Elasticity of Demand

Introduction

- Law of demand states that the direction of change in demand due to change in its own price . In others words we can say that there is an inverse relation between demand and price. Price elasticity of demand refers to the percentage change in the quantity demanded of a commodity as a result of a given percentage change in its own price.

Meaning and Definition

- This concept was actually developed by Dr. Marshall in his book Principles of Economics . Elasticity is a measures of the responsiveness of one variable to change in other.

- According to prof .Dooley ," The elasticity of demand measures the responsiveness of the quantity demanded of a good to change in its price , price of other goods and changes in consumer's income."

Types of elasticity of demand

- It has three types
- Price Elasticity of Demand
- Income Elasticity of Demand
- Cross Elasticity of Demand

Price Elasticity Of Demand

- Price elasticity of demand is the ratio of percentage change in the quantity demanded of a commodity to a percentage change in its price.

- $Ed = (-)$ <u>percentage change in quantity demanded</u>

    - Percentage change in price

Degrees of Price Elasticity of Demand

- Perfectly Elastic Demand
- In perfectly Elastic demand is infinite at the prevailing price . In this situation a slight change in price will cause an infinite change in demand.
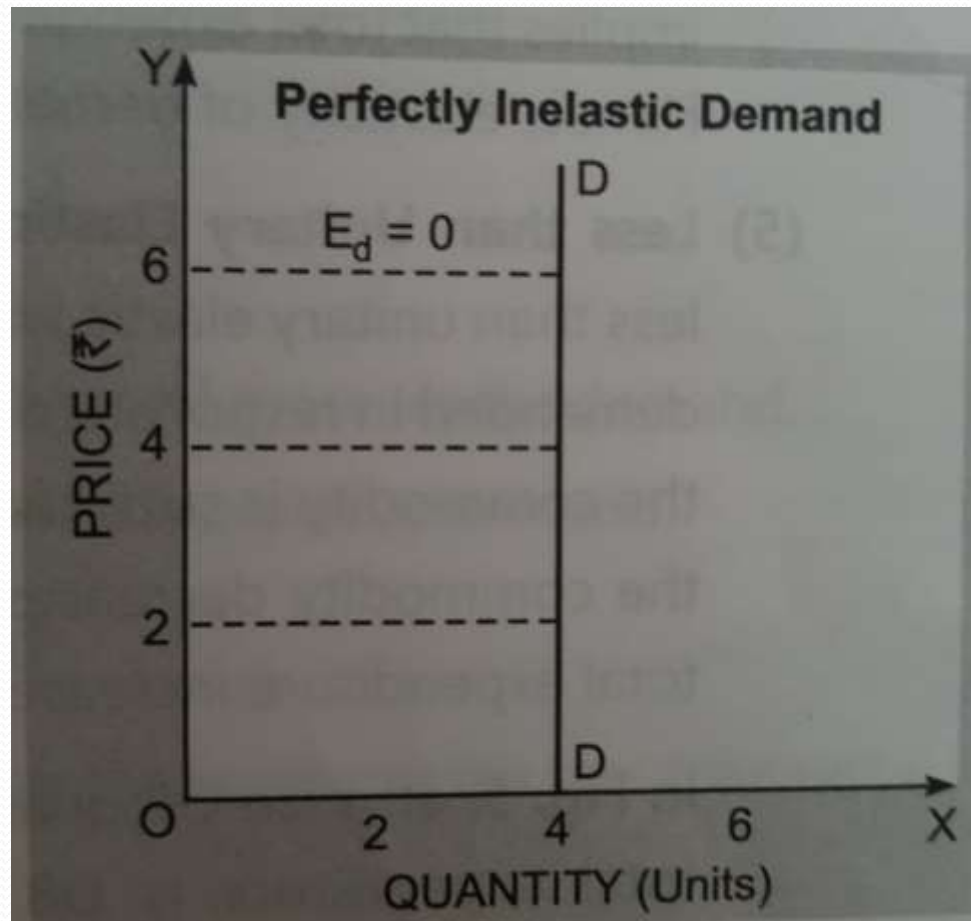
Price Elasticity of Demand
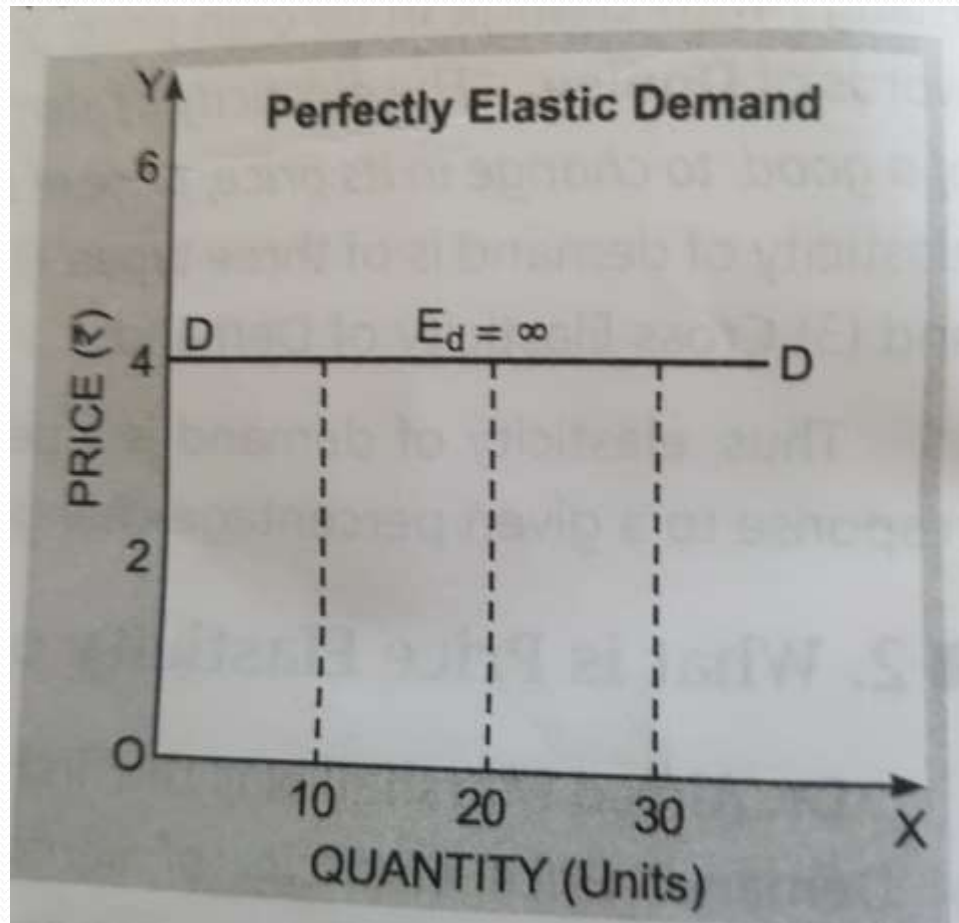
Perfectly Inelastic Demand

