Chapter 4

DEMAND

Teach a parrot 'demand' and 'supply' and you have an economist

Demand is one of the most important concepts in economics. Working of free market economic system is based on **prices** of goods and services which are determined by the interaction of the forces of demand and supply. So we can say that **it is the forces of demand and supply that make market economies work.** If we want to know how any event or policy will affect the economy, we must think first about how it will affect demand and supply position of goods or resources.

Meaning

In common language the words '*demand*', '*desire*' and '*need*' are used in the same meaning. But in economics, the word demand is used in **three senses.**

(i) Demand is the **effective desire** to buy something.[1]
Demand = desire + purchasing power.

Suppose a person desires to get a motorcycle. He knows the price and has enough money to buy one, then his desire becomes demand. If he is just empty pocket, he has desire but no demand.[2]

(ii) Demand indicates quantity actually bought
Demand = **quantity purchased** at a particular price during a period of time.

If in a hockey match, the price of ticket is Rs. 50 and total tickets sold are 1000. Then 1000 is the demand for tickets at this price.

(iii) Demand as a schedule (or table) showing **negative relation between price and quantity** bought.[3]

Demand is a ***relation*** showing the various amounts of a *commodity* that buyers would be willing and able to purchase at alternative prices during a given time period, all other things remaining the same.

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[1] **Demand and Wants:** Consumer demand and consumer wants are not the same thing. Demand reflects those wants that are translated into action; not mere a desire to have something. To say that someone demands a particular good means that he or she is able and willing to buy it at some price.

[2] **Demand reflects wants and not needs.** When we say that a child needs milk, there is no question of price and demand. Need is linked to value judgement what a people 'should' get. But want is linked to psychological feeling of a person. If a person 'wants' to have a palace it does not mean that he 'needs' that.

[3] **Demand function** Demand schedule is also called demand function.

For example, the whole of the table 4.1 will be called demand for eggs. It shows an *assumed daily demand* for eggs by the people of Lahore[4].

When we say that demand for TV sets has risen in Pakistan, we mean a change in demand schedule; showing greater number of sets bought at each price.[5]

Table 4.1 Demand schedule

Price of eggs (Rs./dozen)	Daily demand[6] (thousand dozens)
20	7
40	6
60	5
80	4
100	3

Individual and Market Demand

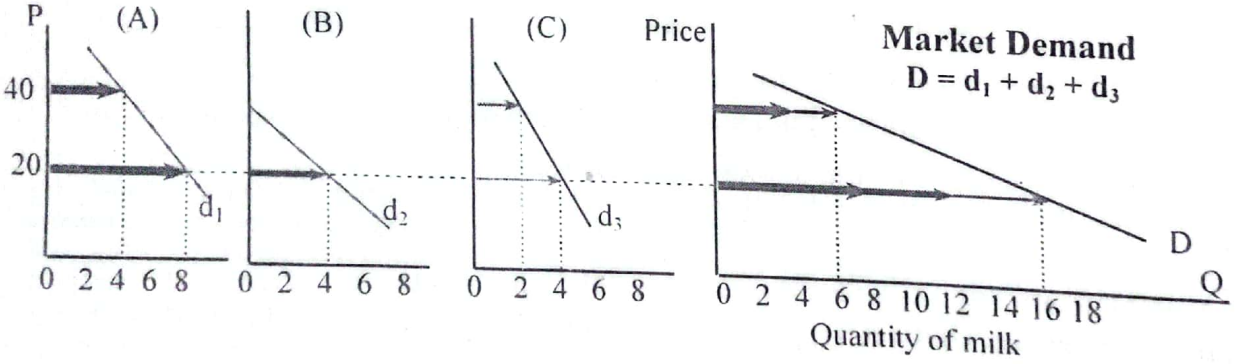
Individual demand is the schedule of quantities demanded by a single buyer at various prices. **The market demand is the total demand of all buyers in the market and it is obtained by adding the individual demands**[7] as done in table 4.2. We have supposed that there are only three buyers in the market with different incomes and tastes.

Table 4.2

Price of Milk (Rs./litre)	Individual demands (Litres per day) A	B	C	Daily market demand (litres) A + B + C
40	4	0	2	6
30	6	2	3	11
20	8	4	4	16

If we add individual demands horizontally,[8] we get market demand.

Fig. 4.1



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[4] This demand schedule does not tell us **which of the five prices** will actually exist in the egg market. This depends on demand and supply. Demand is simply a **price-quantity relationship** and **tabular statement of buyers' plans** what they are ready to buy at each price.

[5] We have seen that **'demand' and 'quantity demanded'** are different. Yet while talking of demand, frequently, we use 'demand' for 'quantity demanded' and vice versa.

[6] To be meaningful the quantities demanded at each price must relate to some **period of time**; a day, a week or a month.

[7] Demand is of many kinds: **derived demand, complementary demand** and **composite demand**. For detail see supplementary notes at the end of the chapter.

[8] It is also called **lateral summation.**

LAW OF DEMAND

It is our common experience that the quantity of a commodity people buy is linked to its price. We may observe any number of markets we will always find that *price of a commodity and its demand have inverse relation*. Since the inverse relationship between price and quantity demanded is universally true, the economists call the relation as **law of demand.**

"If other things do not change, people buy more of a good when its price falls and less of it when its price rises."[9]

This is *verbal statement* of law of demand. The law can be shown in the form of a demand *schedule* or a demand *curve*.

Demand Schedule

A demand schedule shows the quantities of a good or service which buyers would be willing and able to purchase at various prices.[10] When the pairs of P and Q are put in a table, we get a demand schedule as shown in table 4.3. The demand schedule shows that when price is Rs.40 per kg, people buy 200 kg. of sugar. When price starts falling the demand for sugar expands. At price Rs.20 per kg, the quantity demanded reaches 600 kg.

Table 4.3 Demand schedule

Price of sugar (Rs./kg)	Quantity demanded (kg)
40	200
35	300
30	400
25	500
20	600
15	700

Demand Curve

When the relation between demand and price is shown in a graph, it is called demand curve. Each point of the demand curve refers to a quantity that will be demanded at the given price. We have plotted the values of price and quantity from table 4.3. in the following graph:

Demand schedule is a table that shows the relationship between the price of a good and the quantity demanded.

Demand curve is a graph showing the relationship between the price of a good and the quantity demanded

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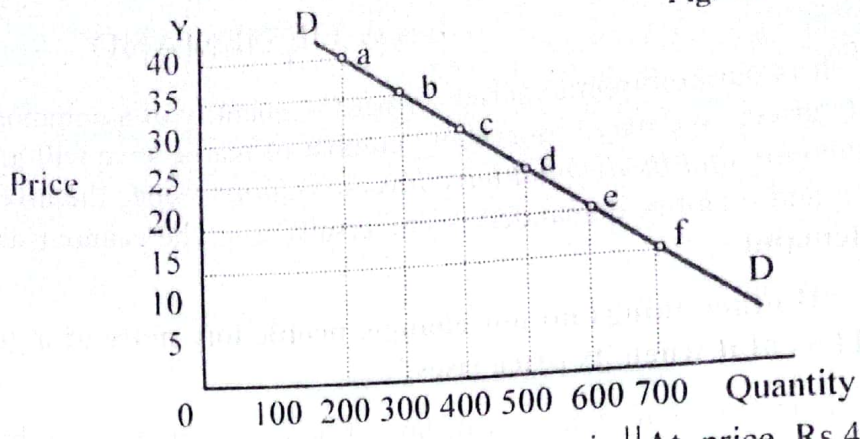
[9] Or 'An **inverse relationship** exists between the **price** of a good and the **quantity demanded** of that good, other things being equal'.

[10] To describe the inverse relation between price and quantity demanded we always take the **change in price first** and then the resultant change in quantity. This is explained as law of demand. However in real markets we also observe that when demand rises, price rises and vice versa. This relationship i.e. the **effect of change in demand on price** is explained through a shift of demand and its effect on market equilibrium. To say that since the demand for cars has increased, the price of cars has increased means that demand curve for cars has shifted towards right. As a result a new equilibrium price (higher) will be settled in the market. See Chapter 6.

Fig. 4.2



Quantity is measured along x-axis and price along y-axis.[11] At price Rs.40 the demand is 200. This gives us point **a**. Similarly, we get the points **b, c, d** and **e** at other prices. When we join these points, we get demand curve DD. It is falling from left to right. (Each point of the demand curve relates a particular quantity demanded to a price if the consumers expect that price to continue).[12]

Why demand curve has negative slope?

There are three reasons for this.

(i) When price decreases, purchasing power of people (i.e. real income) increases, so they can buy more with the same amount of money. This is called **income effect.**

(ii) If the price of some commodity, say, mangoes decreases while the prices of its substitutes (say, banana and apples) remain the same, people feel that this commodity is relatively cheaper. So, they decrease the purchase of apples and buy more of mangoes. This is called **substitution effect.**

(iii) Fall in price brings **new buyers** into the market. Many such people who could not buy at higher price now start buying.[13]

(iv) Demand curve slopes downward because of **diminishing marginal utility.** A commodity is demanded because it has utility. Since utility of additional units is lower i.e. MU falls, people buy additional units if they are offered at lower price.

