Business Economics

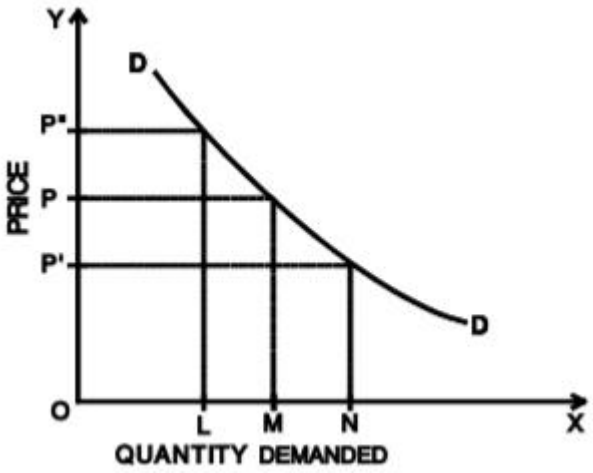
B.com 1st Year

TOPIC: EXPANSION AND CONTRACTION OF DEMAND, INCREASE AND DECREASE IN DEMAND, ELASTICITY OF DEMAND

EXPANSION AND CONTRACTION OF DEMAND

The demand schedule, demand curve and the law of demand all show that when the price of a commodity falls, its quantity demanded increases, other things being equal. When, as a result of decrease in price, the quantity demanded increases, in Economics, we say that there is an expansion of demand and when, as a result of increase in price, the quantity demanded decreases, we say that there is contraction of demand. For example, suppose the price of apples at any time is Rs 100/ per kilogram and a consumer buys one kilogram at that price. Now, if other things such as income, prices of other goods and tastes of the consumers remain the same but the price of apples falls to Rs 80 per kilogram and the consumer now buys two kilograms of apples, we say that there is a change in quantity demanded or there is an expansion of demand. On the contrary, if the price of apples rises to Rs 150 per kilogram and the consumer then buys only half a kilogram, we say that there is a contraction of demand.

The phenomena of expansion and contraction of demand are shown in Figure. The figure shows that when price is OP, the quantity demanded is OM, given other things equal. If, as a result of increase in price (OP"), the quantity demanded falls to OL, we say that there is 'a fall in quantity demanded' or 'contraction of demand' or 'an upward movement along the same demand curve'. Similarly, as a result of fall in price to OP', the quantity demanded rises to ON, we say that there is 'expansion of demand' or 'a rise in quantity demanded' or 'a downward movement on the same demand curve.



Expansion and Contraction of Demand

INCREASE AND DECREASE IN DEMAND

Till now we have assumed that other determinants of demand remain constant when we are analysing demand for a commodity. It should be noted that expansion and contraction of demand take place as a result of changes in the price while all other determinants of price viz. income, tastes, propensity to consume and price of related goods remain constant. The 'other factors remaining constant' means that the position of the demand curve remains the same and the consumer moves downwards or upwards on it. What happens if there is a change in consumers' tastes and preferences, income, the prices of the related goods or other factors on which demand depends? Let us consider the demand for commodity X: Table shows the possible effect of an increase in income of the consumer on the quantity demanded of commodity X.

Two demand schedules for commodity X

	Price (₹)	Quantity of 'X' demanded when average household income is ₹ 20,000 per month	Quantity of 'X' demanded when average household income is ₹ 25,000 per month	
A	5	10	15	A1
B	4	15	20	B1
C	3	20	25	C1
D	2	35	40	D1
E	1	60	65	E1

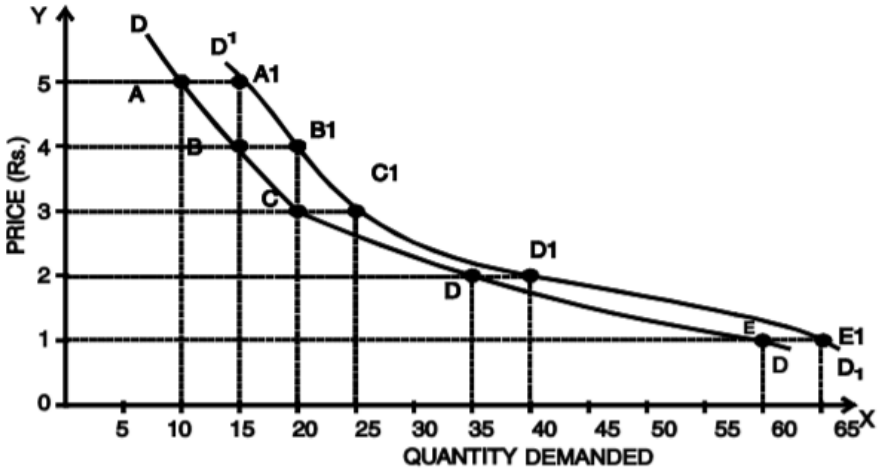
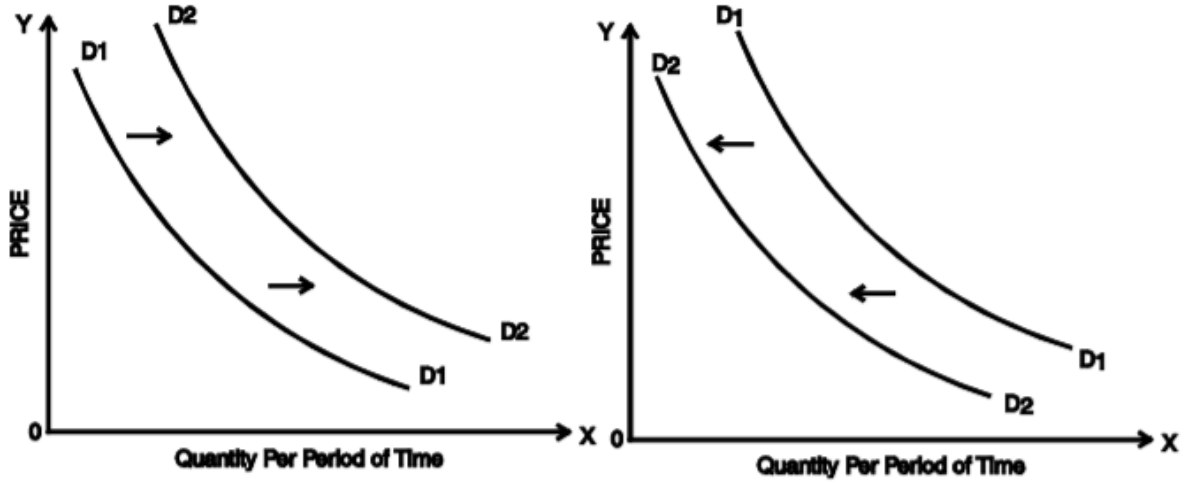


