What is Elasticity of Demand?

- The term elasticity indicates the responsiveness of one variable to a change in the other variable. It helps us understand how sensitive consumers are to price changes.
- The elasticity of demand is a "measurement of the relative change in quantity demanded in response to the relative change in price or any other factors"
- According to Prof. Marshall, "Elasticity of demand is great or small according to the amount demanded which rises much or little for a given fall in price and quantity demanded falls much or little for a given rise in price."
- It is the ratio of the percentage change in quantity demanded of a commodity to a percentage change in price.

Types of elasticity of demand

1. Income Elasticity of Demand.
2. Cross Elasticity of Demand.
3. Price Elasticity of Demand.

Income Elasticity: When a percentage change in quantity demand of a commodity due to the change in the consumer income only, other factors including price remain constant, it is called income elasticity demand. It can be expressed as follows:

$$Ey = \frac{\text{Percentage change in Qty. Demanded}}{\text{Percentage change in Income}}$$

Symbolically,

$$Ey = \frac{\% \triangle Q}{\% \triangle Y}$$

$$= \frac{\triangle Q}{Q} \div \frac{\triangle Y}{Y}$$

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

Where,

$\triangle$ = Represents change

Q = Orignal demand

Y = Orignal income

$\triangle Q$ = Change in quantity demanded

$\triangle Y$ = Change in income of a consumer

Cross Elasticity: Cross Elasticity of demand refers to a change in quantity demanded for a commodity due to the change in the price of complementary goods. For example, Cars and Petrol, SIM cards, and Mobile phones, etc.

$$Ec = \frac{\text{Percentage change in Qty. demanded of A}}{\text{Percentage change in Price of B}}$$

(A = Original commodity, B = Other commodity)

Symbolically, $Ec = \frac{\% \triangle Q_A}{\% \triangle P_B}$

$$= \frac{\triangle Q_A}{Q_A} \div \frac{\triangle P_B}{P_B}$$

$$= \frac{\triangle Q_A}{Q_A} \times \frac{P_B}{\triangle P_B}$$

Where,

Q_A = Original quantity demanded of commodity A

$\triangle Q_A$ = Change in quantity demanded of commodity A

P_B = Original price of commodity B

$\triangle P_B$ = Change in price of commodity B

Price Elasticity: Price Elasticity of demand refers to the percentage change in quantity demanded for a commodity due to a percentage change in its price only, other factors remain the same.

$$Ed = \frac{\text{Percentage change in Quantity Demanded}}{\text{Percentage change in Price}}$$

Symbolically, $Ed = \frac{\% \triangle Q}{\% \triangle P}$,

$$Ed = \frac{\triangle Q}{Q} \div \frac{\triangle P}{P}$$

$$Ed = \frac{\triangle Q}{Q} \times \frac{P}{\triangle P}$$

Where,

Q = Original quantity demanded

△Q = Difference between the new quantity and original quantity demanded

P = Original price

△P = Difference between new price and original

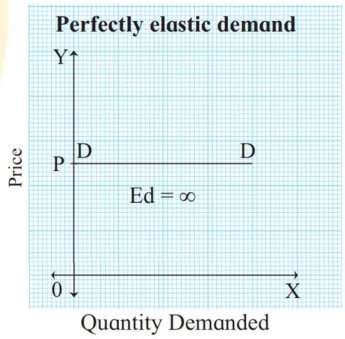
Types of Price Elasticity of Demand:

1. Perfectly Elastic Demand:

When a **slight or zero change** in the price brings about an **infinite change** in the quantity demanded of that commodity, it is called perfectly elastic demand. if the price changes by 1% may lead to an infinite rise in demand.

$$Ed = \frac{\text{Percentage change in Quantity Demanded}}{\text{Percentage change in Price}} = \infty$$

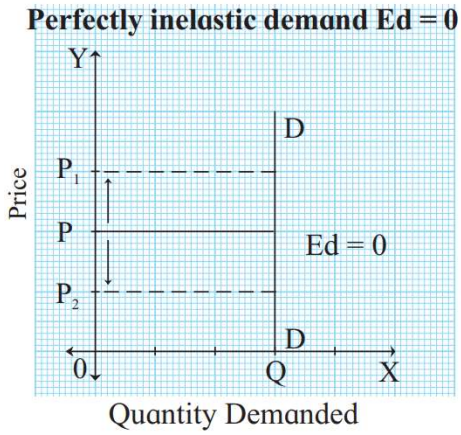
Ed = ∞



In the above diagram the demand curve DD is a horizontal line parallel to the X-axis indicating perfectly elastic demand.