Assumptions

The inverse relation between **price** of a commodity and **quantity** demanded will be observed only if other factors influencing quantity are held constant i.e. "if other things do not change." These are called the assumptions of law of demand. These are:

1. *Income of the consumers does not change*: If income changes, it may neutralise

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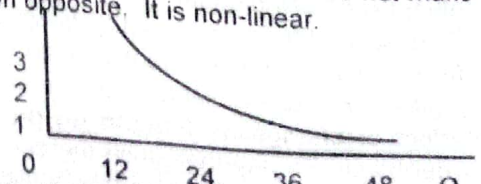
[11] Although **price is independent variable** and according to mathematics it should be shown on x-axis, yet in economics it is more convenient to represent P on vertical axis.

[12] **Shape of Demand Curve** In the above given example, we have shown demand as a straight line. We have done so because it is convenient to draw st. lines and we want to keep the study simple. In reality a demand curve is more likely to be a curved line convex to the origin. We may take values, which do not make a st. line. For example graph this table: It will make a curve as shown opposite. It is non-linear.

P	4	3	2	1
Q	12	16	24	48



[13] **Price acts as an obstacle** to buy goods. The lower this obstacle, the more buyers can enter the market.

the effect of change in price and people may buy the same quantity even when price rises. For example although PIA has increased fares, yet more and more people are travelling by air. The reason is higher incomes.

2. *Tastes of the buyers do not change*: Tastes include habits, customs, weather conditions, fashion etc. When winter comes people buy more woollen clothing although its price has not fallen.

3. *Prices of related goods remain the same*: Related goods may be either substitutes or complements. Law of demand will be true only if prices of these goods do not change. Thus, even if the price of chicken is constant, people may buy more chicken because price of mutton has risen.

Influences on Demand

Demand for a commodity is influenced by many factors such as price of the commodity, income and tastes of the buyers and prices of other related goods. These factors are called **determinants of demand**. However, in short period, the frequent changes we observe in quantity demanded, are mostly due to changes in price only. The other factors exert influence and become relevant only in the long period. So we explain the relationship between price and quantity bought by assuming that other influencing factors remain unchanged. [This assumption is called as 'other things equal' or 'ceteris paribus'][1]

4. *Population does not increase*: If population rises, the number of buyers in the market will increase and demand will be more even without change in prices.

5. *People do not expect early changes in price*: Sometimes if price increases and the people expect that the price is going to increase still further, they buy more even at higher price. (Before announcement of budget; if people expect some commodities to become dearer due to tax they try to hoard them).

6. *Quantity of money* (or availability of bank credit) in the country does not change: otherwise people's purchasing power increases and they buy more.

Exceptions or exceptional demand curves

Normally demand curve slopes downward. But under some circumstances, it may rise upward i.e. people may buy more at higher prices. There are four main reasons why some goods become exceptions to law of demand.

(1) ***Giffen Good*** is some inferior good having expensive substitutes e.g. wheat and potatoes. Poor families spend a large part of their income on wheat. When price of wheat falls some amount is saved which may be used to buy rice. Consuming more rice means less demand for wheat. So fall in price of wheat causes decreased in demand.[14]

(2) **Hoarding** during war or some other emergency, people may expect that the commodity will not be available in the market. They may buy more even if price is increasing.[15]

(3) If a commodity becomes a **status symbol** or distinction some people (i.e. snobbish persons) may buy more at higher price.

(4) If people **judge the quality by price** of a commodity (taking higher price as a sign of better quality), they buy more when price is higher.

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[14] See explanatory note at the end of chapter.

[15] This trend is also observable about real estate and stock market. When prices of property are rising, the prospective buyers are in hurry to buy. They want to avoid further rise in price.

CHANGES IN DEMAND
OR
SHIFT IN DEMAND CURVE

The demand for a commodity depends upon many factors. These include price of the commodity, and many other factors such as income level, tastes of the buyers, prices of substitutes and complements. A change in any factor can bring about change in the quantity demanded. However economists study the effect of change in price separately from the effect of change in other factors. So, they have classified the changes in demand into two types.

(a) *Extension and contraction* of demand showing influence of price changes. (i.e. movement along demand curve).

(b) *Rise and fall* in demand showing influence of changes in other factors. (i.e. shift of demand curve).

Extension and Contraction

Extension and contraction mean the **variation in quantity demanded because of changes in price**. When price of a commodity decreases, people buy more quantity of it. This is called extension of demand. On the other hand, if price increases, people buy less quantity. This is known as contraction of demand.

In the case of extension or contraction, the demand schedule and demand curve do not change. **The buyer moves up or down the same curve**. In table 4.4 when price of eggs is Rs. 40 per dozen, the quantity demanded is 100 dozens. But when price goes down to Rs.20 per dozen, the demand for eggs extends from 100 dozens to 160 dozens. Later on, if price again rises to Rs. 40 demand will contract.

Table 4.4

Price of eggs (Rs)	Quantity demanded (dozens)
40	100 (contraction ↑ / extension ↓)
20	160

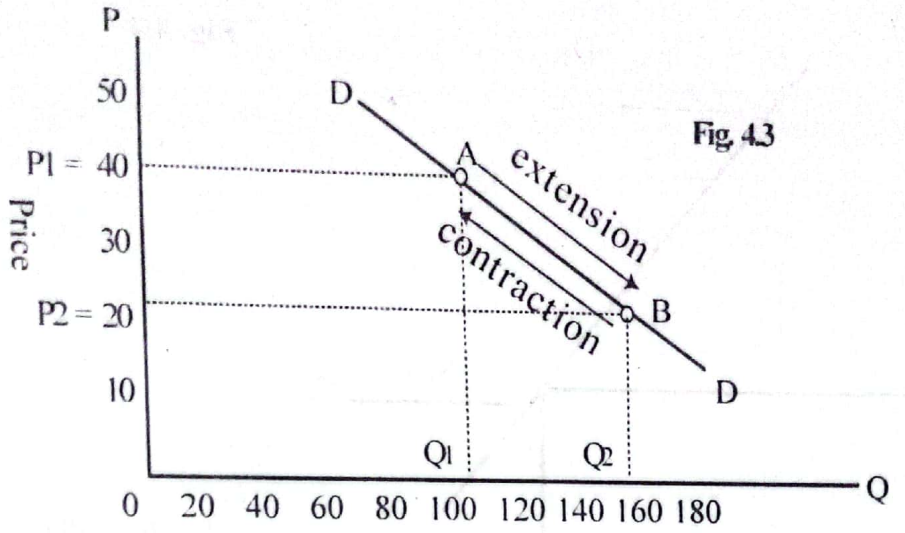


Fig. 4.3

Fig. 4.3 shows that when price is P_1 quantity demanded is Q_1. It gives us point A. When price falls to P_2 quantity demanded extends to Q_2. This gives us the point B. Thus extension means travelling downward along the same demand curve. In the opposite case if there is contraction in demand, the buyer travels upward from point B to A.

Rise and Fall of Demand (or Shift in Demand Curve)

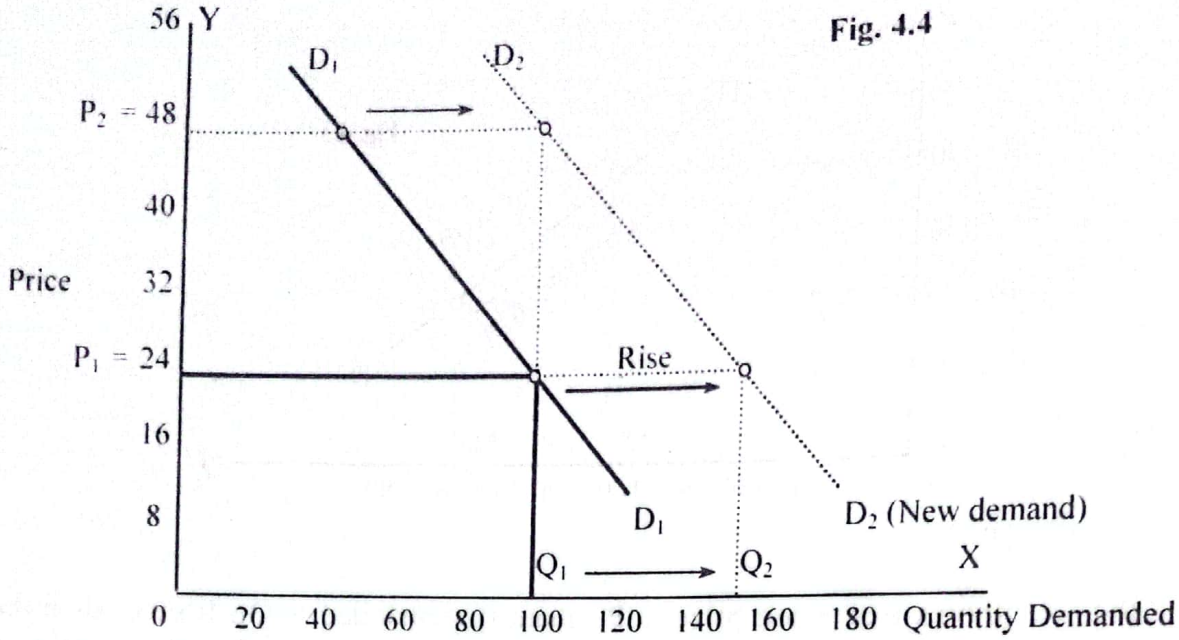
When demand for a commodity goes up or down, not due to price but due to other factors, the change is called rise (or increase) in demand and fall (or decrease) in demand. In such a case the whole demand schedule changes and demand curve shifts. In table 4.5, column 2 shows daily demand for eggs in summer at various prices. In winter, people's taste changes and preference for eggs increases. Column 3 shows this change. We notice that at the same prices, people are buying more eggs in winter than in summer. For instance in summer at price Rs. 24 per dozen, the market demand is 100 dozens. But in winter, at the same price, the demand is 160 dozens. This is rise in demand. We can look at rise in demand in another way. In summer 100 dozen eggs are demanded at price Rs. 24. But in winter the people are willing to buy the same quantity at a higher price i.e. Rs.48. Thus rise in demand also means same quantity demanded at a higher price.

