UNIT-II
(Demand and Supply)
MODULE- : PRICE ELASTICITY OF DEMAND

Notes:
CONTENTS:

3.0: INTRODUCTION:

In Module –I of Unit-II we have discussed the law of demand. The law of demand explains the direction of demand i.e the law of demand states that the price of a commodity and the quantity demanded of that commodity move in opposite direction. It does not tell us anything about the extent or magnitude of change in demand as a result of given percentage change in price. In order to know the quantum of change in dependent variable as a result of given percentage change in the independent variable, we have to take the help of elasticity concept.

3.01: OBJECTIVES:

The objective of this module is to explain the meaning and measurement of price elasticity of demand. After reading this unit you should be able to understand:

Meaning of elasticity
Meaning of price elasticity
Measurement of price elasticity
Estimation of price elasticity
Influencing factors of price elasticity.

3.02: MEANING OF ELASTICITY:

In general elasticity means the degree of responsiveness of the dependent variable to a given proportionate change in the independent variable. This we can write as:

$$\text{Elasticity of demand} = \frac{\text{Proportionate change in the dependent variable}}{\text{Proportionate change in the independent variable}}$$

3.03: PRICE ELASTICITY OF DEMAND:

This indicates the degree of responsiveness of demand for a commodity to a given proportionate change in the price of that commodity. In other words we can say that it is the ratio between percentage changes in quantity demanded to percentage change in price. While estimating price elasticity, we have to take into account demand as the dependent variable and the price as the independent variable. We can write the price elasticity principle as shown below.

$$\text{Price Elasticity of demand} = \frac{\text{Proportionate change in quantity demanded}}{\text{Proportionate change in price}}$$

This we can write as

$$\text{Price Elasticity of demand} = \frac{\dfrac{\text{Change in quantity demanded}}{\text{Original quantity}}}{\dfrac{\text{Change in price}}{\text{Original price}}}$$

NOTE-1

Use notations for
Here/change in Quantity =   Q
Original Quantity =Q
Change in price =   P
Original Price = P

Now we can write the price elasticity as = $\dfrac{\Delta Q/Q}{\Delta P/P}$

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

Here $\frac{\Delta Q}{\Delta P}$ is equal to slope of the demand curve or rate of change i.e. $\partial Q / \partial P$ and P/Q is the ration between price and quantity

Degrees of Price elasticity: Depending on the value of price elasticity, the price elasticity of demand is divided in to five. Let us discuss them in detail.

1.Perfectly elastic demand: If an insignificant or near zero percentage change in price causes an infinite or very large percentage change in demand, it is known as perfectly elastic demand. In this case, the value of elasticity will be equal to infinity and the demand curve will be parallel to horizontal axis as shown below.