Figure showing two demand curves with different incomes

These new data are plotted in Figure as demand curve D'D' along with the original demand curve DD. We say that the demand curve for X has shifted [in this case it has shifted to the right]. The shift from DD to D'D' indicates an increase in the desire to purchase 'X' at each possible price. For example, at the price of Rs 4 per unit, 15 units are demanded when average household income is Rs 20,000 per month. When the average household income rises to Rs 25,000 per month, 20 units of X are demanded at price Rs 4. A rise in income thus shifts the demand curve to the right, whereas a fall in income will have the opposite effect of shifting the demand curve to the left.



(a.) Rightward shift in the demand Curve **(b.) Leftward shift in the demand curve**

(a.) A rightward shift in the demand curve (when more is demanded at each price) can be caused by a rise in income, a rise in the price of a substitute, a fall in the price of a complement, a change in tastes in favour of this commodity, an increase in population, and a redistribution of income to groups who favour this commodity.

(b.) A leftward shift in the demand curve (when less is demanded at each price) can be caused by a fall in income, a fall in the price of a substitute, a rise in the price of a complement, a change in tastes against this commodity, a decrease in population, and a redistribution of income away from groups who favour this commodity.

MOVEMENTS ALONG THE DEMAND CURVE VS. SHIFT OF DEMAND CURVE

It is important for the business decision-makers to understand the distinction between a movement along a demand curve and a shift of the whole demand curve.

A movement along the demand curve indicates changes in the quantity demanded because of price changes, other factors remaining constant. A shift of the demand curve indicates that there is a change in demand at each possible price because one or more other factors, such as incomes, tastes or the price of some other goods, have changed.

Thus, when an economist speaks of an increase or a decrease in demand, he refers to a shift of the whole curve because one or more of the factors which were assumed to remain constant earlier have changed. When the economists speak of change in quantity demanded he means movement along the same curve (i.e., expansion or contraction of demand) which has happened due to fall or rise in price of the commodity.

In short ‘change in demand’ represents shift of the demand curve to right or left resulting from changes in factors such as income, tastes, prices of other goods etc. and ‘change in quantity demanded’ represents movement upwards or downwards on the same demand curve resulting from a change in the price of the commodity.

When demand increases due to factors other than price, firms can sell more at the existing prices resulting in increased revenue. The objective of advertisement and all other sales promotion activities by any firm is to shift the demand curve to the right and to reduce the elasticity of demand.

(The latter will be discussed in the next section). However, the additional demand is not free of cost as firms have to incur expenditure on advertisement and sales promotion devices.

ELASTICITY OF DEMAND

Till now we were concerned with the direction of the changes in prices and quantities demanded. From the point of view of a business firm, it is more important to know the extent of the relationship or the degree of responsiveness of demand to changes in its determinants. Now we will try to measure these changes, or to say, we will try to answer the question "by how much does demand change due to a change in price"?

Consider the following situations:

(1) As a result of a fall in the price of radio from Rs 500 to Rs 400, the quantity demanded increases from 100 radios to 150 radios.
(2) As a result of fall in the price of wheat from Rs 20 per kilogram to Rs 18 per kilogram, the quantity demanded increases from 500 kilograms to 520 kilograms.
(3) As a result of fall in the price of salt from Rs 9 per kilogram to Rs 7.50, the quantity demanded increases from 1000 kilogram to 1005 kilograms.

What do you notice? You notice that as a result of a fall in the price of radios, the quantity demanded of radios increases. Same is the case with wheat and salt. Thus, we can say that demand for radios, wheat and salt all respond to price changes. Then, what is the difference? The difference lies in the degree of response of demand which can be found out by comparing the percentage changes in prices and quantities demanded. Here lies the concept of elasticity.

