to Q, he sacrifices 5 bananas for 1 apple. Thus, MRS_{AB} comes out to be 5:1. Similarly, from Q to R, MRS_{AB} is 4:1. In combination T, the sacrifice falls to 2 bananas for 1 apple. In other words, the MRS of apples for bananas is diminishing.

Why MRS diminishes?

MRS falls because of the law of diminishing marginal utility. In the given example of apples and bananas, Combination 'P' has only 1 apple and, therefore, apple is relatively more important than bananas. Due to this, the consumer is willing to give up more bananas for an additional apple. But as he consumes more and more of apples, his marginal utility from apples keeps on declining. As a result, he is willing to give up less and less of bananas for each apple.

Properties of Indifference Curve:

1. **Indifference curves are always convex to the origin:** An indifference curve is convex to the origin because of diminishing MRS. MRS declines continuously because of the law of diminishing marginal utility.
2. **Indifference curve slope downwards:** It implies that as a consumer consumes more of one good, he must consume less of the other good. It happens because if the consumer decides to have more units of one good (say apples), he will have to reduce the number of units of another good (say bananas), so that total utility remains the same.
3. **Higher Indifference curves represent higher levels of satisfaction:** Higher indifference curve represents large bundle of goods, which means more utility because of monotonic preference..
4. **Indifference curves can never intersect each other:** As two indifference curves cannot represent the same level of satisfaction, they cannot intersect each other. It means, only one indifference curve will pass through a given point on an indifference map.

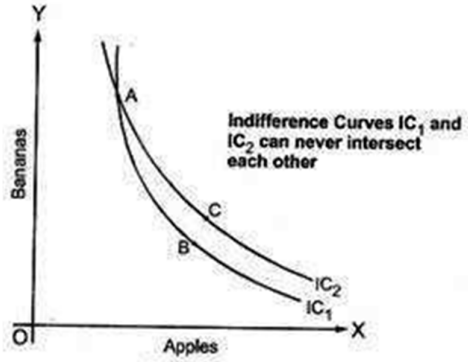


Fig. 2.7

Assumptions of Indifference Curve

The various assumptions of indifference curve are:

1. **Two commodities:** It is assumed that the consumer has a fixed amount of money, whole of which is to be spent on the two goods, given constant prices of both the goods.
2. **Non Satiety:** It is assumed that the consumer has not reached the point of saturation. Consumer always prefer more of both commodities, i.e. he always tries to move to a higher indifference curve to get higher and higher satisfaction.
3. **Ordinal Utility:** Consumer can rank his preferences on the basis of the satisfaction from each bundle of goods.
4. **Diminishing marginal rate of substitution:** Indifference curve analysis assumes diminishing marginal rate of substitution. Due to this assumption, an indifference curve is convex to the origin.
5. **Rational Consumer:** The consumer is assumed to behave in a rational manner, i.e. he aims to maximize his total satisfaction.

1.7 BUDGET LINE

A consumer's budget line characterizes on a graph the maximum amounts of goods that the consumer can afford. In a two good case, we can think of quantities of good X on the horizontal axis and quantities of good Y on the vertical axis. The term is often used when there are many goods, and without reference to any actual graph.

The knowledge of the concept of budget line or what is also called budget constraint is essential for understanding the theory of consumer's equilibrium.

A higher indifference curve shows a higher level of satisfaction than a lower one. Therefore, a consumer in his attempt to maximise his satisfaction will try to reach the highest possible indifference curve.

But in his pursuit of buying more and more goods and thus obtaining more and more satisfaction he has to work under **two constraints**: first, he has to **pay the prices** for the goods and, secondly, he has a **limited money income** with which to purchase the goods. Thus, how far he would go in for his purchases depends upon the prices of the goods and the money income which he has to spend on the goods.

Suppose our consumer has got income of Rs. 50 to spend on two goods X and Y. Let price of good X in the market be Rs. 10 per unit and that of Y Rs. 5 per unit. If the consumer spends his whole income of Rs. 50 on good X, he would buy 5 units of X; if he spends his whole income of Rs. 50 on good Y he would buy 10 units of Y. If a straight line joining 5Xand 10Vis drawn, we will get what is called the price line or the budget line.