GRAPH-1

Y

Price elasticity =

D

Price

0 ⟶ X
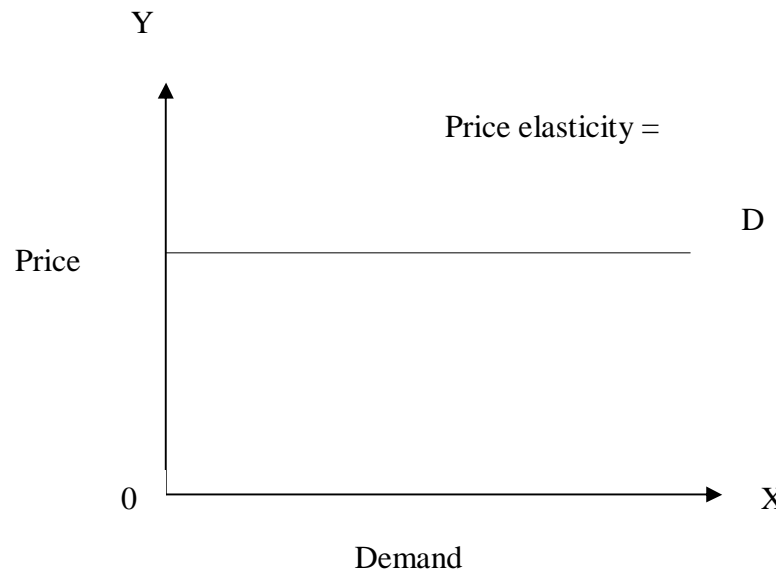
Demand

2. Perfectly inelastic demand: If the demand is non-responsive to a given proportionate change in price, it is known as perfectly inelastic demand. In this case the value of price elasticity is equal to zero and the demand curve will be parallel to vertical axis as shown below.

GRAPH-2

Y

D

B

P2 ....

Price elasticity =

Price P1 ....
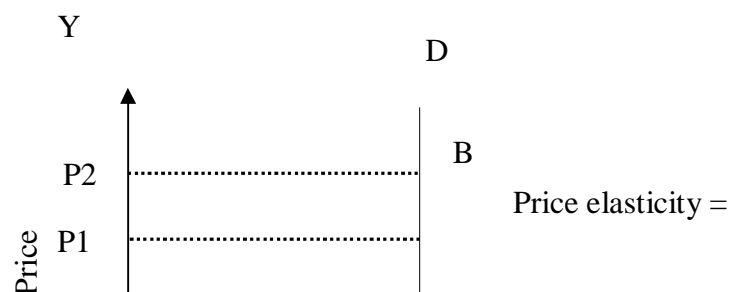
The above diagram indicates that, even if the price rises from P1 to P2 or falls from P2 to P1, the quantity demanded remains constant as 'OQ'.

3. Unitary elasticity:

If the proportionate change in quantity demanded is exactly equal to proportionate change in price, then it is called as unitary elastic demand. In this case the value of elasticity is equal to one(1) and the demand curve will be like rectangular hyperbola as shown in graph.

GRAPH-3

Y

D

Price elasticity = 1 (one)

Price

D

0
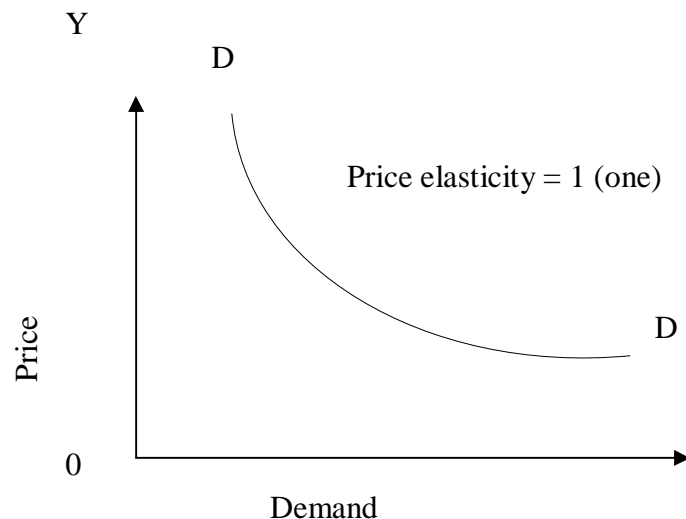
Demand

4. Relatively elastic demand: If the proportionate change in de
than the proportionate change in price, it is known as relatively eiasuc uemanu.
In this case the value of elasticity will be greater than one.

5. Relatively inelastic demand:
If the proportionate change in demand is less than the proportionate change in price, it is known as relatively inelastic demand. In this case the value of elasticity will be less than one.

ACTIVITY -1

1. Define elasticity of demand.
2. Draw the shape of demand curve in case of unitary elasticity.

MEASUREMENT OF PRICE ELASTICITY:

In order to measure the price elasticity, there are three methods available in economic literature. They are:
Total Outlay Method
Point Method
Arc Method.

Now we try to understand each one of the above methods.