Definition: Elasticity of demand is de-ned as the responsiveness of the quantity demanded of a good to changes in one of the variables on which demand depends. More precisely, elasticity of demand is the percentage change in quantity demanded divided by the percentage change in one of the variables on which demand depends.

These variables are price of the commodity, prices of the related commodities, income of the consumers and other factors on which demand depends. Thus, we have price elasticity, cross elasticity, income elasticity, advertisement elasticity and elasticity of substitution. It is to be noted that when we talk of elasticity of demand, unless and until otherwise mentioned, we talk of price elasticity of demand. In other words, it is price elasticity of demand which is usually referred to as elasticity of demand.

Price Elasticity

Price elasticity of demand expresses the response of quantity demanded of a good to a change in its price, given the consumer's income, his tastes and prices of all other goods. In other words, it is measured as the percentage change in quantity demanded divided by the percentage change in price, other things remaining equal. That

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

Or

$$Ep = \frac{\frac{\text{Change in Quantity}}{\text{Original Quantity}} \times 100}{\frac{\text{Change in Price}}{\text{Original Price}} \times 100} \quad \text{OR } Ep = \frac{\text{Change in Quantity}}{\text{Original Quantity}} \times \frac{\text{Original Price}}{\text{Change in Price}}$$

In symbolic terms

$$Ep = \frac{\Delta q}{q} \times \frac{p}{\Delta p} = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

Where Ep stands for price elasticity

q stands for quantity

p stands for price

Δ stands for a very small change.

Strictly speaking, the value of price elasticity varies from minus infinity to approach zero from the negative sign, because $\frac{\Delta q}{\Delta p}$ has a negative sign. In other words, since price and quantity are inversely related (with a few exceptions) price elasticity is negative. But, for the sake of convenience, we ignore the negative sign and consider only the numerical value of the elasticity. Thus if a 1% change in price leads to 2% change in quantity demanded of good A and 4% change in quantity demanded of good B, then we get elasticity of A and B as 2 and 4 respectively, showing that demand for B is more elastic or responsive to price changes than that of A. Had we considered minus signs, we would have concluded that the demand for A is more elastic than that for B, which is not correct. Hence, by convention, we take the absolute value of price elasticity and draw conclusions.

A fews examples for price elasticity of demand case as follows:

Illustration 1: - The price of a commodity decreases from Rs 6 to Rs 4 and quantity demanded of the good increases from 10 units to 15 units. Find the coefficient of price elasticity.

Solution: Price elasticity = (-) Δ q / Δ p × p/q = 5/2 × 6/10 = (-) 1.5

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

$$= 15\% / 5\%$$

$$= 3$$

Comment: The good in question has elastic demand.

Illustration 2: - The price of a good decreases from Rs 100 to Rs 60 per unit. If the price elasticity of demand for it is 1.5 and the original quantity demanded is 30 units, calculate the new quantity demanded.

Solution: -

$$Ep = \Delta q/\Delta p * p/q, \quad \text{Here } 1.5 = \frac{\Delta q}{40} \times \frac{100}{30}$$

$$\Delta q = \frac{1.5 \times 1200}{100} = 18$$

Therefore, new quantity demanded = 30+18 = 48 units

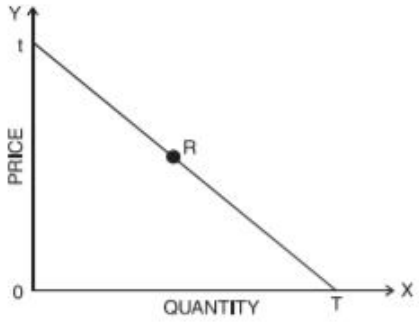
Point elasticity: In point elasticity, we measure elasticity at a given point on a demand curve. The concept of point elasticity is used for measuring price elasticity where the change in price is infinitesimal. Point elasticity makes use of derivative rather than finite changes in price and quantity. It may be defined as:

$$Ep = \frac{-dq}{dp} \times \frac{p}{q}$$

where dq/dp is the derivative of quantity with respect to price at a point on the demand curve, and p and q are the price and quantity at that point. Point elasticity is, therefore, the product of price quantity ratio at a particular point on the demand curve and the reciprocal of the slope of the demand line.

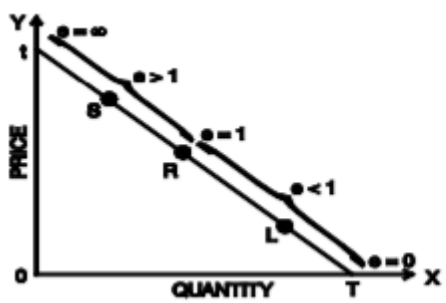
It is to be noted that elasticity is different at different points on the same demand curve. Given a straight-line demand curve tT, point elasticity at any point say R can be found by using the formula

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

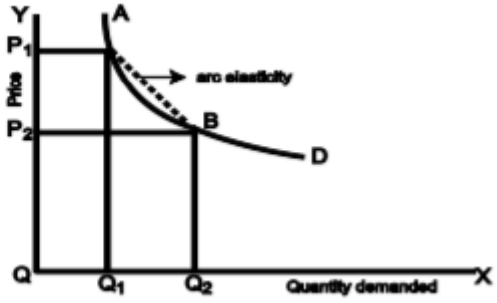


Elasticity at a point on the demand curve

Using the above formula, we can get elasticity at various points on the demand curve.