Thus budget line shows all those combinations of two goods which the consumer can buy by spending his given money income on the two goods at their given prices. A look at Fig. 8.14 shows that with Rs. 50 and the prices of X and Y being Rs 10 and Rs. 5 respectively the consumer can buy l0Y and OX, or Stand IX; or 6Y and 2X, or 4y and 3X etc.

In other words, he can buy any combination that lies on the budget line with his given money income and given prices of the goods. It should be carefully noted that any combination of the two goods such as H (5Y and 4X) which lies above and outside the given budget line will be beyond the reach of the consumer.

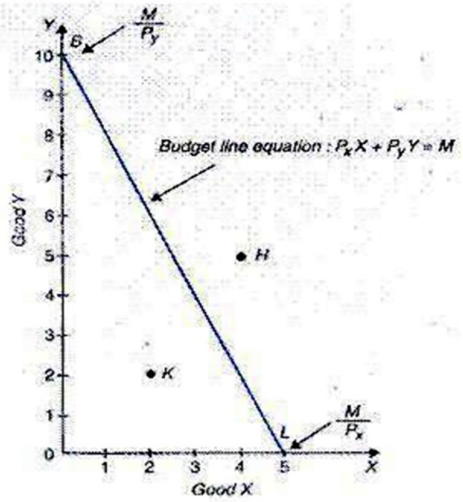


Fig. 8.14. Budget Line or Budget Constraint

But any combination lying within the budget line such as K (2X and 2Y) will be well within the reach of the consumer, but if he buys any such combination he will not be spending all his income of Rs. 50. Thus, with the assumption that whole of the given income is spent on the given goods and at given prices of them, the consumer has to choose from all those combinations which lie on the budget line.

It is also important to remember that the intercept OB on the Y-axis in Fig. 8.14 equals the amount of his entire income (M) divided by the price (P_Y) of commodity Y. That is, OB = M/P_Y. Likewise, the intercept OL on the X-axis measures the total income divided by the price of commodity X. Thus OL = M/P_x.

The budget line can be written algebraically as follows:

$$P_xX + P_yY = M \quad \text{... (1)}$$

$$Y = \frac{M}{P_Y} - \frac{P_x}{P_Y}.X$$

Where P_x and P_y denote prices of goods X and Y respectively and M stands for money income:

The above budget-line equation (1) implies that, given the money income of the consumer and prices of the two goods, every combination lying on the budget line will cost the same amount of money and can therefore be purchased with the given income. The budget line can be defined as a set of combinations of two commodities that can be purchased if whole of the given income is spent on them and its slope is equal to the negative of the price ratio.

Budget Space:

It should be carefully understood that the budget equation

$P_xX + P_yY =$ M or Y = $M/P_y - Px/P_yX$ depicted by the budget line in Figure only describes the budget line and not the budget space. A budget space shows a set of all combinations of the two commodities that can be purchased by spending the whole or a part of the given income.

Therefore, we can algebraically express the budget space in the following form of inequality:

$P_xX + P_yY \leq M$, or $M \geq P_xX + P_yY$

The budget space is the entire area enclosed by the budget line BL and the two axes.

Changes in Price and Shift in Budget Line:

Now, what happens to the budget line if either the prices of goods change or the income changes. Let us first take the case of the changes in prices of the goods. This is illustrated in Fig. 8.16. Suppose the budget line in the beginning is BL, given certain prices of goods X and Y and a certain income. Suppose price of X falls, the price of Y and income remaining unchanged. Now, with a lower price of X the consumer will be able to purchase more quantity of X than before with his given income.

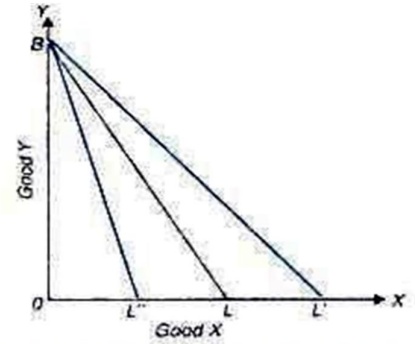


Fig. 8.16. *Changes in Budget Line as a Result of Changes in Price of Good X*

Let at the lower price of X, the given income purchases OL' of X which is greater than OL. Since price of Y remains the same, there can be no change in the quantity purchased of good Y with the same given income and as a result there will be no shift in the point B. Thus, with the fall in price of good X, the consumer's money income and the price of Y remaining constant, the budget line will shift to the right to the new position BL'.