- A change in price causes no change in quantity demanded . For example when price is Rs.2 demand of X commodity is 5 . When price rises to Rs 4 to 6 the demand remain the same.
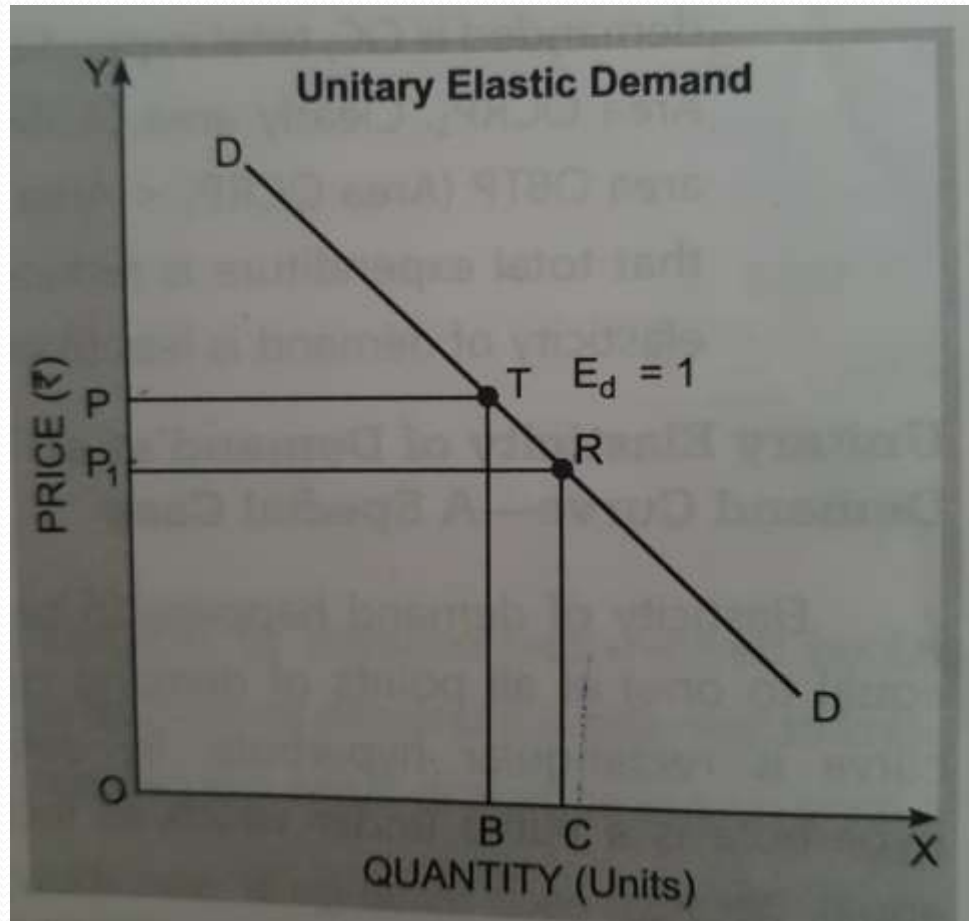
Perfectly Inelastic Demand

Unitary Elastic Demand.

- It is a situation when change in quantity in response to change in own price. As a result the total expenditure on the commodity remains constant.
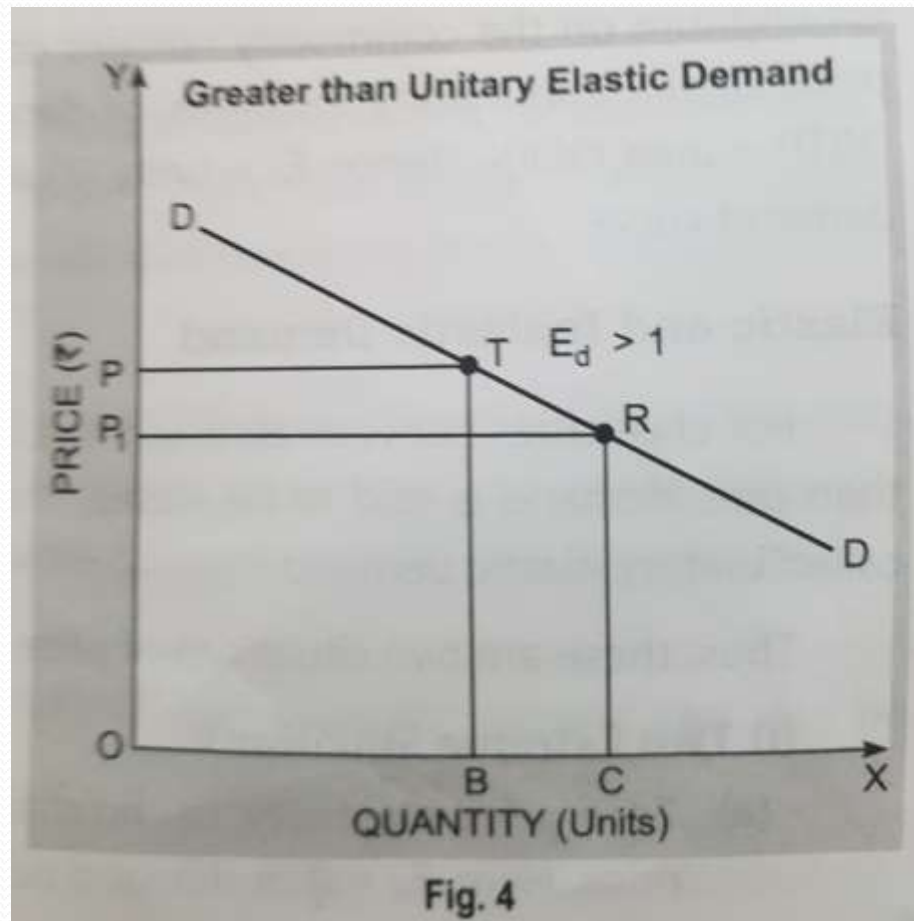
Unitary Elastic Demand.