(a) Elasticity at different points on the demand curve



(b) Arc Elasticity

Thus, we see that as we move from T towards t, elasticity goes on increasing. At the mid-point it is equal to one, at point t it is infinity and at T it is zero.

Arc-elasticity: When the price change is somewhat larger or when price elasticity is to be found between two prices [or two points on the demand curve say, A and B in figure], the question arises which price and quantity should be taken as base. This is because elasticities found by using original price and quantity figures as base will be different from the one derived by using new price and quantity -figures. Therefore, in order to avoid confusion, generally mid-point method is used i.e. the averages of the two prices and quantities are taken as (i.e. original and new) base. The arc elasticity can be found out by using the formula:

$$Ep = \frac{q_1 - q_2}{q_1 + q_2} \times \frac{p_1 + p_2}{p_1 - p_2}$$

where p1, q1 are the original price and quantity and p2, q2 are the new ones.

Thus, if we have to find elasticity of radios between:

p1 = Rs 500, q1 = 100

p2 = Rs 400, q2 = 150

We will use the formula

$$Ep = \frac{q_1 - q_2}{q_1 + q_2} \times \frac{p_1 + p_2}{p_1 - p_2}$$

$$\text{Or } Ep = \frac{50}{250} \times \frac{900}{100} \qquad \text{or } Ep = 1.8$$

Interpretation of the numerical values of elasticity of demand

The numerical value of elasticity of demand can assume any value between zero and infinity.

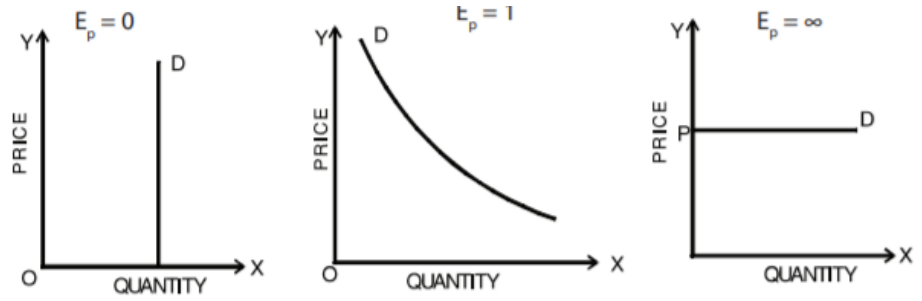
Elasticity is zero, if there is no change at all in the quantity demanded when price changes i.e. when the quantity demanded does not respond at all to a price change.

Elasticity is one, or unitary, if the percentage change in quantity demanded is equal to the percentage change in price.

Elasticity is greater than one when the percentage change in quantity demanded is greater than the percentage change in price. In such a case, demand is said to be elastic.

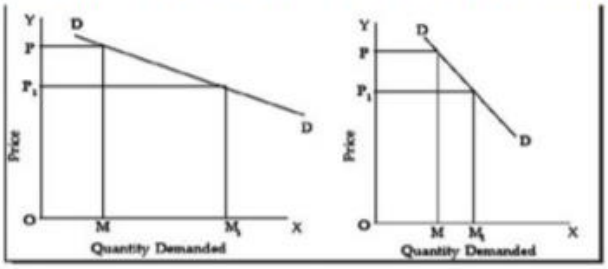
Elasticity is less than one when the percentage change in quantity demanded is less than the percentage change in price. In such a case, demand is said to be inelastic.

Elasticity is infinite, when a ‘small price reduction raises the demand from zero to infinity. Under such a case, consumers will buy all that they can obtain of the commodity at some price. If there is a slight increase in price, they would not buy anything from the particular seller. This type of demand curve is found in a perfectly competitive market.



Demand curve of zero, unitary and infinite elasticity

Elasticity is greater than one (Ep > 1) **Elasticity is less than one (Ep < 1)**



Demand curves of greater than one and less than one elasticities

Elasticity measures, meaning and nomenclature

Numerical measure of elasticity	Verbal description	Terminology
Zero	Quantity demanded does not change as price changes	Perfectly (or completely) inelastic
Greater than zero, but less than one	Quantity demanded changes by a smaller percentage than does price	Inelastic
One	Quantity demanded changes by exactly the same percentage as does price	Unit elasticity
Greater than one, but less than infinity	Quantity demanded changes by a larger percentage than does price	Elastic
Infinity	Purchasers are prepared to buy all they can obtain at some price and none at all at an even slightly higher price	Perfectly (or infinitely) elastic

Now that we are able to classify goods according to their price elasticity, let us see whether the goods which we considered in our example, are price elastic or inelastic.