Now, what will happen to the budget line (initial budget line BL) if price of good X rises, the price of good Y and income remaining unaltered. With higher price of good X, the consumer can purchase smaller quantity of X, say OL" than before. Thus, with the rise in price of X the budget line will shift to the left to the new position BL".

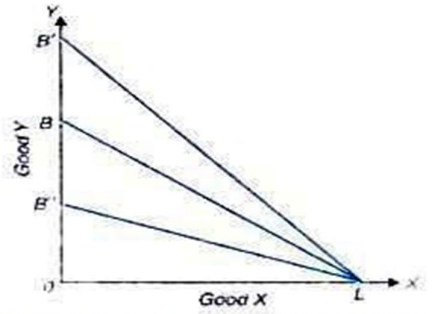


Fig. 8.17. *Changes in Budget Line as Result Changes in Price of Good Y*

Figure 8.17 shows the changes in the budget line when price of good Y falls or rises, with the price of X and income remaining the same. In this the initial budget line is BL. With fall in price of good Y, other things remaining unchanged, the consumer could buy more of Y with the given money income and therefore budget line will shift above to LB'. Similarly, with the rise in price of Y, other things being constant, the budget line will shift below to LB ".

Changes in Income and Shifts in Budget line:

Now, the question is what happens to the budget line if income changes, while the prices of goods remain the same. The effect of changes in income on the budget line is shown in Fig. 8.18. Let BL be the initial budget line, given certain prices of goods and income. If consumer's income increases while prices of both goods X and y remain unaltered, the price line shifts upward (say, to BL') and is parallel to the original budget line BL.

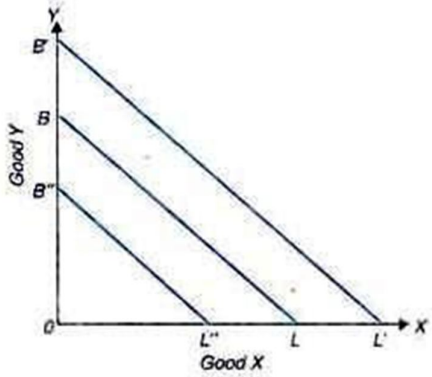


Fig. 8.18. *Shifts in Budget Line as a Result of Changes in Income*

This is because with the increased income the consumer is able to purchase proportionately larger quantity of good X than before if whole of the income is spent on X, and proportionately greater quantity of good Y than before if whole of the income is spent on Y. On the other hand, if income of the consumer decreases, prices of both goods X and Y remaining unchanged, the budget line shifts downward (say, to B"L") but remains parallel to the original price line BL.

This is because a lower income will purchase a proportionately smaller quantity of good X if the whole of the income is spent on X and proportionately smaller quantity of good Y if the whole of the income is spent on Y.

It is clear from above that the budget line will change if either the prices of goods change or the income of the consumer changes.

This is because with the increased income the consumer is able to purchase proportionately larger quantity of good X than before if whole of the income is spent on X, and proportionately greater quantity of good Y than before if whole of

the income is spent on Y. On the other hand, if income of the consumer decreases, prices of both goods X and Y remaining unchanged, the budget line shifts downward (say, to B"L") but remains parallel to the original price line BL.

This is because a lower income will purchase a proportionately smaller quantity of good X if the whole of the income is spent on X and proportionately smaller quantity of good Y if the whole of the income is spent on Y.

It is clear from above that the budget line will change if either the prices of goods change or the income of the consumer changes.

Thus, the two determinants of the budget line are:

(a) The prices of goods, and

(b) The consumer's income to be spent on the goods.

Slope of the Budget Line and Prices of Two Goods:

It is also important to remember that the slope of the budget line is equal to the ratio of the prices of two goods. Suppose the given income of the consumer is M and the given prices of goods X and Y are P_x and P_y respectively.

The slope of the budget line BL is OB/OL. We intend to prove that this slope is equal to the ratio of the prices of goods X and Y.