Total outlay method:
This method is also known as total expenditure method. Under this method the price elasticity is measured in terms of pattern of expenditure on any commodity. That is as price falls, the law of demand states that demand rises. But here the question is, what happens to the expenditure on that commodity. Will expenditure increase or decrease or remain constant?. Based on this i.e. expenditure pattern, the price elasticity of demand is explained in terms of

Elastic demand
Unitary elastic demand
Inelastic demand

Elastic demand: As a result of fall in price the demand increases and at the same time if the expenditure on this commodity increases, it is known as elastic demand.

Unitary elastic demand; As a result of fall in price the demand increases and at the same time if the expenditure on this commodity remains constant, it is known as elastic demand.

Inelastic demand: As a result of fall in price the demand increases and at the same time if the expenditure on this commodity decreases, it is known as inelastic demand.

We can understand elastic, unitary elastic and inelastic demand with the help of following example:

NOTE- 2

| Quantity of A (Units)		Price of A (Rs)		Total Expenditure (Rs)	
1	————	10	————	10	
2	————	9	————	18	
3	————	8	————	24	Elastic demand
4	————	7	————	28	
5	————	6	————	30	
					Unitary elastic
6	————	5	————	30	
7	————	4	————	28	
8	————	3	————	2	in elastic demand
9	————	2	————	18	
10	————	1	————	10	

According to the above example, as price falls from Rs.10 to Rs 6,the quantity of A commodity increased from 1 unit to 5 units and the expenditure on A commodity increased from Rs 10 to Rs 30. So this is the case of elastic demand.

As price falls from Rs 6 to Rs 5, the quantity of A increased from 5 units to 6 units. But the expenditure on the commodity remains constant. So this is the case of unitary elasticity.

Finally, as the price falls from Rs 5 to Rs 1 the quantity of A increased but the expenditure on this commodity decreased from Rs 30 to Rs 10. So this is inelastic demand.

By plotting the above data in a diagram we can derive the total expenditure total outlay curve. The shape of the total expenditure curve is shown below.

GRAPH-4
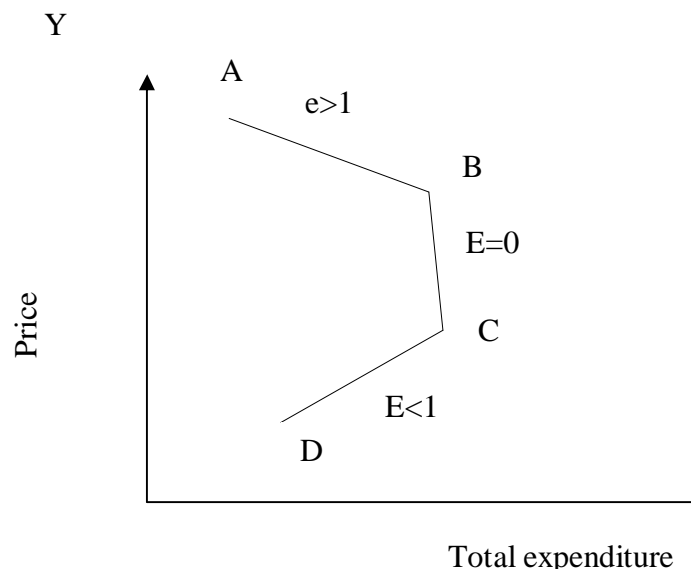
Point elasticity Method

This method is known as geometric method. This method is used to find out the value of price elasticity of demand at any point on a straight line demand curve. Under this method, the principle for estimating price elasticity at any point on the demand curve is shown below.

Price elasticity at any point = $\dfrac{\text{Distance of lower segment of the demand curve}}{\text{Distance of upper segment of the demand curve.}}$
On the demand curve

We can understand the point elasticity with the help of the following diagram.