Greater Than Unitary Elastic Demand

- When change in quantity demanded in response to change in own price of the commodity .The total expenditure on the commodity increase when price is decrease and vice-versa.
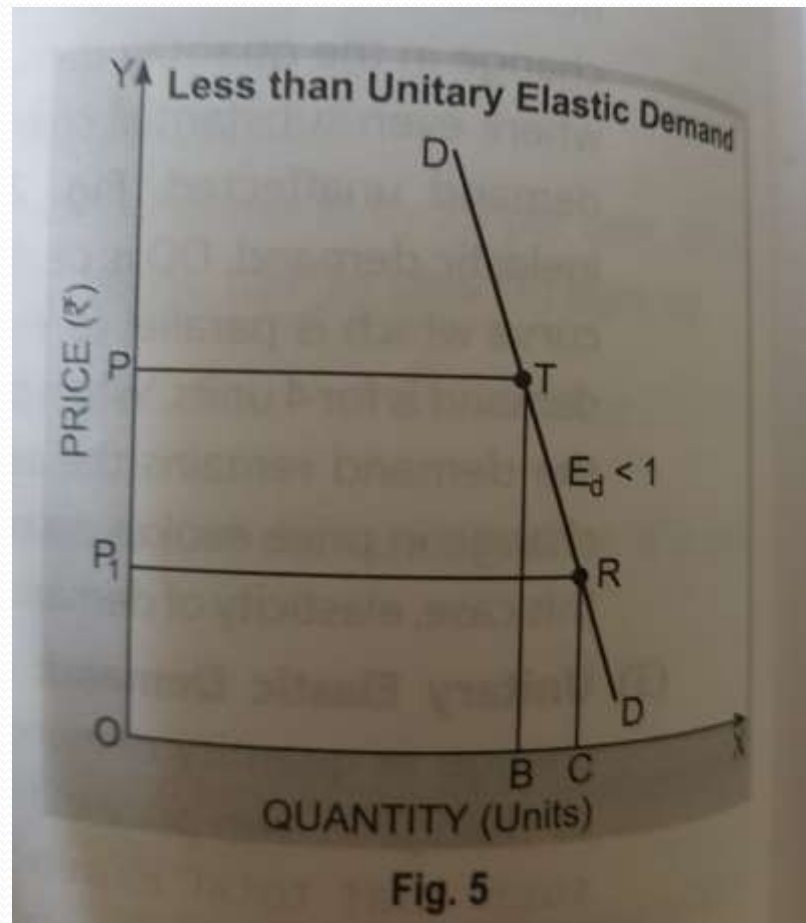
Greater Than Unitary Elastic Demand

Fig. 4

Less Than Unitary Elastic Demand

- When change in quantity demanded in response to change in own price of the commodity .The total expenditure on the commodity decrease and price increase and vice-versa.

Less Than Unitary Elastic Demand

Fig. 5

Measurement of Price Elasticity of Demand

- There are five methods of measuring price elasticity of demand
- Total Expenditure Method
- Percentage Method
- Point Method
- Arc Method
- Revenue Method

Total Expenditure Methods

- According to this method , in order to measure the elasticity of demand it is essential to know how much and in what direction the total expenditure has changed as a result of change in own price of the commodity.

Total Expenditure Methods

Table 2 shows the effect of change in price on elasticity of demand.

Table 2. Total Expenditure Method

Situation	Price of Commodity (₹)	Quantity (Kilo)	Total Expenditure (₹)	Effect on Total Expenditure	Elasticity of Demand
A	2	4	8	Same Total Expenditure	Unity
	4	2	8		
	1	8	8		
B	2	4	8	Less Total Expenditure	Greater than Unity
	4	1	4		
	1	10	10	More Total Expenditure	
C	2	3	6	More Total Expenditure	Less than Unity
	4	2	8		
	1	4	4	Less Total Expenditure	