The quantity of good X purchased if whole of the given income M is spent on it is OL. Therefore, $OL \times P_x = M$; $OL = M/P_x$

Now, the quantity of good Y purchased if whole of the given income M is spent on it is OB.

Therefore, $OL \times P_x = M$

$$OL = \frac{M}{P_x} \quad \text{...(i)}$$

Now, the quantity of good Y purchased if whole of the given income M is spent on it is OB. Therefore,

$$OB \times P_y = M$$

$$OB = \frac{M}{P_y} \quad \text{...(ii)}$$

Dividing (ii) by (i) we have

$$\frac{OB}{OL} = \frac{M}{P_y} \div \frac{M}{P_x} = \frac{M}{P_y} \times \frac{P_x}{M} = \frac{P_x}{P_y}$$

Thus, slope of budget line $= \frac{OB}{OL} = \frac{P_x}{P_y}$

It is thus proved that the slope of the budget line BL is equal to the ratio of prices of two goods.

1.8 WELFARE ANALYSIS

When studying markets, economists not only want to understand how prices and quantities are determined, but they also want to be able to calculate how much value markets create for society. Economists call this topic of study welfare analysis, but, despite its name, the subject doesn't have anything directly to do with transferring money to poor people.

Economic value created by a market accrues to a number of different parties.

It goes to

- consumers when they can purchase goods and services for less than they value the use of the items
- producers when they can sell goods and services for more than each item cost to produce
- the government when markets provide an opportunity to collect taxes

Economic value is also either created or destroyed for society when markets cause spillover effects for parties not directly involved in a market as a producer or a consumer.

In order to quantify this economic value, economists simply add up the value created for all of the participants in (or onlookers to) a market. By doing so, economists can calculate the economic impacts of taxes, subsidies, price controls, trade policies, and other forms of regulation (or deregulation). That said, there are a few things that must be kept in mind when looking at this type of analysis.

First, because economists simply add up the values, in dollars, created for each market participant, they implicitly assume that a dollar of value for Bill Gates or Warren Buffet is equivalent to a dollar of value for the person who pumps Bill Gates' gas or serves Warren Buffet his morning coffee.

Similarly, welfare analysis often aggregates the value to consumers in a market and the value to producers in a market. By doing this, economists also assume that a dollar of value for the gas station attendant or barista counts the same as a dollar of value for a shareholder of a large corporation. (This isn't as unreasonable as it may initially seem, however, if you consider the possibility that the barista is also a shareholder of the large corporation.)

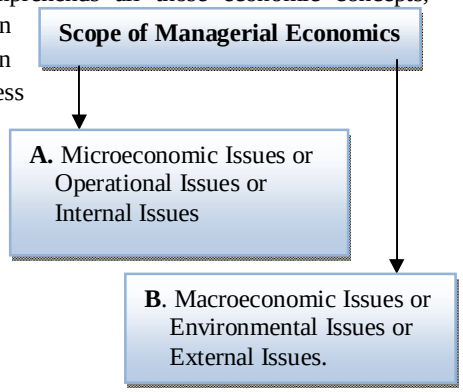
Second, welfare analysis only counts the number of dollars taken in in taxes rather than the value of what that tax revenue is ultimately spent on. Ideally, tax revenue would be used for projects that are worth more to society than they cost in taxes, but realistically this is not always the case. Even if it were, it would be very difficult to link up taxes on particular markets with what the tax revenue from that market ends up buying for society. Therefore, economists purposely separate out the analyses of how many tax dollars are generated and how much value spending those tax dollars creates.

These two issues are important to keep in mind when looking at economic welfare analysis, but they don't make the analysis irrelevant. Instead, it's helpful to understand how much value in the aggregate is created by a market (or created or destroyed by regulation) in order to properly assess the tradeoff between overall value and equity or fairness. Economists often find that efficiency, or maximizing the overall size of the economic pie, is at odds with some notions of equity, or dividing that pie in a manner that is considered fair, so it's crucial to be able to quantify at least one side of that tradeoff.

In general, textbook economics draws positive conclusions about the overall value created by a market and leaves it to philosophers and policy makers to make normative statements about what is fair. Nonetheless, it's important to understand how much the economic pie shrinks when a "fair" outcome is imposed in order to decide whether the tradeoff is worth it.