2. Perfectly Inelastic Demand:

When a percentage change in price has **no effect** on the quantity demanded of a commodity it is called perfectly inelastic demand. For example, a 20% fall in price will have no effect on the quantity demanded, demand for salt, milk, etc.



$$Ed = \frac{\% \triangle Q}{\% \triangle P}$$

$$Ed = \frac{0}{20} = 0$$

$$Ed = 0$$

In the above diagram, when the price rises from OP to OP1 or when the price falls from OP to OP2, demand remains unchanged at OQ. Therefore, the demand curve is a vertical straight line parallel to the Y axis, indicating perfectly inelastic demand.

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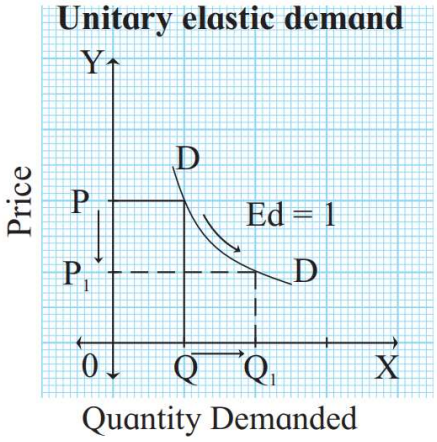
3. Unitary elastic demand:

When a percentage change in price leads to an equal percentage change in quantity demanded, it is called unitary elastic demand. For example, 50% fall in the price of a commodity leads to 50% rise in the quantity demanded.

$$Ed = \frac{\% \triangle Q}{\% \triangle P} = \frac{50}{50} = 1 \qquad \therefore Ed = 1$$



In the above diagram when the price falls from OP to OP1 (50%), demand rises from OQ to OQ1 (50%). Therefore, the slope of the demand curve is a 'rectangular hyperbola'.

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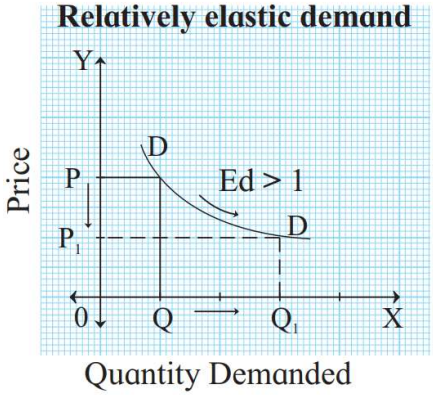
4. Relatively elastic demand:

When a change in price brings about **more than** a proportionate change in quantity demanded of a commodity, it is called as relatively elastic demand. For example- 50% fall in price leads to 100% rise in quantity demanded.



$$Ed = \frac{\% \triangle Q}{\% \triangle P}$$

$$Ed = \frac{100}{50} \qquad \therefore Ed = 2$$

$$Ed > 1$$

In the above diagram when the price falls from OP to OP1 (50%), demand rises from OQ to OQ1 (100%). Therefore, the demand curve has a flatter slope.

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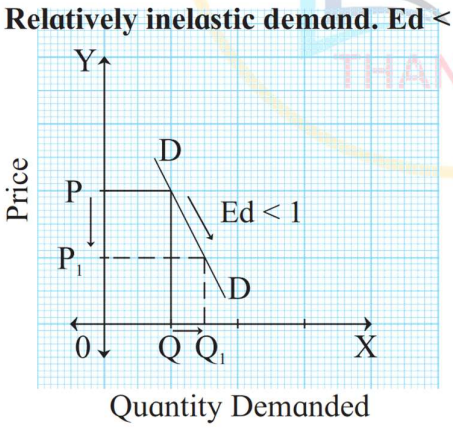
5. Relatively inelastic Demand:

When a change in price brings about **less than** a proportionate change in quantity demanded of a commodity, it is called relatively inelastic demand. For example, 50% fall in price leads to 25% rise in quantity demanded.



$$Ed = \frac{\% \triangle Q}{\% \triangle P} = \frac{25}{50} = 0.5$$

$$Ed = 0.5 \qquad \therefore Ed < 1$$

When the price falls from OP to OP1 (50%), demand rises from OQ to OQ1 (25%). Therefore, the demand curve has a steeper slope.

Factors influencing the elasticity of demand:

1) **Nature of the commodity:** The demand for necessities like food grains, medicines, textbooks, etc. is relatively inelastic demand and the demand for luxuries and comfort like cars, perfumes, furniture, etc. is relatively elastic demand.

2) **Availability of substitutes:** If the commodity has close substitutes, demand will be more elastic. For example, lemon juice, sugarcane juice, etc. But for commodities having no close substitutes like salt, the demand will be inelastic.

3) **Number of uses:** Single-use goods have a less elastic demand. For example, Party Balloons, Disposable Plates and Cutlery, and Tissues. Multi-use goods have more elastic demand, For example, coal, electricity, etc.

4) **Habits:** Habits make demand for certain goods relatively inelastic. For example, Toothpaste, Mobile Phone Data Plan, Milk, Laundry Detergent, etc.