Total Expenditure Methods
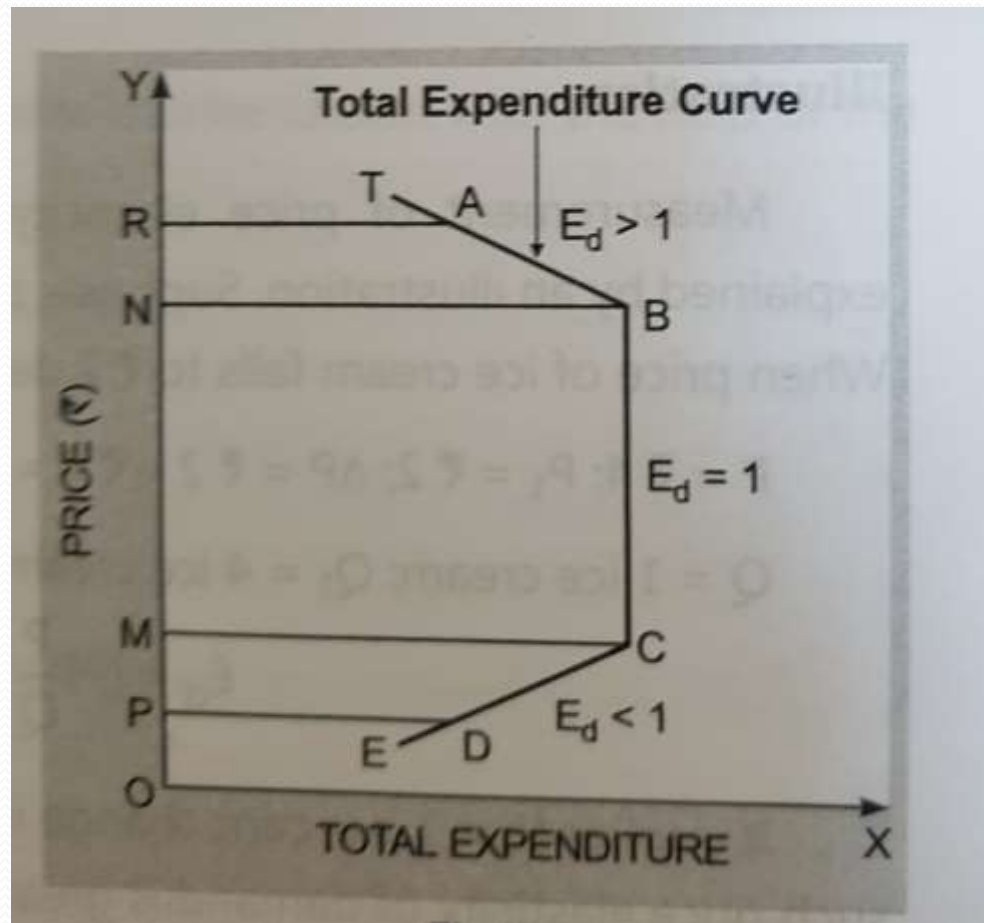
Percentage Methods

) Proportionate or Percentage Method

The second method of measuring price elasticity of demand is called proportionate or entage method. As per this method proportionate change in demand is divided by ortionate change in price. Its formula is as under:

$$E_d = (-) \frac{\text{Proportionate or percentage change in quantity demanded}}{\text{Proportionate or percentage change in price}}$$

Or

$$E_d = (-)\frac{\dfrac{\text{Change in quantity demanded}}{\text{Initial demand}} \times 100}{\dfrac{\text{Change in price}}{\text{Initial price}} \times 100} = (-)\frac{\dfrac{Q_1 - Q}{Q} \times 100}{\dfrac{P_1 - P}{P} \times 100} = (-)\frac{\dfrac{\Delta Q}{Q} \times 100}{\dfrac{\Delta P}{P} \times 100}$$

$$E_d = (-)\frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = (-) \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$E_d = (-)\frac{P}{Q} \times \frac{\Delta Q}{\Delta P}$$

lere, Q = Initial quantity demanded; Q_1 = Changed demand; P = Initial price of the good; P_1 = ed price; $\Delta Q = Q_1 - Q$ (Change in demand); $\Delta P = P_1 - P$ (Change in price); Δ = Change.]

e percentage change in any quantity of good-X is defined as 100 times the change in good-X,
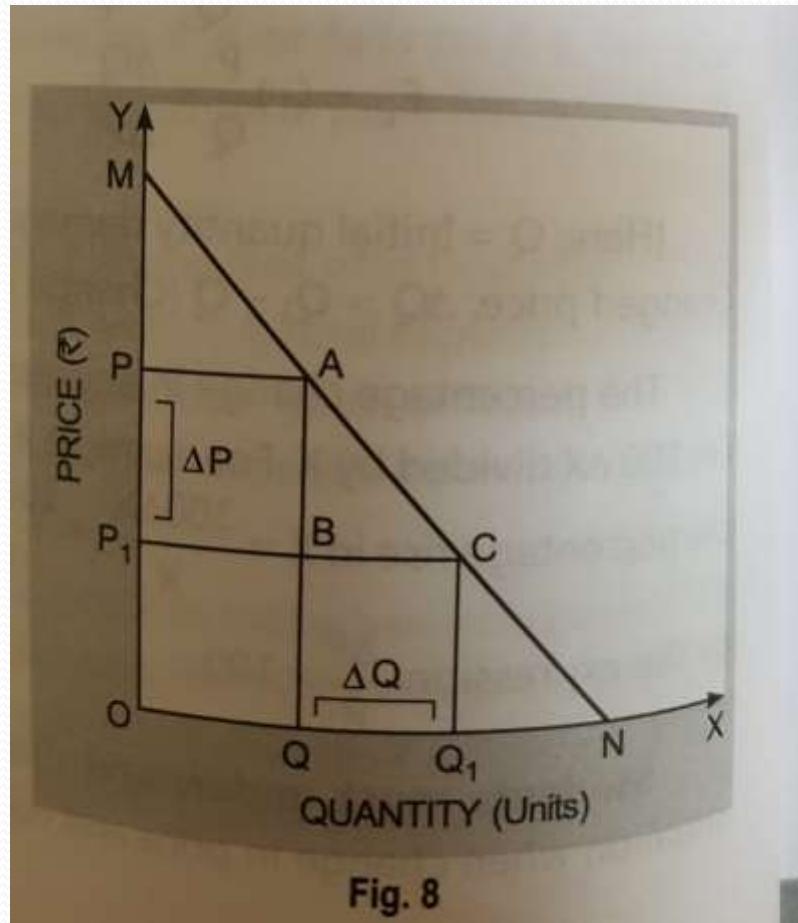
Point Methods

Fig. 8

- Point elasticity refers to price elasticity of demand at any point on the demand curve.