Table 4.5 Rise in Demand

Price of eggs (Rs./dozen)	Original demand in summer (dozens per day)		Increased demand in winter (dozens per day)
48	40		100
40	60		120
32	80	Rise →	140
24	100		160
16	120		180

In fig. 4.4, D_1 D_1 is the original demand in summer. In winter the demand rises and shifts to D_2 D_2 position

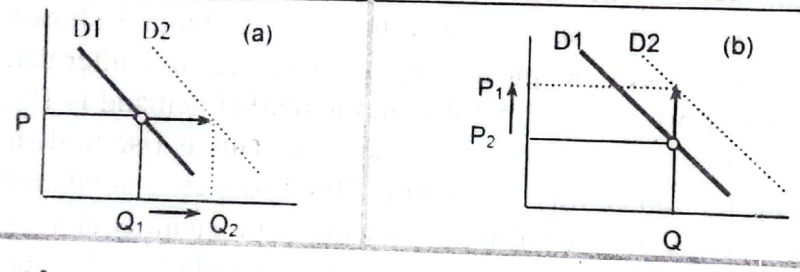
Fig. 4.4



At price OP_1, quantity demanded in summer is OQ_1 while it is OQ_2 in winter at the same price. In another way, we can see that in summer OQ_1 quantity is bought at price OP_1. When demand rises in winter, the same quantity is bought at a higher price OP_2.

Two ways to look at Rise in Demand

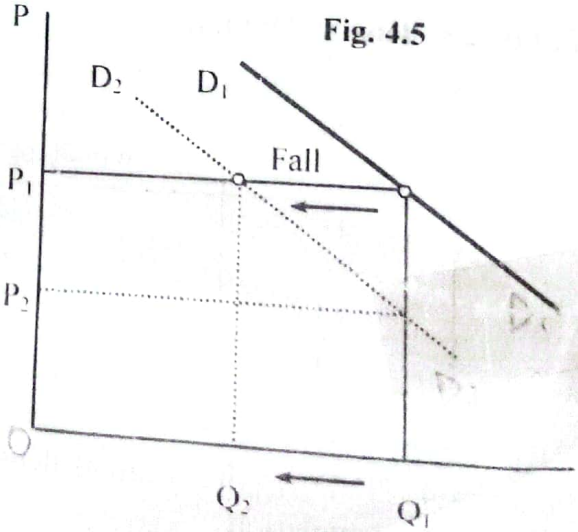
(a) More Qd at Same Price		(b) Same Qd at More Price	
P	Q	P	Q
4	100	4	100
4	150	8	100



Fall in Demand

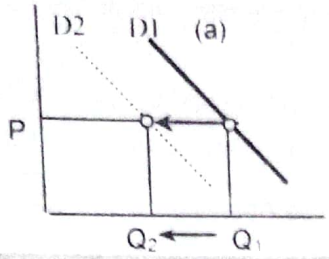
Fig. 4.5 shows the fall in demand. D_1 D_1 is the original demand and D_2 D_2 is new demand showing a fall. Initially at price OP_1 the quantity demanded is OQ_1 but after fall in demand, at the same price, people demand less quantity i.e. OQ_2. Shift of demand curve from D_1 D_1 position to D_2 D_2 also indicates that people will buy the same quantity OQ_1 even though new price OP_2 is lower than before OP_1. **When a cricket match becomes dull and uninteresting, the number of tickets sold may not increase even if the price is reduced**

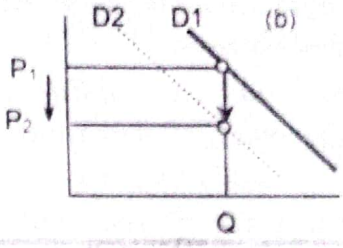
Fig. 4.5



Two Ways to look at **Fall in Demand**

(a) Less Qd at same price		(b) Same Qd at less price	
P	Q	P	Q
4	100	4	100
4	50	2	100





Causes of Change in Demand (Demand Shifters)[16]

Many factors are responsible for rise or fall in demand of a commodity.[17]

1. *Change in Income*: Demand for a commodity is directly affected by changes in income of the consumers. Normally when income of the consumers increases, they buy more of the commodity. Decrease in income has opposite effect. One reason that demand for fridges and cars is increasing in Pakistan is that average income of Pakistanis is rising.[18]

2. *Change in Population*: If population increases, the number of buyers will also increase. Consequently, demand will rise at the same prices and vice versa. For example

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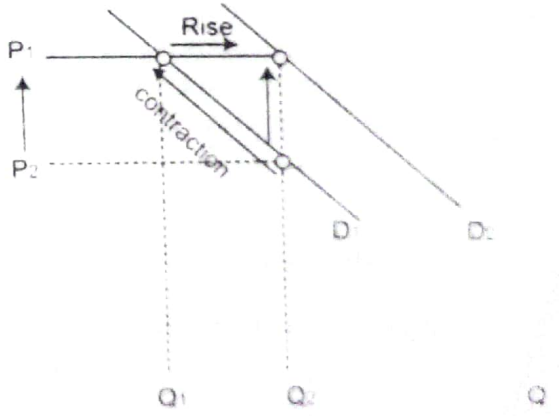
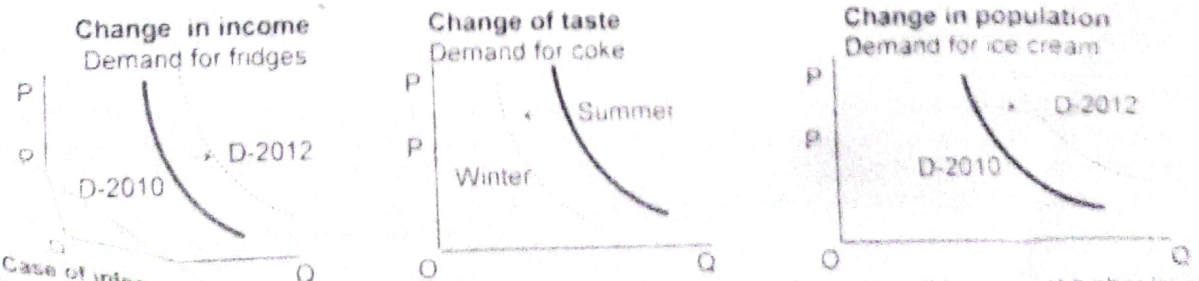
[16] **Demand and Quantity Demanded** When price changes, there is a change in quantity demanded and movement along the same curve. But when other factors like income change, there is change in demand. The whole schedule changes and there is shift to a new demand curve. Consider two statements (i) Rise in price of meat has reduced its demand. (ii) Rise in demand for meat has increased its price. Can both statements be true? Yes, both are true. The only confusion is that they are referring to two different things. First statement refers to qd. which has contracted. The second refers to shift of demand or rise of demand due to some factor like income or tastes. (See the fig.)





Case of inferior goods: If a consumer thinks that the commodity is inferior, he will buy less at higher level of income. This can happen when a poor person becomes rich. He consumes more meat and his demand for pulses may fall instead of rising.

population of our country has increased, so demand for houses is rising. Due to rise in number of old people in Pakistan, demand for medical care has increased.

3. *Change in Consumer preferences (Tastes or* Liking and Disliking): If people's preferences change in favour of a particular commodity and they like to consume more of it, the demand will rise. And if the change in tastes is unfavourable towards the commodity, the demand will fall. The taste for a commodity depends upon factors such as fashion, habits, customs, weather, season, education etc. For example during winter, people do not like cold drinks so their demand falls and demand curve shifts leftwards.[19]

4. *Prices and availability of related goods (substitutes and complements)* A decrease in the price of substitute of a commodity will cause fall in its demand. For instance fish is substitute for meat. A decrease in the price of fish will cause fall in the demand for meat. Cars and petrol are complements i.e. they are used jointly. So if prices of cars fall, demand for both cars and petrol would rise.

Variable Affecting demand	Kind of change it brings
Price	Shows movement along the same demand curve
Income	Shifts the demand curve
Prices of related goods	Shifts the demand curve
Tastes and preferences	Shifts the demand curve
Expectations	Shifts the demand curve
Number of buyers	Shifts the demand curve

5. *Advertisement and Publicity* Through advertisement and publicity, people's tastes and preferences can be affected and their purchase plans can be changed. A successful advertisement campaign[20] attracts more customers at the same price.