5) **Durability:** The demand for durable goods is relatively elastic. For example, furniture, washing machines, etc. The demand for perishable goods is inelastic. For example, milk, vegetables, etc.

6) **Complementary commodities:** The elasticity of demand for a product can be influenced by its connection to other goods to satisfy a single want is relatively inelastic. For example, a fall in the price of mobile handsets may lead to a rise in the demand for SIM cards.

7) **Income of the consumer:** Demand for Normal goods is usually inelastic if the consumer has a high income because they have enough money to buy the product even if the price changes a little. A very poor person's demand may not change even if the price of necessary items like basic food increases because they may not have other options and would still buy those items.

8) **Urgency:** Goods that are urgently needed will have relatively inelastic demand, for example, medicines. Less urgent luxury goods have relatively elastic demand.

9) **Time period:** Elasticity of demand is always related to a period. It varies with the length of the period. The longer the duration of the period greater the elasticity of demand and vice-versa. This is because a consumer can change their consumption habits in the long run-in favour of cheaper substitutes of the commodities.

Importance of Elasticity of Demand:

1) **Importance to the producer:** - Every producer must determine the selling price for the product at which he has to sell it. For this purpose, the elasticity of demand becomes important. If the demand for a product is relatively inelastic, he will fix up a higher price and vice-versa. It is also useful for a monopolist to practice price discrimination.
2) **Importance to the Government:** - Elasticity of demand helps the government in determining taxation policy. If the demand is inelastic the governments impose a higher tax and if the demand is elastic the governments impose less tax.

3) **Importance to factor pricing:** - Elasticity of demand is very useful for determining the factor price. Factor, which has an elastic demand, is paid less wages. On the other hand, labour that has inelastic demand is paid higher wages.

4) **Importance in Foreign Trade:** - Elasticity of demand is useful to determine terms and conditions in foreign trade. If countries exporting commodities demand is relatively inelastic can fix higher prices to earn more foreign exchange. For example, the Organization of Petroleum Exporting Countries (OPEC) has increased the price of oil several times. It is also useful in formulating the export and import policy of a country.

5) **Public Utilities:** In the case of public utilities like railways which have inelastic demand, Government can either subsidise (reduce the cost of a product or service) or nationalise (control by the government) them to avoid consumer exploitation.

6) **Proportion of expenditure:** When a consumer spends a very small portion of his income on a commodity demand will be inelastic and vice versa e.g., newspaper.

Relatively elastic demand	Relatively inelastic demand
1. When a change in price brings about more than a proportionate change in quantity demanded of a commodity.	When a change in price brings about **less than** a proportionate change in quantity demanded of a commodity.
2. It represents a flatter demand curve.	It represents a steeper demand curve.
3. For example- 20% fall in price leads to 80% rise in quantity demanded.	For example- 60% fall in price leads to 20% rise in quantity demanded.
4. Symbolically, Ed > 1	Symbolically, Ed < 1

Perfectly elastic demand	Perfectly inelastic demand
1. When a slight or zero change in the price brings about an infinite change in the quantity demanded of that commodity, it is called perfectly elastic demand.	When a percentage change in price has no effect on the quantity demanded of a commodity it is called perfectly inelastic demand.
2. The perfectly elastic demand curve is parallel to the OX axis	The perfectly elastic demand curve is parallel to the OY axis.
3. For example- 10% fall in price may lead to an infinite rise in demand.	For example- 20% fall in price will have no effect on the quantity demanded.
4. Symbolically, Ed = ∞	Symbolically, Ed = 0

Methods of Measuring Price Elasticity of Demand:

1) Ratio or Percentage method:

i. The ratio method was developed by Prof. Marshall.
ii. According to this method, elasticity of demand is measured by dividing the percentage change in demand by the percentage change in price.
iii. The percentage method is also known as the Arithmetic method.

$$Ed = \frac{\text{Percentage change in Quantity demanded}}{\text{Percentage change in Price}}$$

$$Ed = \frac{\% \triangle Q}{\% \triangle P}$$

Mathematically, the above formula can be presented as under.

$$Ed = \frac{\triangle Q}{Q} \div \frac{\triangle P}{P} \quad \therefore Ed = \frac{\triangle Q}{Q} \times \frac{P}{\triangle P}$$

Q = Original quantity demanded

$\triangle Q$ = Difference between the new quantity and original quantity demanded.