Point Method

curve, elasticity of demand will be $\frac{AN}{AM}$ and the same can be known with the help of the following method. As we know,

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

It is evident from **Fig. 8** that

$P = OP\ (= AQ);\ Q = OQ\ (AP)$

$\Delta P = PP_1(= AB);\ \Delta Q = QQ_1\ (= BC)$

$\therefore \qquad E_d = \frac{AQ}{AP} \times \frac{BC}{AB}$ \hfill ...(i)

Since $\triangle ABC$ and $\triangle AQN$ are similar triangles, so the ratio of their sides will also be equal, *i.e.,*

$$\frac{BC}{AB} = \frac{QN}{AQ}$$

By putting $\frac{QN}{AQ}$ in place of $\frac{BC}{AB}$ in equation (i), we have

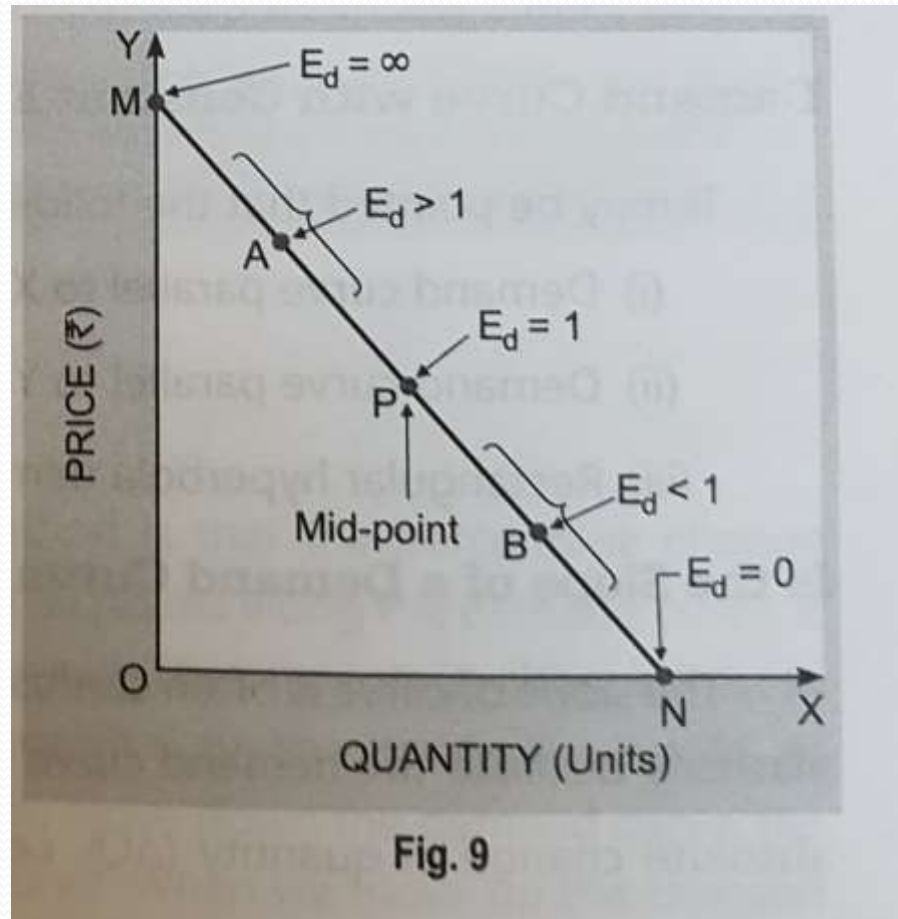$$E_d = \frac{AQ}{AP} \times \frac{QN}{AQ} = \frac{QN}{AP}$$

Since $\triangle AQN$ and $\triangle MPA$ are similar triangles, so the ratio of their sides will also be equal.

$$E_d = \frac{QN}{AP} = \frac{AN}{AM} = \frac{\text{Lower portion of demand curve}}{\text{Upper portion of demand curve}}$$

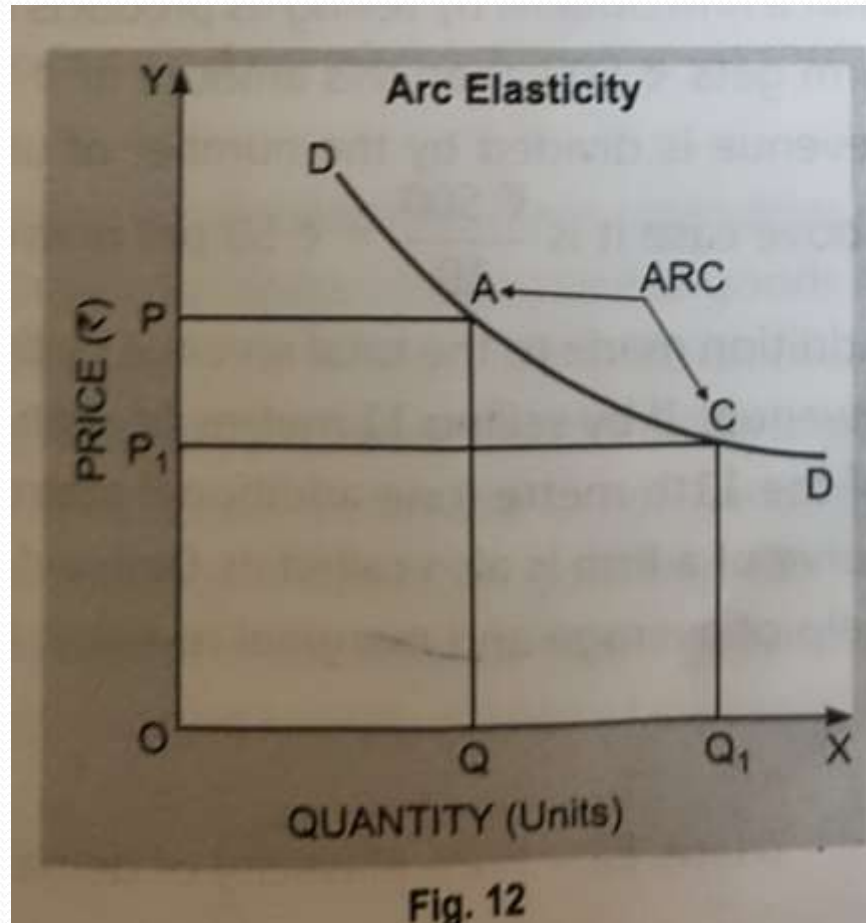Price elasticity at different points of a straight line