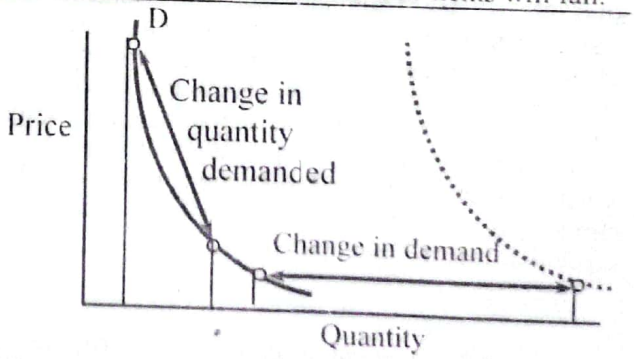
6. *Change in income distribution* if due to government policy, the income of poorer sections rises while that of the rich decreases, then demand for ACs will fall and demand for fans will increase. Similarly if the change is in favour of the rich, demand for luxuries will rise.

7. *Expectations about future prices can affect current purchases.* If a rise in price of sugar is expected, people buy larger quantity now. An expected fall in prices has the opposite effect e. g. if people expect that after the budget, ghee will become expensive, they will try to buy more ghee at current prices[21].

8. *Change in quantity of money*: When the quantity of money in a country increases, the demand for goods rises and vice versa e.g. If banks increase credit (loans) facilities, demand for many goods rises.

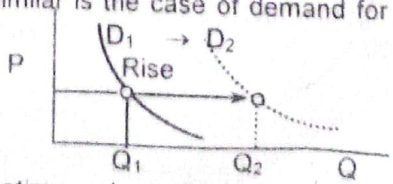
9. *Expenditure Tax* discourages people to buy goods. As a result, demand for various items will fall.

Change in demand and Change in quantity demanded



[19] **Technological development** in the form of a new product may bring a revision in consumers' tastes e.g. introduction of ball-pen has reduced demand for pen. Similar is the case of demand for simple radio after invention of TV.

[20] Effect of **successful advertisement** by Sony TV



[1] **Interesting examples** can be observed in daily life. Sometimes a journalist in the newspaper drops a hint of shortage of sugar, petrol or something else with the result that people rush to buy it. Suddenly the demand rises that actual shortage is felt.

ELASTICITY OF DEMAND

The concept of elasticity of demand is very important in economic theory and economic policy. It is used to measure the **effect of changes in price on quantity demanded**. For a given change in price, if the change in quantity demanded is greater, we say the demand is more elastic. We can define it as follows: [22]

"Elasticity of demand is the measure of responsiveness of quantity demanded to changes in price."

OR

"Percentage change in quantity demanded divided by percentage change in price"

$$Ed = \frac{\text{\% change in quantity demanded}}{\text{\% change in price}} \qquad \left[\frac{\%\Delta Q}{\%\Delta P}\right]$$

Where E_d = elasticity of demand.[23]

Elastic and Inelastic Demand

The response of demand to changes in price is not constant. Sometimes the consumers are highly responsive to price changes. A small change in price causes a big change in quantity demanded. This is called *relatively elastic demand* or simply *elastic demand*. For some products like salt the consumers pay little attention to price changes. A large change in price has a very small effect on demand. The demand for such products is known as *relatively inelastic* or simply *inelastic demand*. The following table makes the concept clear.

Table 4.6

(a) Elastic Demand

Price	Demand
10	100
9	150

(b) Inelastic Demand

Price	Demand
10	100
5	110

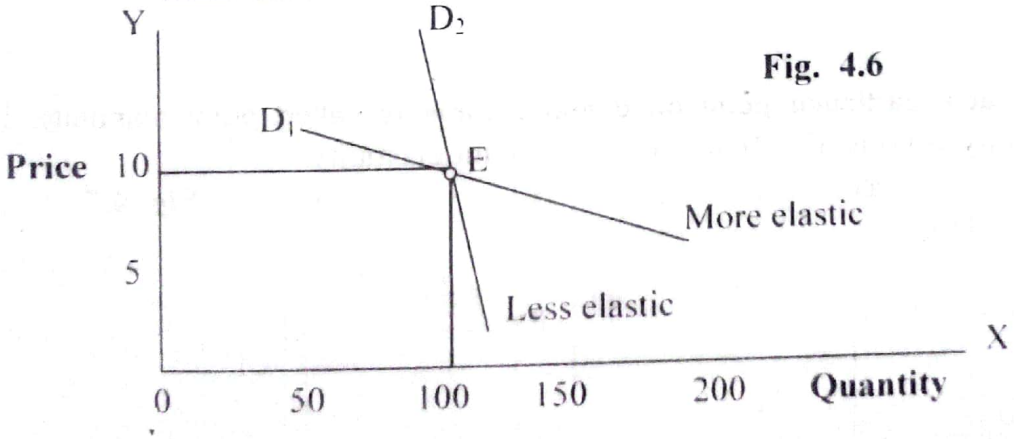


Fig. 4.6

[22] A. L. Meyers defines elasticity in the following words: **"The elasticity of demand is a measure of relative change in amount purchased in response to a relative change in price on a given demand curve".**

[23] We know $e = \frac{\text{\% change in Q}}{\text{\% change in P}} = \frac{\Delta Q/Q \times 100}{\Delta P/P \times 100} = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

Since $\Delta Q/Q$ is called relative change in Q, we can write

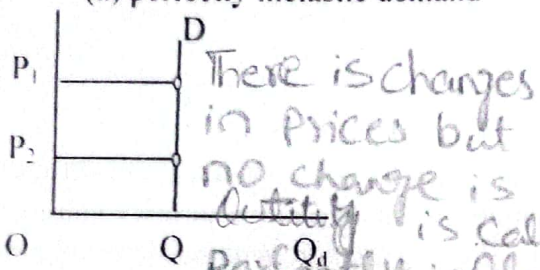
$Ed = \frac{\text{Relative change in Q}}{\text{Relative change in P}}$ or $\frac{\text{Proportionate change in Q}}{\text{Proportionate change in Q}}$

In the above figure demand curve 1 is relatively flatter. On this demand a given change in price will bring a larger change in q.

Elastic Demand		Inelastic Demand	
Price Coca cola	Bottles Demanded Millions per year	Price of Salt (per kg.)	Demand (000 tons) per year
10	40	10	20
9	80	5	21

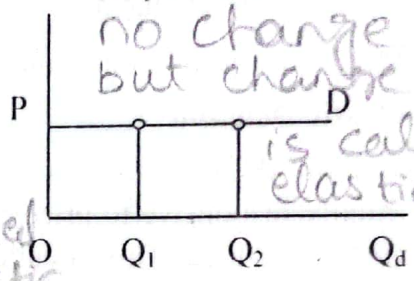
Zero and Infinite Elasticity. There are two extreme cases of perfectly inelastic and perfectly elastic demand[24] as shown in fig. (a) and (b)

(a) perfectly inelastic demand



change of price has no effect on Q_d

(b) perfectly elastic demand



more quantity sold at the same price.

MEASUREMENT OF ELASTICITY

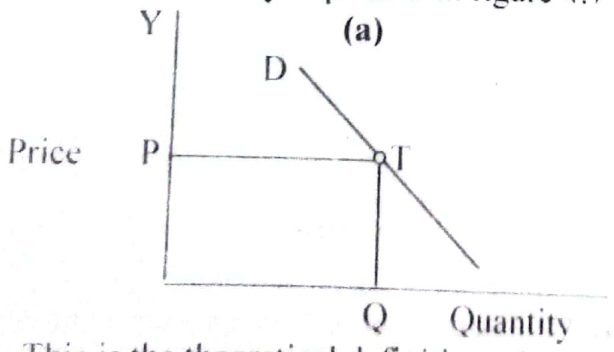
The basic principle for measurement of *coefficient of elasticity* of demand is

$$\text{Elasticity} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} \qquad Ed = \frac{\% \Delta Q}{\% \Delta P}$$

The actual form of application of this rule will depend whether we are measuring point elasticity or arc elasticity.

Point Elasticity

The elasticity at a particular point on demand curve is called point elasticity. For example the elasticity at point T in figure 4.7 (a) is point elasticity.



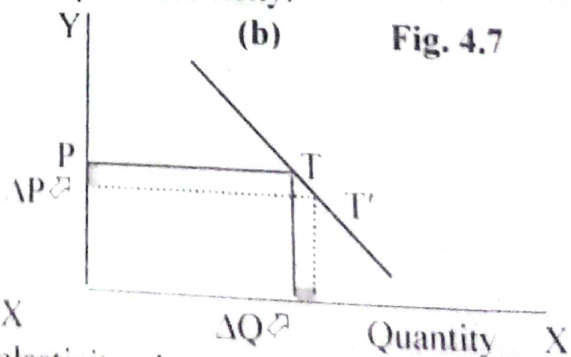


Fig. 4.7

This is the theoretical definition of point elasticity. In practice, the concept of point elasticity is used when there is a small change in price as shown in fig. 4.7. (b). (The two points on the demand curve are very close to each other).

[24] If a 2% change in price results in 4% change in quantity demanded, the demand is elastic.

Measurement

Point elasticity can be measured either mathematically or geometrically.