1.9 SCOPE OF BUSINESS ECONOMICS

The scope of business economics comprehends all those economic concepts, theories and tools of analysis which can be used to analyze the business situation and to find solution to practical business problems. The areas of business issues to which economic theories can be directly applied may be broadly divided into two categories.



A. Microeconomic Issues/Operational Issues/Internal Issues.

They include all those problems which arise within the business organization and fall within the purview and control of the management. Some of the internal issues are

- Choice of business and the nature of product
- Choice of size of the firm
- Choice of technology
- Choice of price
- How to promote sales
- How to manage profit and capital
- How to manage inventory

Given below are some of the scopes of business economics covered under internal issues of a business enterprises:

1. **Demand Analysis and Forecasting** - A firm must decide its total output before preparing its production schedule and deciding on the resources to be employed. Demand forecast can also serve as a guide to the management for maintaining its market share in competition with its rivals, thereby securing profits. Demand analysis also facilitates the identification of the various factors affecting the demand for its output.
2. **Cost and Production Analysis** - Firms profitability depends upon its costs of production. A wise manager would prepare cost estimates of a range of output, identify the factors causing variations in costs and choose the cost minimizing output level, taking also into consideration the degree of uncertainty in production and cost calculation. In this whole process the various tools and logics of business economics is usually applied by him.
3. **Pricing Decision, Policies and Practices** - Business Economics scope ranges to the pricing policies of the firm. A business manager makes uses of various market analysis tools to determine the price of the product as well as find out the breakeven point of the firm.
4. **Profit Management** - Economics tells us that profit is the reward for uncertainty bearing and risk taking. A successful manager is one who can form more or less correct estimates of cost and revenue likely to accrue to the firm at different levels of output. In fact profit planning and profit measurement constitutes the most of the challenging of Business Economics.

5. Capital Management - Business Economics finds its application in the sphere of capital management too. Capital Investment is a long term investment in plant and machinery, lands or any other fixed assets, therefore before coming to any conclusion regarding capital investment, business managers usually analyze the whole business situation and plan and control capital investment and capital expenditure.

B. Macroeconomic issues/External issues/Environmental issues

1. General Trend in Economic Activities - By general trend in the economic activities of the country we mean investment climate, price trends and trends in output and employment. These factors not only determine the prospects of private business, but also greatly influence the functioning of individual firms. Therefore while planning about the size of the firm, business managers finds the answers to the question like, what is the consumption level of the economy, what are the trends in the economic system of the country?

2. Issues related to Foreign Trade - Due to the infusion of globalization, business units get affected by each and every small movement in the business world operating globally. An economy gets affected by the trade relations with other countries. Fluctuations in the international market exchange rate and inflows and outflows of capital in an open economy have a serious bearing on its economic environment and thereby on the functioning of its business undertakings. The managers of a firm would, therefore be interested in knowing the trends in international trade, prices, exchange rates and prospectus in the international market

3. Government Policies - The government policies and its various regulatory measures are designed by and large to minimize the conflicts in between the firm and society. The managers should therefore be fully aware of aspiration of the people and give such factors due consideration in their decisions. The economic concepts and tools of analysis help in determining such costs, and benefits.

Managerial Economics: Significance in Decision-Making

1. ***What do you mean by decision-making?***

Well decision-making is not something which is related to managers only or which is related to corporate world, but it is something which is related to everybody's life. Whether a person is working or non-working, irrespective of his/her field decision-making is important to everyone. You need to make decision irrespective of the work you are doing. As a student also you have to take so many decisions. Suppose at a particular point of time you want to go for a movie, and at the same point of time you want to go for shopping then what you will do. You can't do two things at the same point of time. You have to decide what to first end what to do next. Therefore decision-making can be called as choosing the right option from the given one. To decide is to choose. Whether to do this or to do that is what decision-making.

2. ***Meaning of Decision-making***

Decision-making is the most important function of business managers. Decision-making is the central objective of Managerial Economics. Decision-making may be defined as the process of selecting the suitable action from among several alternative courses of action. The problem of decision-making arises whenever a number of alternatives are available. Such as:

- What should be the price of the product?
- What should be the size of the plant to be installed?
- How many workers should be employed?
- What kind of training should be imparted to them?
- What to the optimal level of inventories of finished products, raw material, spare parts, etc.?