Point Method
Linear Demand Curve

Fig. 9

Arc Elasticity

Fig. 12

Arc Elasticity

Arc elasticity of demand is calculated with the help of the following formula:

$$E_d = (-) \frac{\dfrac{\text{Change in quantity demanded}}{\text{Average quantity demanded}}}{\dfrac{\text{Change in price}}{\text{Average price}}}$$

$$E_d = (-) \frac{\dfrac{Q_1 - Q}{\frac{1}{2}(Q_1 + Q)}}{\dfrac{P_1 - P}{\frac{1}{2}(P_1 + P)}} = (-) \frac{Q_1 - Q}{\frac{1}{2}(Q_1 + Q)} \times \frac{\frac{1}{2}(P_1 + P)}{P_1 - P}$$

Or,

$$E_d = (-) \frac{Q_1 - Q}{Q_1 + Q} \times \frac{P_1 + P}{P_1 - P}$$
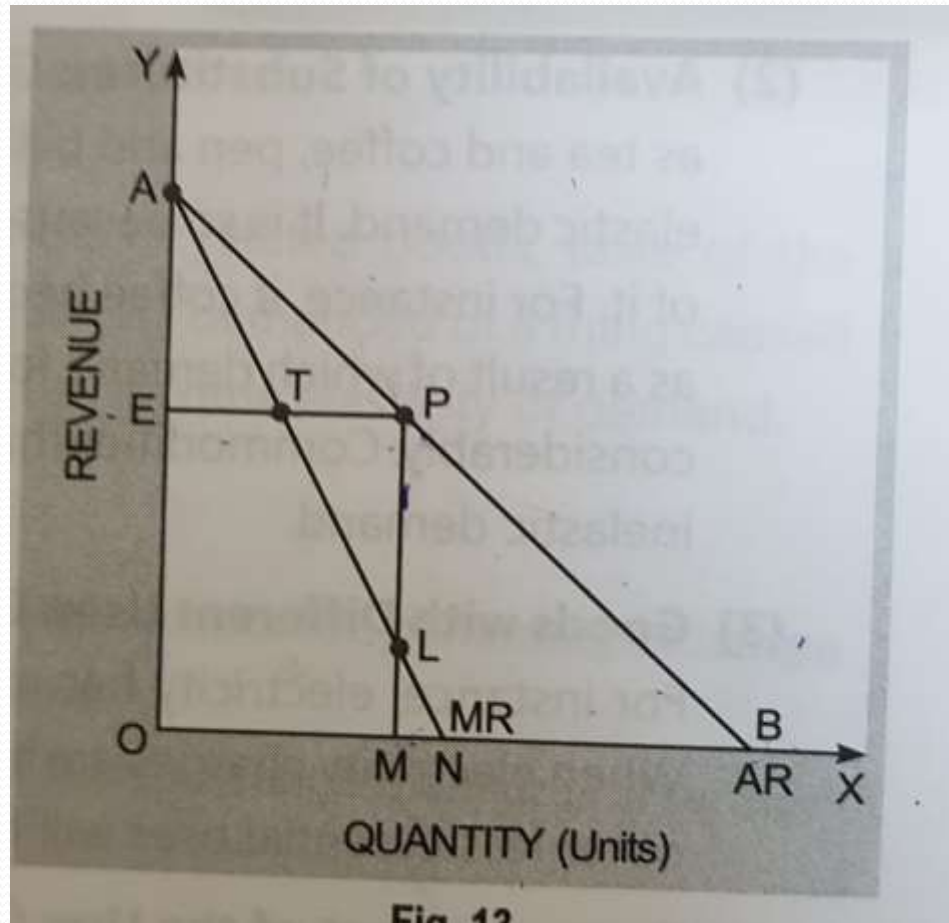
(Here, Q = Initial dem

Revenue Method

Fig. 13

Revenue Method

$$E_d = \frac{\text{Lower Portion}}{\text{Upper Portion}} \quad \text{or} \quad \frac{PB}{PA}$$

ΔPMB and ΔAEP are similar, so ratio of their sides is also equal.

$$E_d = \frac{PB}{PA} = \frac{PM}{AE} \qquad \qquad \text{... (i)}$$

ΔAET and ΔLPT are congruent triangles, so $PL = AE$. By p

$$E_d = \frac{PM}{PL}$$

Because, $PL = PM - LM$

Hence, $\quad E_d = \dfrac{PM}{PM - LM}$

Here, $PM = AR$ and $LM = MR$

So, $\quad E_d = \dfrac{PM}{PM - LM} = \dfrac{AR}{AR - MR} \quad \text{or} \quad \dfrac{A}{A - M}$

If by the use of above formula, value of E_d is one, it mear

Factors Determining the price Elasticity of Demand

- Nature of Commodity
- Availability of substitutes
- Goods with different uses
- Postponement of the use
- Income of the consumer
- Habit of the consumer
- Proportion of income spent on a commodity
- Price level
- Time
- Joint Demand

Income Elasticity of Demand

Other things, such as price of the given commodity, prices of related goods, taste of the consumer, etc., remaining constant, percentage change in the quantity demanded of a thing caused by a given percentage change in income of the consumer is called income elasticity of demand.