***(a)* Mathematical Method** Exact measurement needs advance Mathematics[25]. So to avoid this difficulty, the following formula is used. It gives us an approximate value of coefficient elasticity at a point.

$$e = \frac{\Delta q/q}{\Delta p/p} = \frac{\Delta q}{q} \times \frac{p}{\Delta p} = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

Where q = quantity, p = price

Δq = change in quantity

Δp = change in price

Example Suppose demand for a commodity is as given in the table.[26]

p	q
10	100
11	98

Here $p = 10$ $\Delta p = 1$

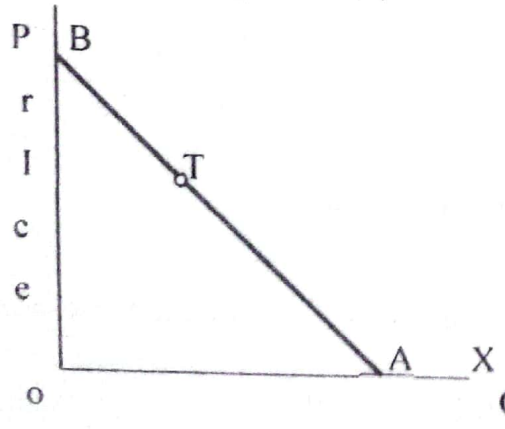
$q = 100$ $\Delta q = -2$

$$e = \frac{-2/100}{1/10} = \frac{-2}{100} \times \frac{10}{1} = \frac{-1}{5}$$

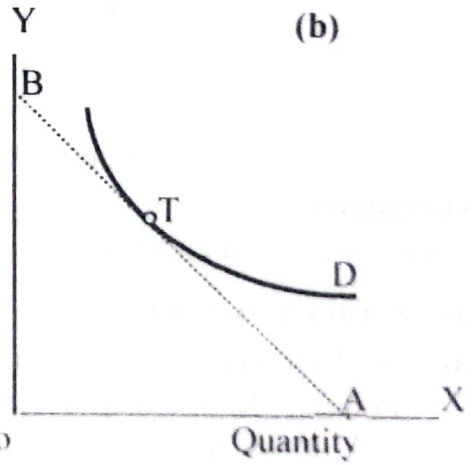
In calculating the elasticity it is customary to disregard the **minus sign** to make the elasticity a positive number. That way a large elasticity number means that demand is more responsive to price

***(b)* Geometric Method** In this method, elasticity at a point of demand curve is measured by comparing the distance from the point downward along the demand curve to x-axis by the distance upward to the y-axis. We clarify this method by an example. Suppose we want to know elasticity at any point T of demand curve DD' as in fig. 4.8 (a).

Fig. 4.8 (a)



(b)



$$\text{Then } e = \frac{\text{length of AT}}{\text{length of BT}} = \frac{\text{length of lower part}}{\text{length of upper part}}$$

Suppose length AT = 5 cm and BT = 2 cm. Then, $e = 5/2$

If we have a demand which is not a st. line but a curve as in figure 4.8 (b) then to find elasticity at T, we draw a tangent AB. Then elasticity at point T = AT/BT

---

[25] For exact measurement the concept of **derivative** is used i.e. $e = dq/dp \cdot p/q$

[26] **Negative sign**: Although price elasticity is a negative number, the economists prefer to drop the negative sign and write elasticity as a positive value. e.g. in this example $e = -1/5$. But ignoring negative sign, we can write as $e = 1/5$.

Coefficient of Elasticity: The numerical value of elasticity is called coefficient of elasticity.

Elasticity Along a Linear Demand Curve

Elasticity of demand decreases as we move along a linear demand curve. In upper part demand is more elastic.

In fig. 4.9, if distance TA = BT, then elasticity at point T is e = 1. Elasticity at some other points will be as indicated in the graph.[27]

Elasticity increases as we move up the demand curve.

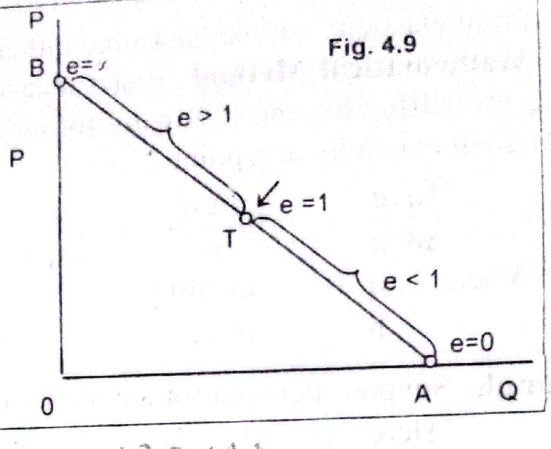
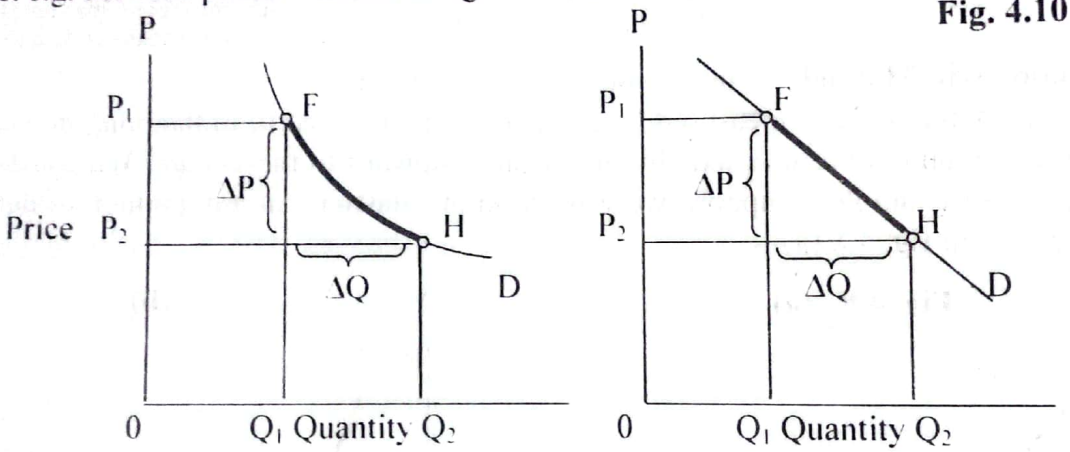


Fig. 4.9

ARC Elasticity

Arc elasticity means elasticity between two distinct points of a demand curve. Practically the concept of arc elasticity is used when there is a substantial change in price, e.g. between points F and H in fig. 4.10 (a) and fig. 4.10 (b).

Fig. 4.10



Measurement

For the measurement of arc elasticity two methods can be used.

(a) Formula Method [28]

(b) The following formula is used to measure arc elasticity.[29] It is called mid-point formula. (see note at the end of Chapter).

$$e = \frac{\frac{q_2 - q_1}{q_2 + q_1}}{\frac{p_2 - p_1}{p_2 + p_1}} \quad \text{or} \quad e = \frac{\frac{\text{Difference of q}}{\text{sum of q}}}{\frac{\text{Difference of p}}{\text{sum of p}}}$$

[27] **Along a straight-line (linear) demand curve, elasticity is different at different points.** It may vary from zero to infinity. As we move down the curve, elasticity falls.

[28] This is also percentage method. But instead of dividing by initial price and initial quantity, average of two prices and average of two quantities is used. See note at the end of the chapter.

[29] The formula was given by Allen.

Where q_1 = initial quantity p_1 = initial price
q_2 = new quantity p_2 = new price

Example

p	q
2	100
4	90

Here $q_1 = 100$ $q_2 = 90$
$p_1 = 2$ $p_2 = 4$

$$e = \frac{\frac{90 - 100}{90 + 100}}{\frac{4 - 2}{4 + 2}} = \frac{\frac{-10}{190}}{\frac{2}{6}} = \frac{-10}{190} \times \frac{6}{2} = \frac{-3}{19}$$

(b) Total Expenditure Method (Total Revenue Method)[30] (or Unitary Method)

Total amount spent on a commodity has close relation with elasticity of demand. From direction of change in total expenditure we know if the demand is elastic or inelastic[31].

Inelasticity

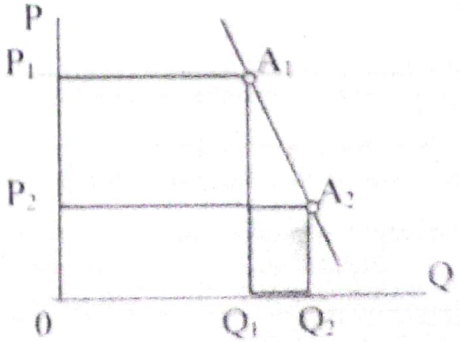
(i) **Elasticity less than Unity (e < 1)** If a commodity is necessity, the quantity demanded shows *little response to changes in price*. So total expenditure increases with rise in price and decreases with fall of price. (i.e. **T.E. moves in the same direction as change in price**).

Price of Wheat (Rs/kg)	Q_d	TE = (PQ)
10	20	200
20	18	360

Price of Salt	Demand	TE (PQ)
4	100	400
2	110	220

In case of e < 1, area (price x quantity) showing TE decreases with fall in price and vice versa.

Area $OP_2 A_2Q_2$ < Area $OP_1 A_1Q_1$



[30] **Total expenditure** becomes **total revenue (TR)** from seller's point of view.