GRAPH-5
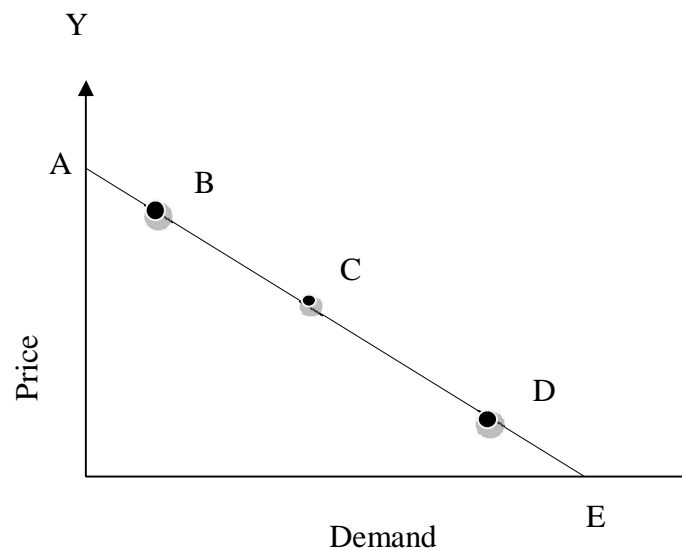
In the above diagram we have drawn a straight line demand curve AE and identified different points on this curve such as A,B,C,D and E.

$$\text{Elasticity of demand at point C is} = \frac{CE \text{ (lower segment)}}{CA \text{ (upper segment)}} = 1$$

Because C is a mid -point on the straight line demand curve. So point C dividng the AE demand curve in to two equal parts as CE and CA.

$$\text{The price elasticity of demand at point D} = \frac{DE}{AD} = \text{less than one}$$

$$\text{The price elasticity of demand at point E} = \frac{0 \text{ (ZERO)}}{AE} = 0 \text{(zero)}$$

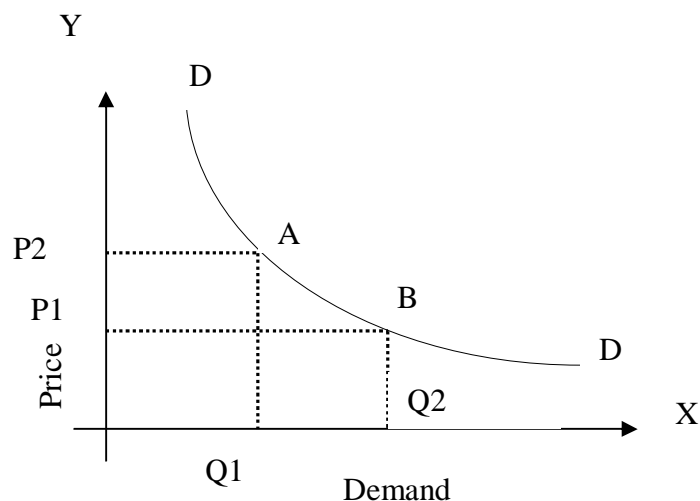$$\text{The price elasticity of demand at point B} = \frac{BE}{AB} = \text{more than one}$$

$$\text{The price elasticity of demand at point A} = \frac{AE}{Zero} = \text{infinite}$$

The above analysis indicates that each and every point on the straight line demand curve denotes a different value of elasticity. If you are moving from mid point (C) towards quantity axis the value of elasticity decreases. Where as if you move from mid -point towards price axis the value of price elasticity increases.

Arc Method:
This method is used to find out price elasticity on a segment of the demand curve rather than at a particular point.