Sl. No.	Name of the Commodity	Calculation of Elasticity $\frac{(q_1 - q_2)}{(q_1 + q_2)} \times \frac{(p_1 + p_2)}{(p_1 - p_2)}$	Nature of Elasticity
1.	Radios	$\frac{100-150}{100+150} \times \frac{500+400}{500-400} = 1.8 > 1$	Elastic
2.	Wheat	$\frac{500-520}{500+520} \times \frac{20+18}{20-18} = 0.37 < 1$	Inelastic
3.	Common Salt	$\frac{1000-1005}{1000+1005} \times \frac{9+7.50}{9-7.50} = 0.02743 < 1$	Inelastic

What do we note in the above hypothetical example? We note that the demand for radios is quite elastic, while demand for wheat is quite inelastic and the demand for salt is almost the same even after a reduction in price.

Generally, in real world situations also, we find that demand for goods like radios, TVs, refrigerators, fans, etc. is elastic; demand for goods like wheat and rice is inelastic; and demand for salt is highly inelastic or perfectly inelastic. Why do we find such a difference in the behaviour of consumers in respect of different commodities? We shall explain later at length those factors which are responsible for the differences in elasticity of demand for various goods. First, we will consider another method of calculating price-elasticity which is called total outlay method.

Total Outlay Method of Calculating Price Elasticity: The price elasticity of demand for a commodity and the total expenditure or outlay made on it are greatly related to each other. As the total expenditure (price of the commodity multiplied by the quantity of that commodity purchased) made on a commodity is the total revenue received by the seller (price of the commodity multiplied by quantity of that commodity sold of that commodity), we can say that the price elasticity and total revenue received are closely related to each other. By analysing the changes in total expenditure (or revenue), we can know the price elasticity of demand for the good. However, it should be noted that by this method we can only say whether the demand for a good is elastic or inelastic; we cannot find out the exact coefficient of price elasticity.

When, as a result of the change in price of a good, the total expenditure on the good or total revenue received from that good remains the same, the price elasticity for the good is equal to unity. This is because total expenditure made on the good can remain the same only if the proportional change in quantity demanded is equal to the proportional change in price. Thus, if there is a 100% increase in price of a good and if the price elasticity is unitary, total expenditure of the buyer on the good or the total revenue received from it will remain unchanged.

When, as a result of increase in the price of a good, the total expenditure made on the good or the total revenue received from that good falls or when as a result of decrease in price, the total expenditure made on the good or total revenue received from that good increases, we say that price elasticity of demand is greater than unity. In our example of radios, as a result of fall in price of radios from ` 500 to ` 400, the total revenue received from radios increases from ` 50,000 (500 x 100) to ` 60,000 (400 x 150), indicating elastic demand for radios. Similarly, had the price of radios increased from ` 400 to ` 500, the demand would have fallen from 150 radios to 100 radios indicating a fall in the total revenue received from ` 60,000 to ` 50,000 showing elastic demand for radios.

When, as a result of increase in the price of a good, the total expenditure made on the good or total revenue received from that good increases or when as a result of decrease in its price, the total expenditure made on the good or total revenue received from that good falls, we say that price elasticity of demand is less than unity. In our example of wheat, as a result of fall in the price of wheat from ` 20 per kg. to ` 18 per kg., the total revenue received from wheat falls from 10,000 (20 x 500) to ` 9360 (18 x 520) indicating inelastic demand for wheat. Similarly, we can show that as a result of increase in price of wheat from ` 18 to ` 20 per kg, the total revenue received from wheat increase from ` 9360 to ` 10,000 indicating inelastic demand for wheat. The whole argument can be summarized in the following table.

The Relationship between Price elasticity and Total Revenue (TR)

	Demand		
	Elastic	Unitary Elastic	Inelastic
Price increase	TR Decreases	TR remains same	TR Increases
Price decrease	TR Increases	TR remains same	TR Decreases

Determinants of Price Elasticity of Demand: In the above section we have explained what is price elasticity and how it is measured. Now an important question is: what are the factors which determine whether the demand for a good is elastic or inelastic? We will consider the following important determinants of price elasticity.

(1) **Availability of substitutes:** One of the most important determinants of elasticity is the degree of availability of close substitutes. Some commodities like butter, cabbage, Maruti Car, Coca Cola, etc. have close substitutes. There is margarine, other green vegetables, Santro or other cars, Pepsi or any other cold drink respectively. A change in the price of these commodities, the prices of the substitutes remaining constant, can be expected to cause quite substantial substitution – a fall in price leading consumers to buy more of the commodity in question and a rise in price leading consumers to buy more of the substitutes. Commodities such as salt, housing, and all vegetables taken together, have few, if any, satisfactory substitutes and a rise in their prices may cause a smaller fall in their quantity demanded. Thus, we can say that goods which typically have close or perfect substitutes have highly elastic demand curves. Moreover, wider the range of substitutes available, the greater will be the elasticity. For example, toilet soaps, toothpastes etc have wide variety of brands and each brand is a close substitute for the other.
It should be noted that while as a group, a good or service may have inelastic demand, but when we consider its various brands, we say that a particular brand has elastic demand. Thus, while the demand for a generic good like petrol is inelastic, the demand for Indian Oil's petrol is elastic. Similarly, while there are no general substitutes for health care, there are substitutes for one doctor or hospital. Likewise, the demand for common salt and sugar is inelastic because good substitutes are not available for these.