[31] To facilitate discussion, the economists have put the measure of price elasticity into three categories. Critical value for price elasticity is one. So

Elasticity	Description	Implication
e = 1	Unit elastic	% change in Q = % change in P
e > 1	Elastic	% change in Q > % change in P
e < 1	inelastic	% change in Q < % change in P

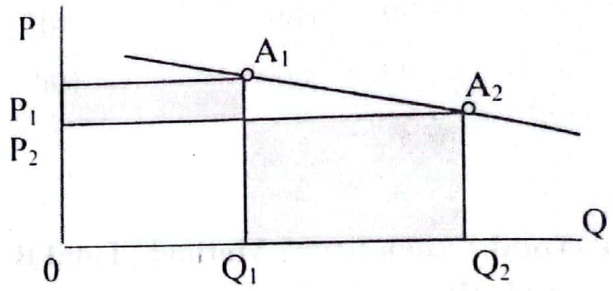
(ii) **Elasticity greater than unity (e > 1).** In case a commodity is a luxury item, change in price has greater effect on demand. The result will be that **TE moves in opposite direction of change in price.**

Price of DVD Player	Qd	TE (PQ)
4000	5	20000
2000	30	60000

Price of Carpet P	Qd	TE
15	200	3000
20	100	2000

In case of e > 1, the area showing PQ increases with fall in price and vice versa.

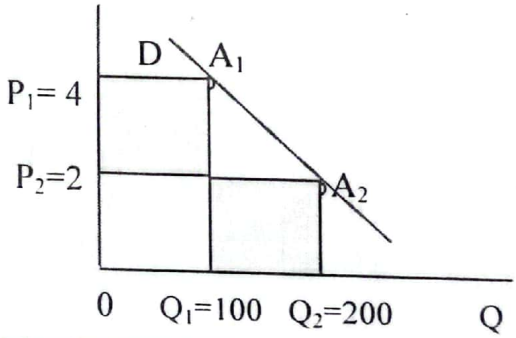
Area $OP_2 A_2Q_2 > OP_1 A_1Q_1$



(iii) **Elasticity equal to unity (e = 1).** These commodities which are neither included in necessities nor in luxuries. **TE is not affected by changes of price.**[32]

Price of Ball pen	Q	TE		P	Q	TE
4	100	400		10	40	400
2	200	400		20	20	400

Area PQ is not affected by change of price as shown below:
Area $OP_1 A_1Q_1$ = Area $OP_2 A_2Q_2$



About the relationship between ed and total expenditure (TE) we have to remember that,

(i) For necessities, ed < 1, because we have to buy whether it is cheaper or dearer.

So, **TE and P move in the same direction.**
increase in P — Increases TE
decrease in P — decreases TE

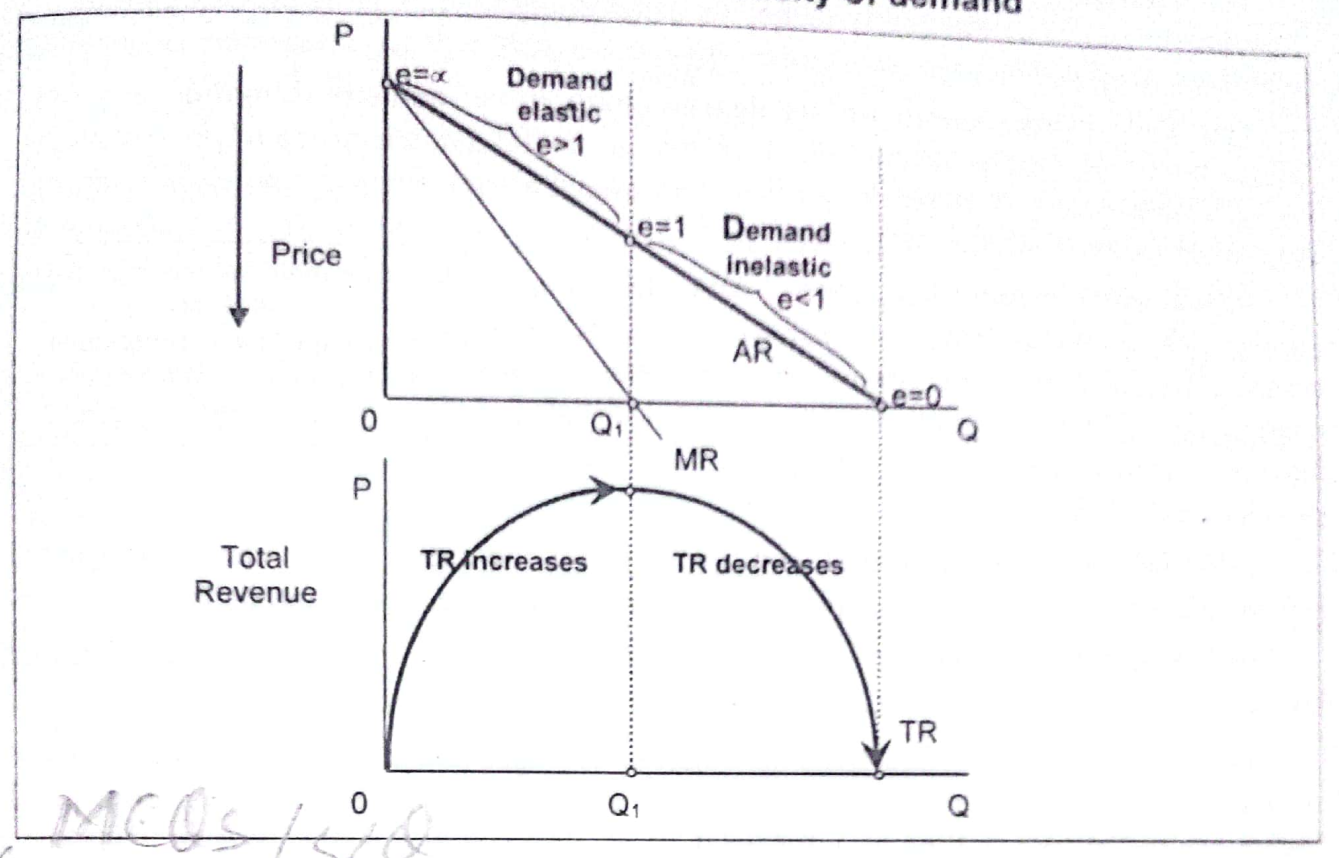
(ii) For luxuries, ed > 1, because if price goes too high, there is sharp decrease in demand.

So, **TE and P move in opposite direction.**
increase in P — decreases TE
decrease in P — increases TE

[32]

P	Q	TE		Coefficient of Elasticity
8	10	80		
			>	e > 1
7	12	84		
			>	e = 1
6	14	84		
			>	e < 1
5	16	80		

Total Revenue and Elasticity of demand



MCQs 5/8

Determinants of Elasticity

Elasticity of demand of all goods is not equal. Even for one good, the elasticity changes with time, place, income, tastes etc. Thus there is no hard and fast rule as to which commodity has elastic demand and which has inelastic. However the following general rules can help us to decide whether the demand will be elastic or inelastic.

(i) Demand for necessities and conventional necessities will be inelastic. This is due to the fact that people must buy such goods whether price is high or low. For example, wheat is a necessity and people will continue to buy it even at higher prices. The conventional necessities such as a newspaper and TV have also inelastic demand.

(ii) Demand for luxuries is elastic. People can easily do without such goods. If they find that their prices are rising sharply, they will buy less. However, the luxury of one person (e.g. perfume or T.V. set for a poor person) may be a conventional necessity of another person (i.e. rich). Similarly many luxuries of past are becoming conventional necessities of today e.g. car, refrigerator etc.

(iii) Goods having many uses have elastic demand. If their prices increase, these may not be used for less important purposes e.g. electricity is used for lighting, heating, cooking and motive power. If there is a quick rise in its price, it may not be used for cooking and heating. Demand for electricity is thus elastic for some uses and inelastic for others.

(iv) Proportion of Income Spent. A good taking a very small part of our budget has inelastic demand. An increase or decrease in its prices has little effect on budget of a person, so their demand is not much affected by changes in price e.g. demand for safety matches is inelastic (people are insensitive to change in price of safety matches).

(v) Demand for goods having many close substitutes will be elastic. Presence of close substitutes of a commodity makes its demand highly elastic. If the price of such a good rises, people shift to its substitutes e.g. if price of SEVEN UP rises, people start using SPRITE.

(vi) Too cheaper goods or too dearer goods have inelastic demand. e.g. sand and diamonds. In case of cheaper goods people do not take much notice of price changes. Too dearer goods are bought by vain and fashionable rich people who do not change their purchase plan because of price.

Three main factors affecting elasticity
- **availability of substitutes**
- **income available to spend**
- **Time available to adapt**

(vii) Jointly demanded goods have less elastic demand. A fall or rise in their price will not affect their demand much unless the prices of complements also change e.g. demand for petrol and automobiles, bat and ball. A rise in price of petrol has little effect unless the prices of automobiles also rise.[33]

(viii) Demand for durables[34] and for the goods the use of which can be postponed will be elastic. If price rises, people can wait for sometime e.g. furniture.

(ix) Fashion and Habit: If some commodity comes into fashion, its demand becomes less elastic. People become careless about its price because they take it as a necessity.