Income elasticity of demand can be measured by the following formula:

$$E_Y = \frac{\text{Proportionate or percentage change in quantity demanded}}{\text{Proportionate or percentage change in income}}$$

$$E_Y = \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta Y}{Y} \times 100} = \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} = \frac{Y}{Q} \times \frac{\Delta Q}{\Delta Y}$$

(Here E_Y = Income elasticity of demand; ΔQ = Change in the quantity demanded; Q = Initial demand; ΔY = Change in income; Y = Initial income.)

Degrees of Income Elasticity of Demand
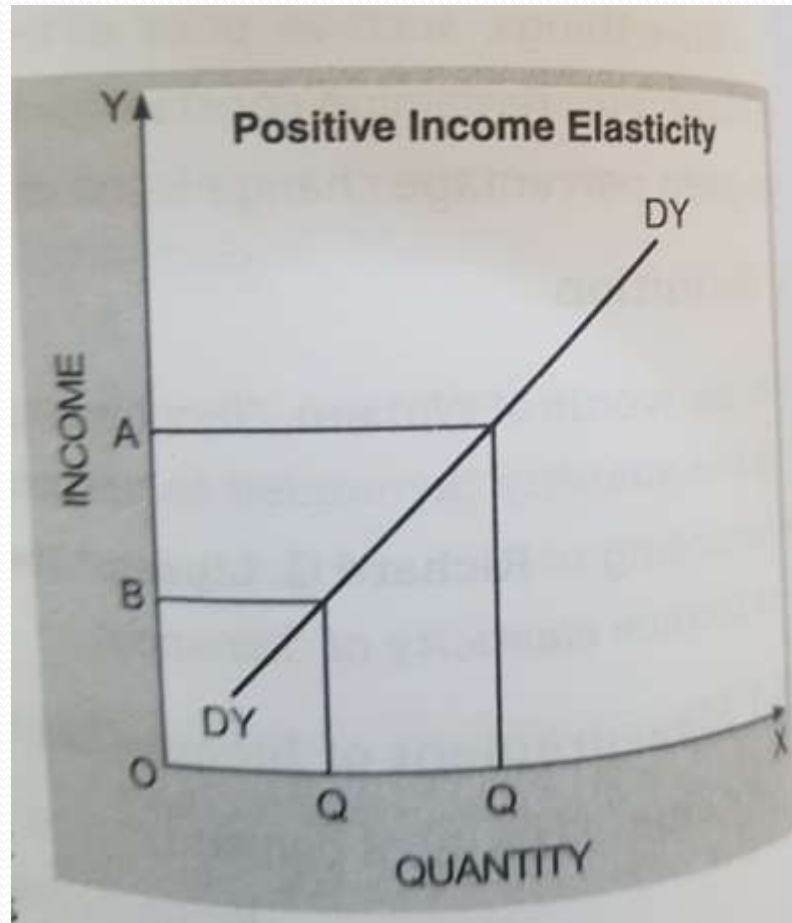
Positive Income Elasticity of Demand

- Unitary Income Elasticity of Demand
- Less than Unitary Income Elasticity of Demand
- More than Unitary Income Elasticity of Demand

Negative Income Elasticity of Demand

- Income elasticity of demand is negative when increase of the consumer is accompanied by fall in demand of a good and decrease in income is followed by rise in demand.

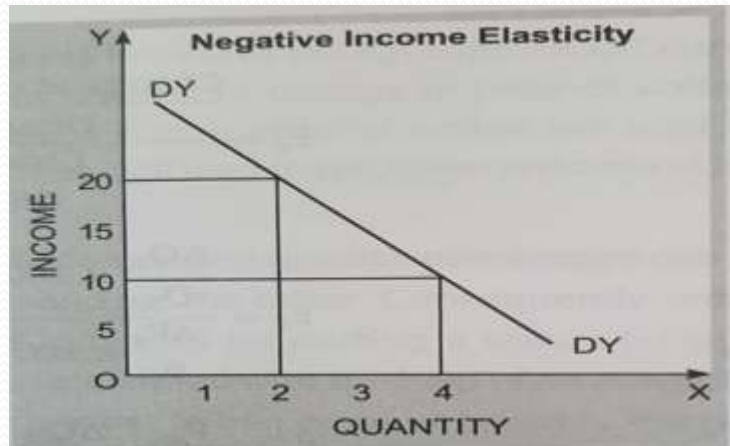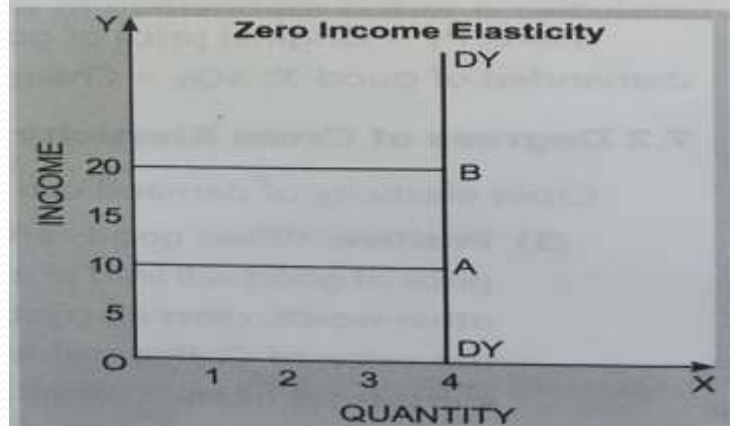# Negative Income Elasticity or Zero Income Elasticity

