Lecture : 5

Elasticity of demand :

The concept of elasticity of demand explains the responsiveness of quantity demanded of a product to the change in any one of the factors which influence demand in the market.

Price elasticy of demand :

Since price is considered to be the most important determinant of demand, let us begin with the responsiveness of Q_{dx} to the change in P_x. This is called Price elasticity of demand i.e P_{ed}.

$$P_{ed} = \frac{\text{Percentage change in } Q_{dx}}{\text{Percentage change in price}} = \frac{\% \Delta q}{\% \Delta P}$$

OR

$$P_{ed} = \frac{\text{Proportionate change in } q}{\text{Proportionate change in } P}$$

$$= \frac{\partial q}{\partial P} \cdot \frac{P}{q}$$

P – Price

q – quantity

e.g

If 10% increase in Price of petrol causes 20% decrease in the demand for Petrol then —

$$Ped = \frac{-20\%}{+10\%} = 1-21 = 2$$

The value of Ped of a product explains the nature of the product in the market.

If

Ped > 1 then x is elastic & is a luxurious good

Ped < 1 then x is inelastic & is a necessary good

Ped = 1 then x is unitary elastic in nature

Ped = 0 then x is perfectly inelastic good.

Ped = ∞ then x is a perfectly elastic good.

For the necessary goods, the % change in q_d is less than the % change in price. e.g Food items like sugar, wheat etc.

For the luxurious goods, the % change in q_d is more than the % change in price e.g Branded clothes, Dominos Pizza etc.

How Ped is measured ?

When the price change is very small, Point method is used for the measurement of Ped and when the price change is large, Arc method is used for the same.

Point method :

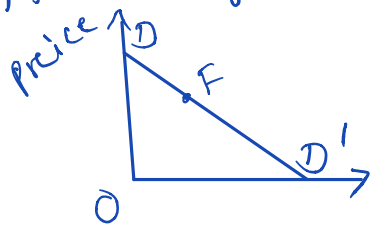
In this method $Ped = \frac{\partial q}{\partial p} \cdot \frac{p}{q}$

Let's try to find Ped of a product at a point on a linear demand curve

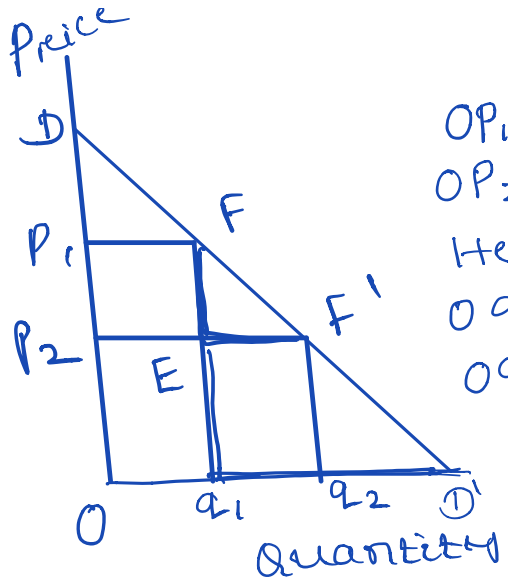
$$Q = b_0 - b_1 P$$

Here $Ped = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = -b_1 \cdot \frac{P}{Q}$

The price elasticity of demand of a product at a point on the demand curve is the ratio of the lower segment and the upper segment of the demand curve.



$$Ped = \frac{FD'}{FD}$$



OP_1 → Initial price
OP_2 → Price decreased
Here $\partial P = P_1P_2$
Oq_1 → Initial quantity
Oq_2 → Quantity increased
Here $\partial q = q_1q_2$

Now let us prove that
Ped at F = FD'/FD

Proof:

$$Ped = \frac{\partial q}{\partial P} \cdot \frac{P}{q}$$

$\partial P = P_1P_2 = EF$
$\partial q = q_1q_2 = EF'$
$P = OP_1$ & $q = Oq_1$

So $$Ped = \frac{EF'}{EF} \Big/ \frac{OP_1}{Oq_1}$$

In the above figure you can see that $\triangle FEF'$ & $\triangle Fq_1D'$ are similar.