(x) Income Level. Elasticity of demand of rich people for a commodity is low because they are impatient. Marginal utility of money for them is very low. So even at higher prices they are willing to purchase it.[35]

INCOME ELASTICITY OF DEMAND

The concept of income elasticity is used to measure the effect of changes in income of the consumers on the demand for a commodity. It is defined as **"Income elasticity of demand is the rate of responsiveness of demand to changes in the income of the consumer"**.

$$e = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}}$$ or

$$e_y = \frac{\Delta q}{q} \div \frac{\Delta y}{y} = \frac{\Delta q}{q} \times \frac{y}{\Delta y}$$

q is quantity demanded and Δq denotes change in quantity. y represents income while Δy indicates change in income.

Example 1

Monthly income of consumer (Rs)	Monthly demand for meat (kg)
15000	4
20000	5

[33] The case resembles the three-legged race by two persons.

[34] **Time Period and Demand Elasticity**: Generally the demand is more elastic the longer the time period under consideration. This is because people are creatures of habits. When price changes, it takes time to make adjustment in purchases. If price of mutton rises, it will take time before people can turn to beef.

[35] **Engel curve** —— See notes.

$$e_y = \frac{\Delta q}{q} \div \frac{\Delta y}{y}$$

$$= \frac{1}{4} \div \frac{5000}{15000} = \frac{1}{4} \times \frac{15000}{5000} = \frac{3}{4}$$

Example 2: Suppose a person was spending 10% of his income on petrol. Then his income rises and the proportion of his income spent on petrol falls to 8%. This means that e_y is less than one.

Income elasticity of demand is:

(i) equal to unity (one) when the proportion of income spent on goods remains the same even after increase in income (e.g. if income doubles and demand also doubles). (ii) It is less than unity if this proportion decreases and

(iii) more than unity if the proportion increases. e_y will be less than unity if demand has not increased in the same ratio as income.

Income elasticity of inferior goods.

For most of the commodities income elasticity is positive i.e. with increase in income, demand e.g. meat. But for the commodities which are considered inferior by the consumer, income elasticity is negative i.e. with increase in income, demand for such commodities falls. See the following example of pulses.

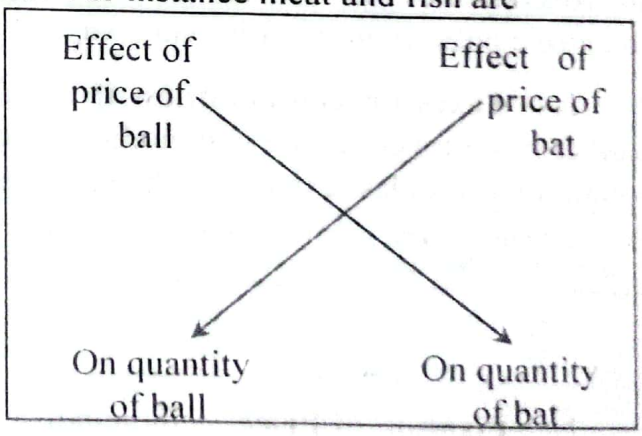
Example

y (Rs.)	demand for pulses (kg)
5000	4
9000	3

$$ey = \frac{-1}{4} \div \frac{4000}{5000} = \frac{-1}{4} \times \frac{5000}{4000} = \frac{-5}{16}$$

CROSS ELASTICITY OF DEMAND

The change in price of a commodity does not only affect its own demand but also the demands for many other related commodities. For instance meat and fish are substitutes. A change in price of meat will affect demand for fish. Similarly bat and ball are complements. A rise or fall in price of balls will lead to change in demand for bats. To measure this cross effect of price variations, the concept of cross elasticity is used. If A and B are two related commodities then cross elasticity of demand for A for changes in price of B is **defined as**



"The rate of responsiveness of quantity demanded of commodity A to changes in price of commodity B."

To measure cross elasticity for change in price of B and quantity of A, we use the rule

$$CE_{AB} = \frac{\% \text{ change in quantity demanded of A}}{\% \text{ change in price of B}} \quad \text{Or}$$

$$CE_{AB} = \frac{\Delta Q_A}{Q_A} \div \frac{\Delta P_B}{P_B}$$

Two goods are *substitutes* if the cross elasticity of demand is positive. Two goods are *complements* if the cross elasticity of demand is negative

Example

Price of wheat (Rs./kg) P_B	Quantity..demanded of rice (tons) Q_A
30	1000
40	1200

P_B = Price of wheat = 30

ΔP_B = Change in price = 10

Here Q_A = Quantity demanded of rice = 1000

ΔQ_A = Change in quantity = 200

$$CE_{AB} = \frac{\Delta Q_A}{Q_A} \div \frac{\Delta P_B}{P_B}$$

$$= \frac{200}{1000} \div \frac{10}{30} = \frac{200}{1000} \times \frac{30}{10} = \frac{3}{5}$$

Rice is a substitute for wheat, so CE_{AB} of demand for rice has a positive value i.e. if price of wheat rises, people increase the consumption of rice.

In case of commodities which are used jointly (complements) the value of cross elasticity will come out to be negative e.g. cross elasticity of demand of petrol with respect to variation in prices of motor cars will be negative[36].

PRACTICAL IMPORTANCE OF ELASTICITY OF DEMAND

The concept of elasticity of demand has many applications in both micro and macroeconomics. It is used in business decisions of firms and making government economic policies in the following ways.

1. **Taxes on commodities**: If the government increases tax on a commodity to collect more revenue, the commodity selected must have inelastic demand. If the taxed commodity has elastic demand, the revenue may fall instead of rising.

Example

Price of cinema ticket without tax (Rs)	Tax (Rs)	Price including tax	Tickets demanded	Amount of tax collected
20	5	25	100	500
20	10	30	40	400

2. **Fixation of Price**: A monopolist fixes the price of his product only after taking into consideration the elasticity of demand for his product. If he finds that the demand is elastic so that by charging a lower price, he can sell much larger quantity, he will accept a lower price. For instance if PIA fears to lose large number of passengers by increasing fares, it will not

[36] **Cross elasticity** When two products are substitutes, the price of one good and the demand for the other good are directly related. When two commodities are complements the P of one good and the Qd of the other are inversely related. For closer substitutes, **cross elasticity** of demand has a higher positive value.

For complements ← − **unrelated** 0 → + **For substitutes**

do so. When a seller of ready-made garments feels that by lowering the prices, he can attract large number of buyers and can dispose off old stock, he does [illegible] the form of **"Clearance Sale"**[37]

3. **Policy of price discrimination** by a monopolist i.e. charging of different prices from different customers is mainly dependent upon the concept of elasticity of demand. In some international cricket match the price of ticket for students may be less than for others because elasticity of demand of students is greater. So by lowering of price for them, very large number of tickets can be sold and total revenue increased.

4. **Pricing of Joint Products**: The prices of jointly produced commodities are determined by their relative elasticities of demand. The price will be lower for the product having more elastic demand than for the other. Wheat and straw are jointly produced. Their costs of production cannot be determined separately. Price of wheat is higher because demand for wheat is less elastic and people will buy it even if its price is higher than straw's.

5. **Increasing Returns Industry**: When some industry is subject to increasing returns, expansion in production lowers average cost of the product. If the demand of such product is elastic, the producer can get more profit by reducing the price and producing larger quantity.

6. **Wages**: If the demand for a particular type of labour is inelastic, the labour unions can easily get higher wages from the firms for the workers.

Devaluation of Currency: i.e. decrease in the value of local currency against foreign currencies can only be useful if home demand for imports and foreign demand for our exports are elastic. Suppose Pak rupee is devalued against other currencies. This step raises prices of imported goods for us and lowers prices of our goods for foreigner, so we can earn more foreign exchange, only if demand is elastic.

7. **Paradox of Poverty in Plenty:** If demand for a product is inelastic, its increased production may result in less profit. Suppose demand for potatoes is inelastic. Now if farmers grow more potatoes, their total income will decrease rather than increase. So, for them, plenty of potatoes means poverty. See the table 4.11

Table 4.11

Year	Production of Potatoes (Tons)	Price Rs./Ton	Total revenue received (Rs)
2011	100	10000	10,00,000
2012	150	6000	9,00,000

In 2012 the growers earn less money although production of potatoes has increased over 2011.

[37] The more inelastic the demand curve facing a firm, the greater is the **firm's market power** to raise price without losing customers and sales revenue.

EQUATION OF DEMAND

The relation between price of a commodity and its quantity demanded can be expressed in three different ways. i.e.

(i) In a table.....as demand schedule.
(ii) In a graph .....as demand curve.
(iii) In mathematical language ..... as demand equation.

If we are given some demand schedule, we can make a corresponding demand curve and equation out of it. Similarly, if demand equation is given it can be converted into a schedule and a graph as will be clear from the discussion below. But let us first discuss the form of demand equation to be used.

Functional Equation of Demand

Functional equation of demand shows the relationship between price of a commodity and quantity demanded.