(2) **Position of a commodity in a consumer's budget:** The greater the proportion of income spent on a commodity; generally, the greater will be its elasticity of demand and vice- versa. The demand for goods like common salt, matches, buttons, etc. tend to be highly inelastic because a household spends only a fraction of their income on each of them. On the other hand, demand for goods like clothing, tends to be elastic since households generally spend a good part of their income on clothing.

(3) **Nature of the need that a commodity satisfies:** In general, luxury goods are price elastic while necessities are price inelastic. Thus, while the demand for television is relatively elastic, the demand for food and housing, in general, is inelastic. If it is possible to postpone the consumption of a particular good, such good will have elastic demand. Consumption of necessary goods cannot be postponed and therefore, their demand is inelastic.

(4) **Number of uses to which a commodity can be put:** The more the possible uses of a commodity, the greater will be its price elasticity and vice versa. When the price of a commodity which has multiple uses decreases, people tend to extend their consumption to its other uses. To illustrate, milk has several uses. If its price falls, it can be used for a variety of purposes like preparation of curd, cream, ghee and sweets. But, if its price increases, its use will be restricted only to essential purposes like feeding the children and sick persons.

(5) **Time period:** The longer the time-period one has, the more completely one can adjust. A simple example of the effect can be seen in motoring habits. In response to a higher petrol price, one can, in the short run, make fewer trips by car. In the longer run, not only can one make fewer trips, but he can purchase a car with a smaller engine capacity when the time comes for replacing the existing one. Hence one's demand for petrol falls by more when one has made long term adjustment to higher prices.

(6) **Consumer habits:** If a consumer is a habitual consumer of a commodity, no matter how much its price change, the demand for the commodity will be inelastic.

(7) **Tied demand:** The demand for those goods which are tied to others is normally inelastic as against those whose demand is of autonomous nature. For example, printers and ink cartridges.

(8) **Price range:** Goods which are in very high price range or in very low-price range have inelastic demand, but those in the middle range have elastic demand.

Knowledge of the price elasticity of demand and the factors that may change it is of key importance to business managers because it helps them recognise the eect of a price change on their total sales and revenues. Firms aim to maximise their pro-ts and their pricing strategy is highly decisive in attaining their goals. Price elasticity of demand for the goods they sell helps them in arriving at an optimal pricing strategy. If the demand for a -rm's product is relatively elastic, the managers need to recognize that lowering the price would expand the volume of sales, and result in an increase in total revenue. On the other hand, if demand were relatively inelastic, the -rm may safely increase the price and thereby increase its total revenue as they know that the fall in sales would be less than proportionate. On the contrary, if demand is elastic, a price increase will lead to a decline in total revenue as fall in sales would be more than proportionate.

Knowledge of price elasticity of demand is important for governments while determining the prices of goods and services provided by them, such as, transport and telecommunication. Further, it also helps the governments to understand the nature of responsiveness of demand to the increase in prices on account of additional taxes and the implications of such responses on the tax revenues. Elasticity of demand explains why Governments are inclined to raise the indirect taxes on those goods that have a relatively inelastic demand, like alcohol and tobacco products.

Income Elasticity of Demand

Income elasticity of demand is the degree of responsiveness of quantity demanded of a good to changes in the income of consumers. In symbolic form,

$$E_i = \frac{\text{Percentage change in demand}}{\text{Percentage change in income}}$$

This can be given mathematically as follows:

$$E_i = \frac{\Delta Q}{Q} \div \frac{\Delta Y}{Y}$$

$$= \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y}$$

$$= \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

E_i = Income elasticity of demand
ΔQ = Change in demand
Q = Original demand
Y = Original money income
ΔY = Change in money income

There is a useful relationship between income elasticity for a good and the proportion of income spent on it. The relationship between the two is described in the following three propositions:

1. If the proportion of income spent on a good remains the same as income increases, then income elasticity for the good is equal to one.

2. If the proportion of income spent on a good increase as income increases, then the income elasticity for the good is greater than one.

3. If the proportion of income spent on a good decrease as income rises, then income elasticity for the good is less than one.

Income elasticity of goods reveals a few very important features of demand for the goods in question. If income elasticity is zero, it signifies that the demand for the good is quite unresponsive to changes in income. When income elasticity is greater than zero or positive, then an increase in income leads to an increase in demand for the good. This happens in the case of most of the goods and such goods are called normal goods. For all normal goods, income elasticity is positive. However, the degree of elasticity varies according to the nature of commodities. As against this, goods having negative income elasticity are known as inferior goods and their demand falls as income increases. The reason is that when income increases, consumers choose to consume superior substitutes. Another significant value of income elasticity is that of unity. When income elasticity of demand is equal to one, the proportion of income spent on goods remains the same as consumer's income increases. This represents a useful dividing line. If the income elasticity for a good is greater than one, it shows that the good bulks larger in consumer's expenditure as he becomes richer. Such goods are called luxury goods. On the other hand, if the income elasticity is less than one, it shows that the good is either relatively less important in the consumer's eye or, it is a necessity.

The following examples will make the above concepts clear:

(a) The income of a household rises by 10%, the demand for wheat rises by 5%.