P= Original price

$\triangle P$= Difference between new price and original price

Numerical example :

Price (₹)	Qty. Demanded (in Kg)	Formula
20 25	10 09	$Ed = \frac{\triangle Q}{Q} \times \frac{P}{\triangle P}$

Original Price, P = 20, New price P = 25

$\triangle P = 5$ (Difference between new and original price)

Original Quantity Demanded, Q = 10, New demand = 9

$\triangle Q = 1$ (Difference between new and original quantity demanded)

$$Ed = \frac{\triangle Q}{Q} \times \frac{P}{\triangle P}$$

$$Ed = \frac{1}{10} \times \frac{20}{5}$$

$$Ed = 0.4$$

$Ed < 1$

It means elasticity of demand is relatively inelastic.

2) Total Expenditure Method :

i. The Total Expenditure Method was developed by Prof. Marshall.
ii. In this method, the total amount of expenditure is compared before and after the price change.
iii. Total expenditure refers to the product price and quantity demanded.
Total expenditure = Price × Quantity demanded

Table 3.4 : Total Expenditure method

Price in ₹ (P)		Quantity demanded in units (Q)	Total outlay (P×Q) ₹	Elasticity of demand
A	6	10	60	Ed >1
	5	20	100	
B	4	30	120	Ed = 1
	3	40	120	
C	2	50	100	Ed <1
	1	60	60	

A) Relatively elastic demand (Ed >1): When with a given change in the price of a commodity total outlay increases, the elasticity of demand is greater than one.

B) Unitary elastic demand (Ed = 1): When the price falls or rises, total outlay does not change or remains constant, the elasticity of demand is equal to one.

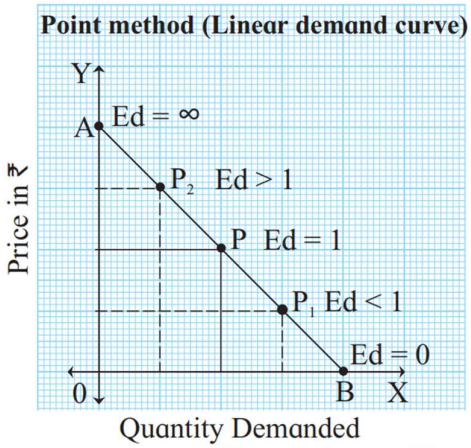
C) Relatively inelastic demand (Ed <1): When with a given change in price of a commodity total outlay decreases, the elasticity of demand is less than one.

3) Point method or Geometric Method :

i. The point method or geometric method was developed by Prof. Marshall
ii. According to this method, we can measure the elasticity of demand At any point on the demand curve.
iii. The ratio method and total outlay methods are unable to measure the elasticity of demand at a given point on the demand curve. So Prof. Marshall introduced the Point method or geometric method.

$$\text{Point elasticity of demand (Ed)} = \frac{\text{Lower segment of demand curve below a given point (L)}}{\text{Upper segment of demand curve above a given point (U)}}$$

A) Linear Demand Curve: When the demand curve is linear i.e. a straight line, we extend the demand curve to meet the Y axis at 'A' and X axis at 'B'.



Let us assume that AB is a demand curve and its length is 8 cm. Point elasticity at various points on a linear demand curve can be measured as follows:

1) At point P, the point elasticity is measured as :

$$P = \frac{PB}{PA} = \frac{4}{4} = 1$$

Thus, at point P, demand is unitary elastic (ed = 1)

2) At point P_1, the point elasticity is measured as :

$$P_1 = \frac{P_1B}{P_1A} = \frac{2}{6} = 0.33$$

Thus, at point P_1, demand is relatively inelastic (ed < 1)

3) At point P_2, the point elasticity is measured as :

$$P_2 = \frac{P_2B}{P_2A} = \frac{6}{2} = 3$$

Thus, at point P_2, demand is relatively elastic (ed > 1)

4) At point A, the point elasticity is ∞ (perfectly elastic demand)

5) At point B, the point elasticity is zero (perfectly inelastic demand.)

Point method - Non-linear demand curve

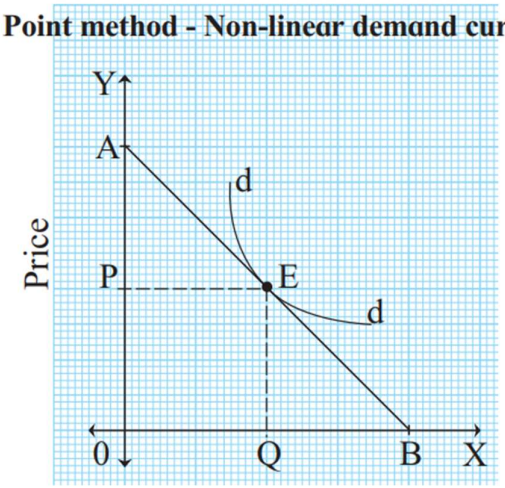


Fig. 3.17

If EB = EA (Ed = 1) - Unitary elastic demand

EB > EA (Ed >1) - Relatively elastic demand

EB < EA (Ed <1) - Relatively inelastic demand