GRAPH-6

In the above diagram AB represents a small segment on the demand curve DD. By using Arc method it is possible to find out price elasticity on AB segment rather than either at point A or at point B. The principle for the estimation of price elasticity under this method is:

NOTE-3

Price elasticity of demand $= \dfrac{change\ in\ demand\ /(\frac{original\ demand + New\ demand}{2})}{Change\ in\ price\ /(\frac{original\ price + new\ price}{2})}$

Further we can write this as

$$\dfrac{change\ in\ demand}{(original\ demand + new\ demand)/2} \times \dfrac{(Original\ price + new\ price)/2}{change\ in\ price}$$

Example: Let initial price is Rs 10. Quantity demanded is 100 units. Price falls to Rs 8. Quantity demanded increased to 140 units. Price elasticity of demand is:
Here change in demand = 40 units
Change in Price = Rs 2
Original demand = 100 Units
New demand =140 units
Original =Rs 10
New Price = Rs 8

Substituting these different values in the above principle we can get price elasticity value.

$$= \dfrac{40}{((100+140)/2)} \times \dfrac{(10+8)/2}{(-)2}$$

$$= \dfrac{40}{120} \times \dfrac{9}{(-)2}$$

$= (-)\ 1.5$

We can say that, on AB segment of the demand curve, the value of price elasticity is (-) 1.5. This indicates that 1% fall in price causes 1.5% rise in demand and vice-versa.

3.04: ESTIMATION OF PRICE ELASTICITY:

With the help of estimated demand function we can find out price elasticity value. For example Qd = 10- .5 PX. If the price is Rs 10 the value of price elasticity is:

NOTE-4

Price elasticity of demand $= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

Here $\frac{\Delta Q}{\Delta P}$ or $\frac{\partial Q}{\partial P} = 0.5$ as given demand function. Using the demand function Qd=10-.5P$_x$, we can find out Qd at Rs 10

$$Qd = 10 - .5 \times 10$$
$$= 10 - 5$$
$$= 5$$

By substituting these values in the demand function we can find out the value of price elasticity.

Price elasticity $= (-)0.5 \times \frac{10}{5}$

$= (-) 1$ since the value of price elasticity of demand is 1(one), its nature is unitary elastic.

ACTIVITY-2

1. What is the principle for price elasticity?
2. What is the value of price elasticity at midpoint of straight line demand curve?

3.05: FACTORS INFLUENCIMG PRICE ELASTICITY OF DEMAND:

The value of price elasticity of demand is influenced by different factors. They are:

1. Nature of commodity:

In case of commodities which are considered as necessaries, the price elasticity tends to be inelastic. For example: Rice, sugar etc. These commodities have got to be purchased irrespective of their prices. When price rises, consumers cannot reduce their consumption. In case of luxury commodities, the price elasticity tends to be elastic.

2. Number of uses:

If a commodity can be put to large number of uses, its demand tends to elastic. In this case, as a result of fall in price, consumers want to put that commodity even for not so important purpose. Due to this, the demand will respond significantly as a result of fall in price.

3. Availability of substitutes:
If a commodity is having large number of substitutes, its price elasticity of demand tends to be elastic.
4. Postponement of consumption:
If it is possible to postpone the consumption of a commodity under consideration, the price elasticity of demand tends to be elastic.

5. Range of prices:
At very low price, the elasticity of demand tends to be inelastic.

6. Time element:
Generally in the long-run the elasticity of demand is more responsive i.e elastic, compared to the short-run.
7. Habits:
If the consumers are habituated to consume a commodity, then the demand for such commodities tends to inelastic.

ACTIVITY-3

1. List out the factors influencing price elasticity of demand.

3.06: SUMMARY:

In this module we discussed at length the concept of price elasticity, its estimation and its determinant. Price elasticity is a ratio between proportionate change in quantity demanded to proportionate change in price. Price elasticity indicates the responsiveness in demand as a result of given percentage change in price. With the help of demand function we can estimate price elasticity.

3.07: References:

1. Stonier and Hague ; Text Book of Economic Theory
2. H.L Ahuja: Advanced Economic Theory
3. Dominick Salvatore ; Managerial economics in a Global Economy

3.08: Self Assessment Test:
1. Define price elasticity of demand and explain its determinants.

2. Discuss different methods of measuring price elasticity of demand.