(b) The income of a household rises by 10%, the demand for T.V. rises by 20%.

(c) The incomes of a household rise by 5%, the demand for bajra falls by 2%.

(d) The income of a household rises by 7%, the demand for commodity X rises by 7%.

(e) The income of a household rises by 5%, the demand for buttons does not change at all. Using formula for income elasticity,

$$\text{i.e. } E_i = \frac{\text{Percentage change in demand}}{\text{Percentage change in income}}$$

we will find income-elasticity for various goods. The results are as follows:

S. No.	Commodity	Income-elasticity for the household	Remarks
a	Wheat	$\frac{5\%}{10\%} = .5$ (Ei <1)	Since 0 < .5 < 1, wheat is a normal good and fulfils a necessity.
b	T.V.	$\frac{20\%}{10\%} = 2$(Ei >1)	Since 2 > 1, T.V. is a luxurious commodity.
c	Bajra	$\frac{(-)2\%}{5\%} = (-).4$ (Ei <0)	Since –.4 < 0, Bajra is an inferior commodity in the eyes of the household.
d	X	$\frac{7\%}{7\%} = 1$(Ei = 1)	Since income elasticity is 1, X has unitary income elasticity.
e	Buttons	$\frac{0\%}{5\%} = 0$(Ei = 0)	Buttons have zero income-elasticity.

It is to be noted that the words 'luxury', 'necessity', 'inferior good' do not signify the strict dictionary meanings here. In economic theory, we distinguish them in the manner shown above.

Knowledge of income elasticity of demand is very useful for a business firm in estimating future demand for its products. Knowledge of income elasticity of demand helps firms predict the outcome of a business cycle on its market demand. This enables the firm to carry out appropriate production planning and management.

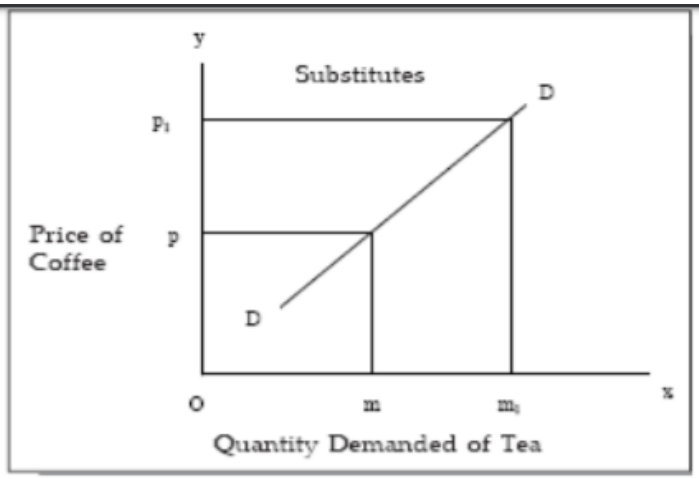
Cross Elasticity of Demand

Price of Related Goods and Demand:

The demand for a particular commodity may change due to changes in the prices of related goods. These related goods may be either complementary goods or substitute goods. This type of relationship is studied under 'Cross Demand'. Cross demand refers to the quantities of a commodity or service which will be purchased with reference to changes in price, not of that particular commodity, but of other inter-related commodities, other things remaining the same. It may be defined as the quantities of a commodity that consumers buy per unit of time, at different prices of a 'related article', 'other things remaining the same'. The assumption 'other things remaining the same' means that the income of the consumer and also the price of the commodity in question will remain constant.

Substitute Products

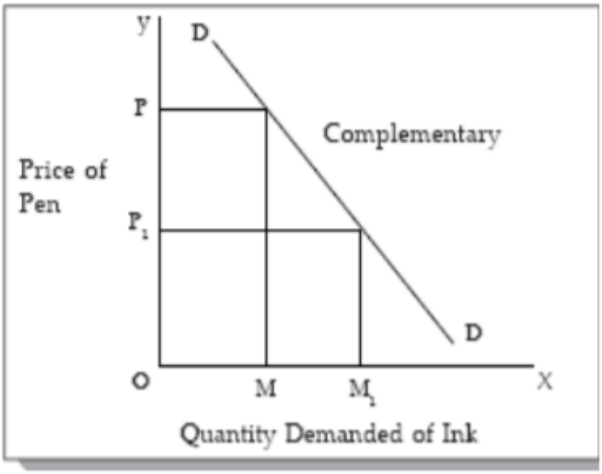
In the case of substitute commodities, the cross-demand curve slopes upwards (i.e. positively) showing that more quantities of a commodity, will be demanded whenever there is a rise in the price of a substitute commodity. In figure, the quantity demanded of tea is given on the X axis. Y axis represents the price of coffee which is a substitute for tea. When the price of coffee increases, due to the operation of the law of demand, the demand for coffee falls. The consumers will substitute tea in the place of coffee. The price of tea is assumed to be constant. Therefore, whenever there is an increase in the price of one commodity, the demand for the substitute commodity will increase.