So $$\frac{EF'}{EF} = \frac{q_1D'}{Fq_1} = \frac{q_1D'}{OP_1}$$ $Fq_1 = OP_1$

Thus

$$Ped = \frac{q_1D'}{OP_1} \cdot \frac{OP_1}{Oq_1} = \frac{q_1D'}{Oq_1}$$

Further

ΔDP_1F & $\Delta Fq_1D'$ are similar

So

$$\frac{q_1D'}{FD'} = \frac{P_1F}{FD} = \frac{Oq_1}{FD}$$

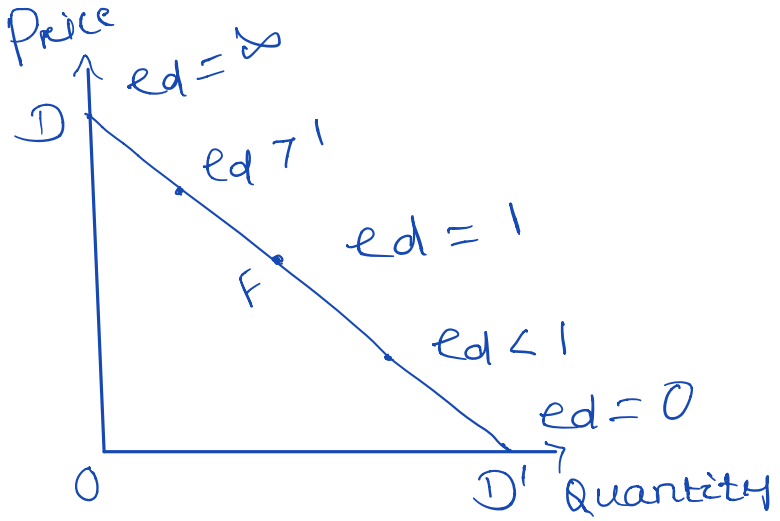
Rearranging

$$\frac{q_1D'}{Oq_1} = \frac{FD'}{FD}$$

$P_1F = Oq_1$

Thus

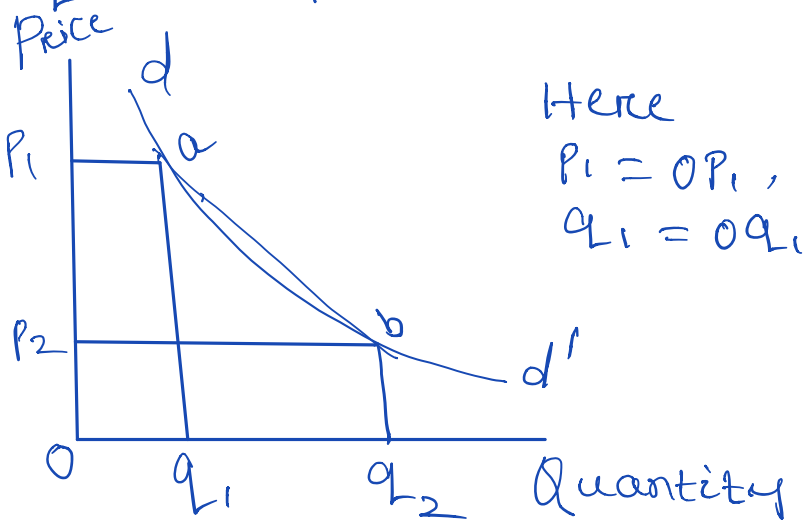
$$Ped = \frac{FD'}{FD} = \frac{\text{Lower segment of } DD'}{\text{Upper segment of } DD'}$$



The point method is used when the price change is very small.

When price change is significant, Arc method is used to find the Ped of a product.

In this method, in place of the initial price & initial quantity, the average price & average quantity are considered.



Here
$P_1 = OP_1$, $P_2 = OP_2$
$q_1 = Oq_1$, $q_2 = Oq_2$

So $Ped = \frac{\partial q}{\partial p} \cdot \frac{(P_1 + P_2)/2}{(q_1 + q_2)/2}$

The difference between Point method & arc method is, in the former method, the initial price & quantity are taken & in the arc method, their average is considered.

Nparth.