Fig. 15

Zero Income Elasticity of Demand

- Income elasticity of demand is zero, when change in the income of consumer evokes no change in his demand.
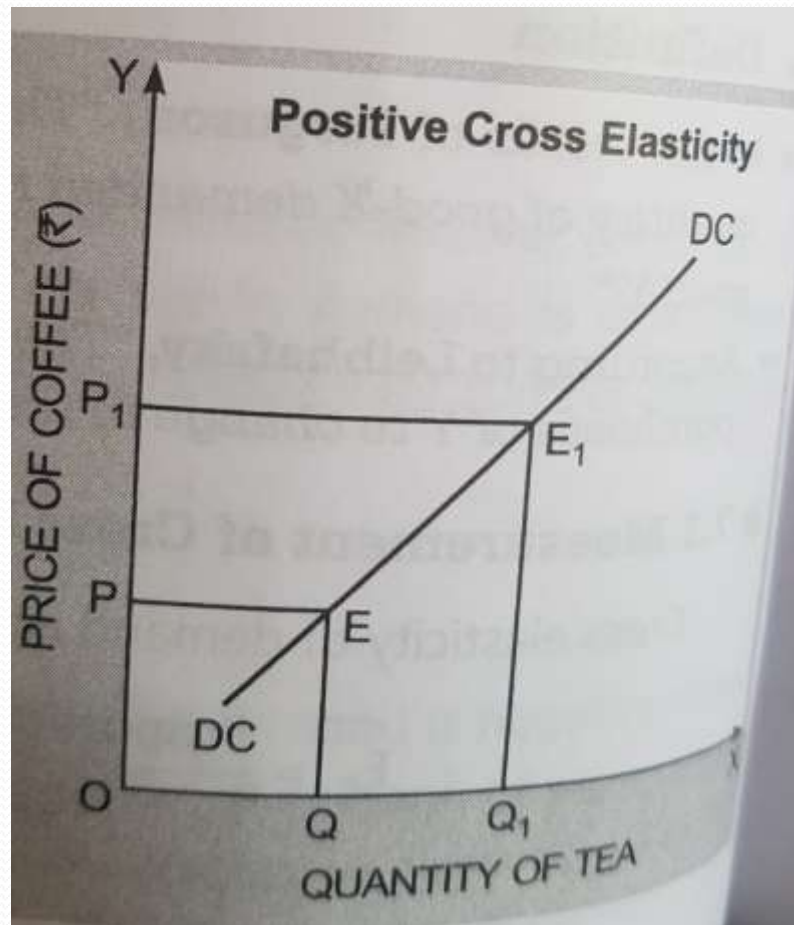
Cross Elasticity of demand

$$E_c = \frac{\dfrac{\text{Change in quantity demanded of good-X}}{\text{Original quantity of good-X}} \times 100}{\dfrac{\text{Change in price of good-Y}}{\text{Original price of good-Y}} \times 100}$$
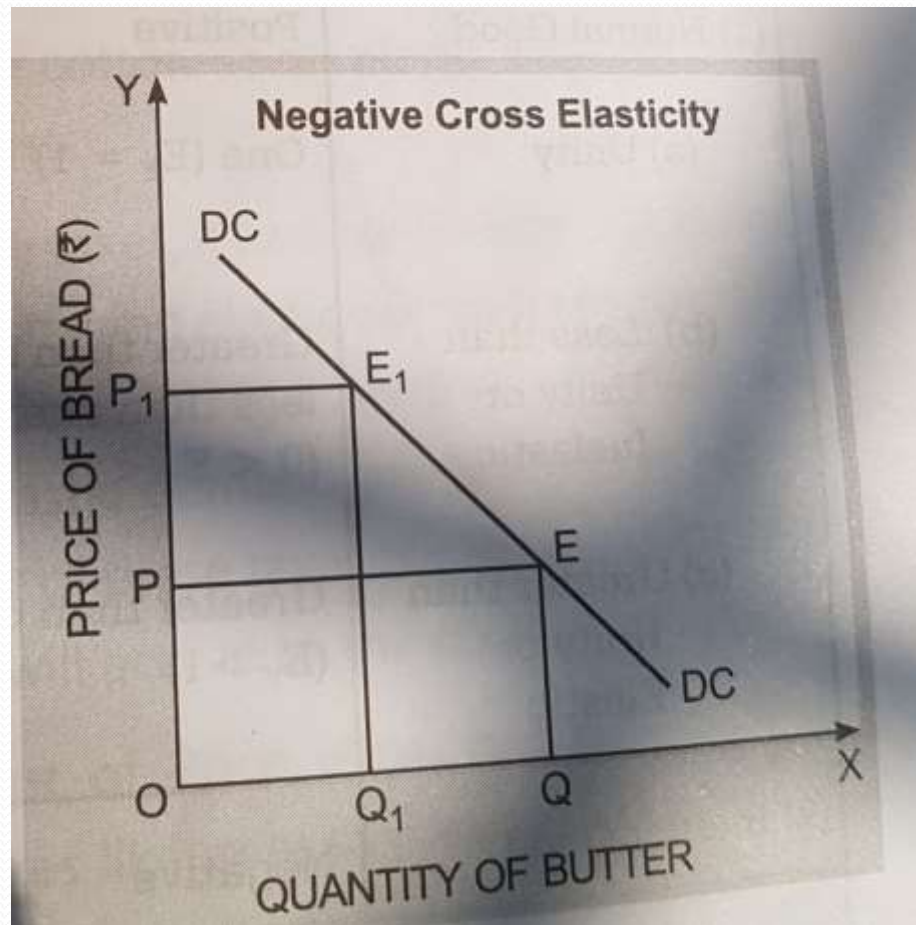
$$E_c = \frac{\dfrac{\Delta Q_X}{Q_X} \times 100}{\dfrac{\Delta P_Y}{P_Y} \times 100} = \frac{\Delta Q_X}{Q_X} \times \frac{P_Y}{\Delta P_Y}$$

$$E_c = \frac{P_Y}{Q_X} \times \frac{\Delta Q_X}{\Delta P_Y}$$

Positive cross Elasticity

Negative Cross Elasticity

Importance of Price Elasticity of Demand

- Determination of Price under Monopoly
- Price Discrimination
- Price Determination of Joint Supply
- Advantages to Finance Minister
- Distribution of Burden of Taxation
- International Trade
- Importance for the Policy of Nationalisation
- Wage Determination
- Paradox of poverty
- Effect on Employment