Substitutes

Complementary Goods

In the case of complementary goods, as shown in the figure below, a change in the price of a good will have an opposite reaction on the demand for the other commodity which is closely related or complementary. For instance, an increase in demand for pen will necessarily increase the demand for ink. The same is the case with complementary goods such as bread and butter; car and petrol electricity and electrical gadgets etc. Whenever there is a fall in the demand for fountain pens due to a rise in prices of fountain pens, the demand for ink will fall, not because the price of ink has gone up, but because the price of fountain pen has gone up. So, we find that there is an inverse relationship between price of a commodity and the demand for its complementary good (other things remaining the same).



Complementary Goods

A change in the demand for one good in response to a change in the price of another good represents cross elasticity of demand of the former good for the latter good. Here, we consider the effect of changes in relative prices within a market on the pattern of demand.

Symbolically, (mathematically)

$$E_c = \frac{\Delta q_x}{q_x} \div \frac{\Delta p_y}{p_y}$$

$$E_c = \frac{\Delta q_x}{\Delta p_y} \times \frac{p_y}{q_x}$$

Where E_c stands for cross elasticity.
q_x stands for original quantity demanded of X.
Δq_x stands for change in quantity demanded of X.
p_y stands for the original price of good Y.
Δp_y stands for a small change in the price of Y.

If two goods are perfect substitutes for each other, the cross elasticity between them is infinite. Greater the cross elasticity, the closer is the substitute. If two goods are totally unrelated, cross elasticity between them is zero.

If two goods are substitutes (like tea and coffee), the cross elasticity between them is positive, that is, in response to a rise in price of one good, the demand for the other good rises. On the other hand, when two goods are complementary (tea and sugar) to each other, the cross elasticity between them is negative so that a rise in the price of one lead to a fall in the quantity demanded of the other. Higher the negative cross elasticity, higher will be the extent of complementarity.

However, one need not base the classification of goods on the basis of the above definitions. While the goods between which cross elasticity is positive can be called substitutes, the goods between which cross elasticity is negative are not always complementary. This is because negative cross elasticity is also found when the income effect of the price change is very strong.

The concept of cross elasticity of demand is useful for a manager while making decisions regarding changing the prices of his products which have substitutes and complements. If cross elasticity to change in the price of substitutes is greater than one, the -rm may lose by increasing the prices and gain by reducing the prices of his products. With proper knowledge of cross elasticity, the -rm can plan policies to safeguard against fluctuating prices of substitutes and complements.

Illustration 1: - The price of 1kg of tea is Rs 30. At this price 5kg of tea is demanded. If the price of coffee rises from Rs 25 to Rs 35 per kg, the quantity demanded of tea rises from 5kg to 8kg. Find out the cross-price elasticity of tea.

Solution: -

$$\text{Cross elasticity} = \frac{\Delta q_x}{\Delta p_y} \times \frac{p_y}{q_x} \quad \text{Here } x = \text{tea},\ y = \text{coffee}$$

$$= \frac{5-8}{-10} \times \frac{25}{5} = \frac{-3}{-10} \times \frac{25}{5} = +1.5$$

The elasticity of demand of tea is +1.5 showing that the demand of tea is highly elastic with respect to coffee. The positive sign shows that tea and coffee are substitute goods.

Illustration 2: - The price of 1 kg of sugar is Rs 50. At this price 10 kg is demanded. If the price of tea falls from Rs 30 to Rs 25 per kg, the consumption of sugar rises from 10 kg to 12 kg. Find out the cross-price elasticity and comment on its value.

Solution: -

$$\text{Cross elasticity} = \frac{\Delta q_x}{\Delta p_y} \times \frac{p_y}{q_x} \quad \text{Here } x = \text{Sugar}, \; y = \text{Tea}$$

$$= \frac{2}{-5} \times \frac{30}{10} = (-)1.2$$

Since the elasticity is -1.2, we can say that sugar and tea are complementary in nature.

Advertisement Elasticity

Advertisement elasticity of sales or promotional elasticity of demand is the responsiveness of a good's demand to changes in -rm's spending on advertising. The advertising elasticity of demand measures the percentage change in demand that occurs given a one percent change in advertising expenditure. Advertising elasticity measures the effectiveness of an advertisement campaign in bringing about new sales.

Advertising elasticity of demand is typically positive. Higher the value of advertising elasticity greater will be the responsiveness of demand to change in advertisement. Advertisement elasticity varies between zero and infinity. It is measured by using the formula;

$$Ea = \frac{\text{\% Change in demand}}{\text{\% change in spending on advertising}}$$

$$Ea = \frac{\Delta Qd / Qd}{\Delta A / A}$$

Where ΔQd denotes change in demand.
ΔA denotes change in expenditure on advertisement.
Qd denotes initial demand.
A denotes initial expenditure on advertisement.

Elasticity	Interpretation
$Ea = 0$	Demand does not respond to increase in advertisement expenditure.
$Ea > 0$ but < 1	Change in demand is less than proportionate to the change in advertisement expenditure.
$Ea = 1$	Demand changes in the same proportion in which advertisement expenditure changes.
$Ea > 1$	Demand changes at a higher rate than change in advertisement expenditure.

As far as a business -rm is concerned, the measure of advertisement elasticity is useful in understanding the effectiveness of advertising and in determining the optimum level of advertisement expenditure.