Therefore we can say that the problem of decision-making arises due to the scarcity of resources. We have unlimited wants and the means to satisfy those wants are limited, with the satisfaction of one want, another arises, and here arises the problem of decision-making. While performing his function manager has to take a lot of decisions in conformity with the goal of the firm. Most of the decisions are taken under the condition of uncertainty, and involves risks.

1.10 TECHNIQUES AND APPLICATIONS OF MANAGERIAL ECONOMICS

(Fundamental Concepts of Managerial Economics)

Economic theory has a variety of concepts and analytical tools, which can be of great use to a business economist of course; economics does not have readymade laws for immediate use in solving business problems. However, it does offer a variety of broad principles, which the managerial economist can put to useful

practice. In applying the economics principles for solving his practical problems of decision-making, the business economist has to use additional skills and tools to make up the gap between economic theory and business practices. Given below are five concepts of managerial economics.

1. **The Opportunity Coat Principle** - The cost involved in any decision consists of the sacrifices of alternatives required by that decision. If there are no sacrifices, there are no costs. This principle is of great use in decision-making. The opportunity cost of doing something is measured by the sacrifices in terms of goods and services involved in that decision.
2. **The Incremental Principle** - Economist world over make wide use of the incremental principle in the theories of consumption, production, production pricing and distribution in price determination. This principle tells a business manager that he should expand his business in each direction only so long as the incremental benefit to his firm is more than the incremental cost
3. **The Principle of Time Perspectiv**e - Economics has brought out the importance of keeping a time perspective in decision-making on output, prices, advertising and expansion of business. Economists distinguish between the short run and long run in discussing the determination of price in a given market form because in the long run a firm must cover its full costs while in short run it can afford to ignore some of the fixed costs.
4. **The Discounting Principle** - "The concept of discounting is concerned with the facts that costs and benefits arising in future years are worth less to us than costs and benefits arising today''. A fundamental fact of life is that people considers a rupee tomorrow to be worth less a rupee today. Anybody will prefer Rs.100 today to Rs. 100 next year. There are two reasons for this

- The future is uncertain and it is preferable to get Rs.100 today rather than year after.
- Even if one is sure to receive the Rs.100 next year, one would do well to receive Rs.100 now and invest it for a year and earn a rate of interest on Rs.100 for one year.

Example - What is the present worth of Rs.100 obtainable after one year?

The relevant formula for finding this out is

Present Worth =Rs.100/1+r

Where r is the rate of interest.

Rs.100 ÷ (1+8/100) = 92.59

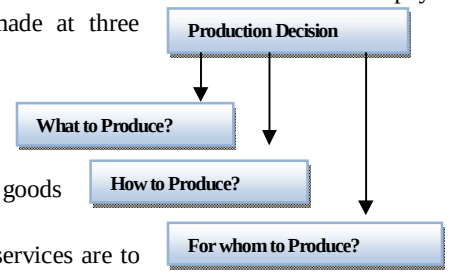
And when he received and invest it into bank with interest rate @ 8% p.a., then he will get Rs. 108 after one year. (Future value of Rs. 100)

$$A = P\left(1 + \frac{r}{100}\right)^n$$

$$A = 100\left(1 + \frac{8}{100}\right)^1 = 108$$

Therefore it means that if the decision affects costs and revenue at a future dates, it is necessary to discount those costs and revenues to obtain the present values of both before a valid comparison of alternatives can be made.

5. **Resource allocation:** When purchasing raw materials, employing labour and undertaking investment, the manager is involved in resource allocation. Societies resources are, inevitably, scare so that the individual firm has to pay for them. Decisions need to be made at three levels, namely



(i) What goods and services to produce with the available resources.

(ii) How to combine the available resources to produce different types of goods and services and

(iii) For whom the different goods and services are to be supplied.

Such decisions are sometime described as the allocative, productive, and distributive choices respectively which face society in general.

6. **Equi-marginal principle:** This principle deals with the allocation of an available resource among the alternative activities. According to this principle, an input should so allocated that the value added by the last unit is the same in all cases. This generalization is called equi-marginal principle. Suppose 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 more labour but only at the cost of other activities.