From economic theory, we know that the demand of a commodity depends upon various factors such as income and tastes of the consumers, price of the commodity and prices of other related commodities (substitutes or complements). We describe this fact by saying that demand is a function of these variables. In mathematical symbols, we will write this relation as

$Q_d = f(P, Y, T, P_i)$ (read as q_d is a function of P, Y, T and P_i)

Where P = Price of the commodity. Y = Income
P_i = Prices of other related goods[38]. T = Tastes

Out of these variables, the relationship of price of a commodity and its demand is supposed to be more close and quick. It is found that in short period, most of the changes in demand are the result of the changes in the price of the commodity itself. Thus, in order to keep our study simple we assume that variables Y, T and Pi remain constant and the changes in demand are only due to change of price. With this assumption the functional relation between demand and price reduces to $\mathbf{Q_d = f(P)}$[39] i.e. quantity demanded of a commodity depends upon price changes. Since it is easy to solve and handle linear equations we further assume that the relation between Q_d and P is linear (or what is the same thing, demand curve is a straight line).[40]

From economic theory, we know that there is negative relation between price and demand. In other words, when P increases the change in Q must be negative. So, the general demand equation (linear) can then be written as:

$$\mathbf{Q_d = a - bP} \qquad (\mathbf{a} \text{ and } \mathbf{b} \text{ are constants})$$

In this equation **b** shows the effect of change in price on Q_d and **a** shows the influence of other factors like income and tastes which we have assumed to be constant.

---

[38] **Pi represents the prices** of other commodities i = 1, 2, 3,....., which are shown as $P_1, P_2, P_3, \ldots\ldots$

[39] **Q = f(P) is general form of demand function.**

[40] **General form** of a linear equation is $y = a + bx$. If we use P and Q symbols, a general linear equation can then be written as: $Q_d = a + bP$ where a and b are constants

If we give some specific values to the parameters **a** and **b**, we can get a specific demand equation. e.g. assume a = 50 and b = 5 then demand equation or demand function[41] will be $Q_d = 50 - 5P$

Demand Schedule and Demand Curve

The demand equation can be easily transformed into a schedule and a graph. In the demand equation $Q_d = 50 - 5P$ when we allot different values to P, we get different corresponding values of Q_d as follows:

When

P = 1. $Q_d = 50 - 5(1) = 50 - 5 = 45$

P = 2. $Q_d = 50 - 5(2) = 50 - 10 = 40$

P = 3. $Qd = 50 - 5(3) = 50 - 15 = 35$

P	Q
1	45
2	40
3	35
4	30
5	25

By plotting these values of P and Q in a graph, we get demand curve of fig. 4.11

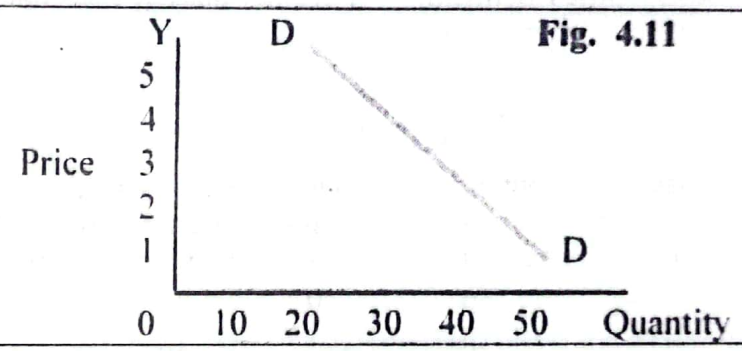


Fig. 4.11

HOW TO GET FUNCTIONAL EQUATION OF DEMAND

If we are given a demand schedule we can find equation of demand by taking any two pairs of prices and quantities and using the following formula:

$$Q - Q_1 = \frac{Q_2 - Q_1}{P_2 - P_1}(P - P_1)$$ (This formula is used for only linear equation)

Where Q_1 = first quantity, P_1 = first price

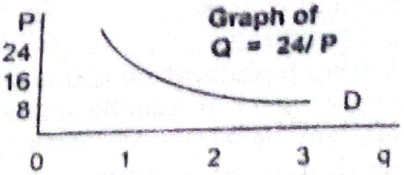
Q_2 = second quantity, P_2 = second price

Example Find linear demand equation from the following schedule.

---

[41] **Non-linear Demand Curve**: It is not necessary that the relationship between price and quantity demanded should always be linear. It may take quadratic or any other form e.g. $Qd = 40 - 2P - P^2$ or $Q = 24/P$

Graph of Q = 24/P will appear as a curve



P	Q
2	90
3	80
4	70

We take $P_1 = 2$, $Q_1 = 90$; $P_2 = 3$, $Q_2 = 80$

$$Q - Q_1 = \frac{Q_2 - Q_1}{P_2 - P_1}(P - P_1)$$

$$Q - 90 = \frac{80 - 90}{3 - 2}(P - 2)$$

$$Q - 90 = \frac{-10}{1}(P - 2)$$

$$Q - 90 = -10P + 20$$

$$Q = 110 - 10P$$

This is the required equation of demand.

because price their is inverse relation between price and quantity

SUPPLEMENTARY NOTES

➢ **Mid Point Formula:** For Arc Elasticity consider two tables:

p	q
2	50
5	40

p	q
5	40
2	50

They represent same demand. But if we use point elasticity formula, answers will b different. The reason is that for table I we divide Δq by 50 and Δp... by 2. For table 2 we have divide Δq by 40 and Δp by 5. So the answers are different. i.e.

For table I, $$e = \frac{\frac{\Delta q}{q}}{\frac{\Delta p}{p}} = \frac{\frac{-10}{50}}{\frac{3}{2}} = \frac{-10}{50} \times \frac{2}{3} = \frac{-2}{15}$$

For table 2, $$e = \frac{\frac{10}{40}}{\frac{-3}{5}} = \frac{10}{40} \times \frac{5}{-3} = \frac{5}{-12} = \frac{-5}{12}$$

To avoid this difficulty we neither divide by q_1 nor q_2. We divide by the average (q_2+q_1) Similarly for P we use $(p_1+p_2)/2$, then

$$e = \frac{\frac{\Delta q}{\text{average of } q_s}}{\frac{\Delta p}{\text{average of prices}}} = \frac{\frac{q_2 - q_1}{\frac{q_2 + q_1}{2}}}{\frac{p_2 - p_1}{\frac{p_2 + p_1}{2}}} = \frac{2}{1} \times \frac{q_2 - q_1}{q_2 + q_1} \times \frac{2}{1} \times \frac{p_2 - p_1}{p_2 + p_1} = \frac{\frac{q_2 - q_1}{q_2 + q_1}}{\frac{p_2 - p_1}{p_2 + p_1}}$$

➢ **Derived demand** It is the demand for a good or service which is derived from the dem for another good or service for which it is used as input. For example, demand for labou derived from the demand for those products which labour produces.

➢ **Complementary demand** If two goods are used together (i.e. they are complements) th demand for one product depends upon the demand for the other good. Demand for petr

complementary to demand for cars.

➢ **Composite demand** Some goods are used for more than one purpose. Demand for such commodity is composite demand because it is the sum of demands for all uses of the commodity

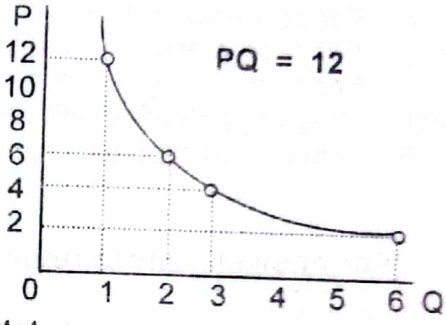
➢ **Giffen Good** is a commodity which is demanded in larger quantities when its price rises and is bought less when its price falls. Giffen was the name of the person who first noticed this tendency about demand of some inferior but essential commodities e.g. wheat.

When wheat is dearer, poor people have to spend higher proportion of their incomes on wheat. It is their staple food. When price comes down, they save some money from wheat and spend it on superior items like rice, meat etc. Their consumption of wheat falls. It is empirical fact that consumption of wheat of the rich is less than for the poor

Giffen Good
Demand for wheat

Price of wheat	Qd
800	10
600	9

➢ **Constant Elasticity Demand Curve** See the demand curve given opposite. It has unit elasticity on all points. This curve is called rectangular hyperbola. Take any price and calculate total expenditure (PxQ). It remain the same i.e. the area (PxQ) under the curve remains constant. For example see the opposite graph for the function PQ = 12



➢ **Estimated Price Elasticities of Demand in the United States**

Elasticity very low	(below 0.5)	Bread, Eggs, Sugar Medical care Newspaper Bus Travel Telephone service
Elasticity low	(0.5 to 0.8)	Milk Clothing Gasoline (in the long run) Cigarettes Shoes
Elasticity about	1	Furniture, movies Beef Housing
Elasticity high	(1 to 2.5)	China and tableware Foreign travel Restaurant meals

(Source : McConnell, Economics, 15 th ed.)

EXERCISES

1. **Define** the terms.
   Demand, elasticity of demand, income elasticity, cross elasticity, point elasticity, arc elasticity, Rise of demand.
2. Explain Law of Demand with the help of schedule and diagram. Discuss its assumptions and exception.
3. Differentiate between the following with the help of tables and diagrams.
   (a) Extension and rise in demand. (b) Contraction and fall in demand
   (c) Elastic and inelastic demand.
4. (a). What is meant by rise and fall in demand?
   (b) Describe the causes of changes in demand