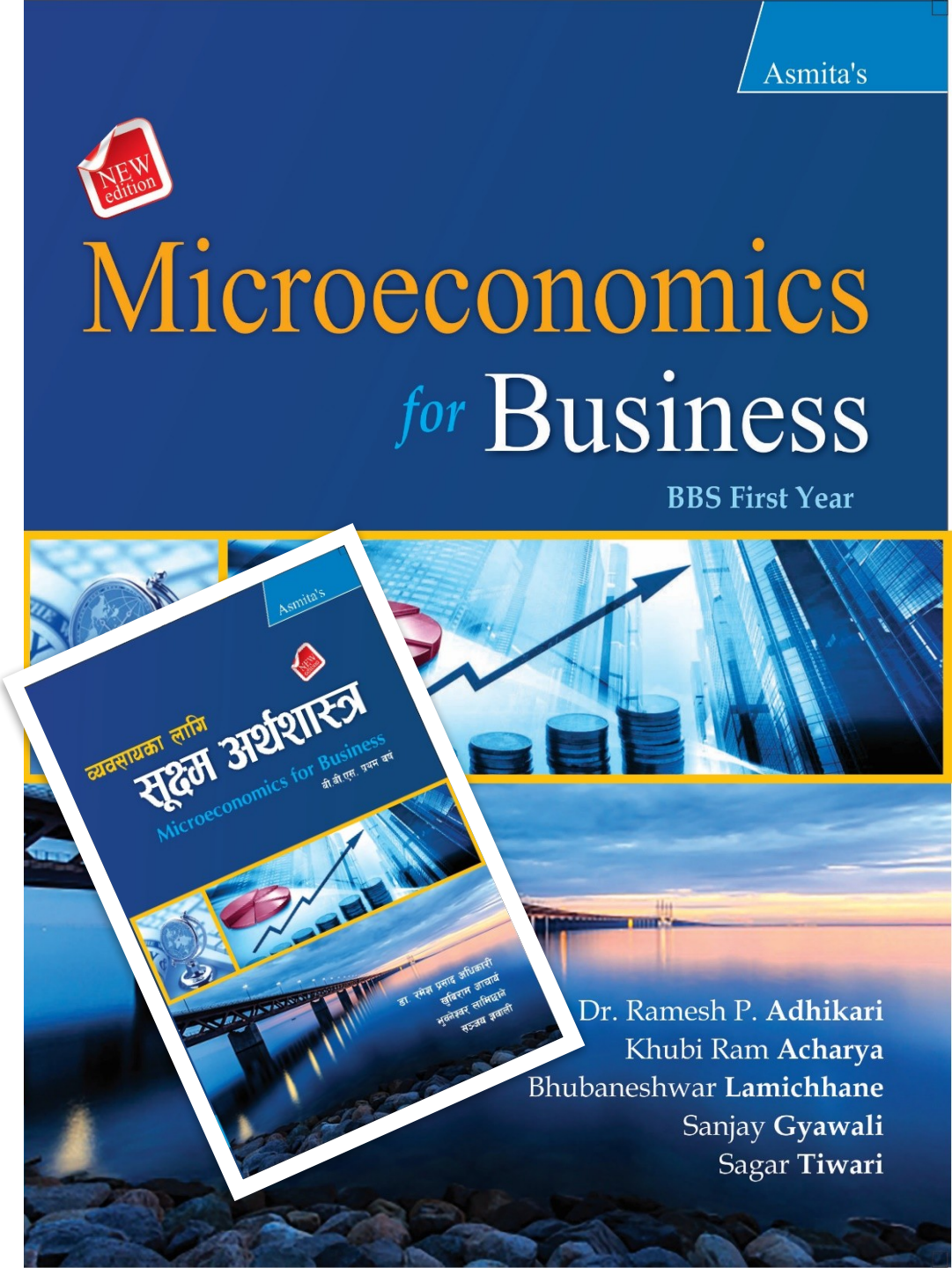
Elasticity of Demand and Supply

Unit 3



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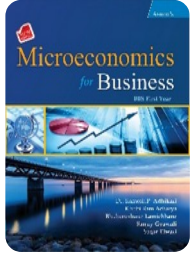
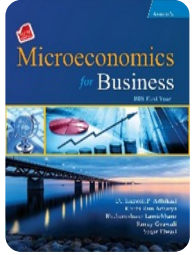


Learning Objectives

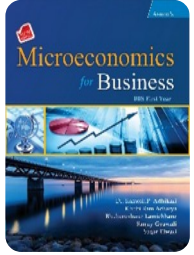
On completion of this unit, students will be able to:

- explain the concept and degrees of price elasticity of demand
- calculate price elasticity of demand by percentage and average method
- explain the point elasticity of demand
- describe price elasticity of demand and total expenditure
- explain the concept and degrees of income elasticity of demand
- calculate income elasticity of demand by using percentage and average method
- explain the concept of advertisement elasticity of demand
- describe the uses of price, income, cross and advertisement elasticity of demand
- describe the concept and degrees of price elasticity of supply
- calculate price elasticity of supply using percentage and average method.



Introduction

- The law of demand states that there is inverse relationship between price of a commodity and its quantity demanded, all other factors remaining the same.
- This law does not explain the degree of relationship between the change in price of the commodity and its quantity demanded. It is silent on the amount of change in demand at the given change in price.
- The explanation on how much or to what extent quantity demanded for a commodity changes as a result of change in price, we study in the elasticity of demand.
- Similarly, the explanation on how much or to what extent quantity supplied for a commodity changes as a result of change in price, we study in the elasticity of supply.

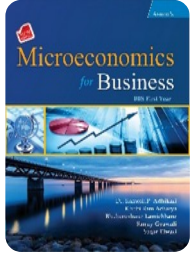


Elasticity of Demand and Its Types

- The concept of elasticity of demand was first introduced by the classical economists **A.A. Cournot and J. S. Mill.** Latter on neo-classical economist **Alfred Marshall** developed it in the scientific way in his book **Principles of Economics**.
- The elasticity of demand is the measure of responsiveness of demand for a commodity to the change in any of its determinants.

Types of Elasticity of Demand

1. Price elasticity of demand
2. Income elasticity of demand
3. Cross elasticity of demand
4. Advertisement elasticity of demand



Price Elasticity of Demand (E_P)

Price elasticity of demand is defined as the responsiveness of change in quantity demanded of a commodity to the change in its price. In other words, the price elasticity of demand is defined as the ratio of percentage change in quantity demanded to the percentage change in price.

$$E_P = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

$$= \frac{\dfrac{\text{Change in quantity demanded}}{\text{Initial Quantity demanded}} \times 100}{\dfrac{\text{Change in price}}{\text{Initial Price}} \times 100} = \frac{\dfrac{DQ}{Q} \times 100}{\dfrac{DP}{P} \times 100} = \frac{DQ}{DP} \cdot \frac{P}{Q}$$

$$\therefore \quad E_P = \frac{DQ}{DP} \cdot \frac{P}{Q}$$

where

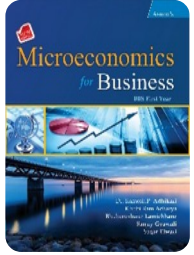
E_P = Coefficient of price elasticity of demand

Q = Initial quantity demanded

P = Initial price

DQ = Change in quantity demanded

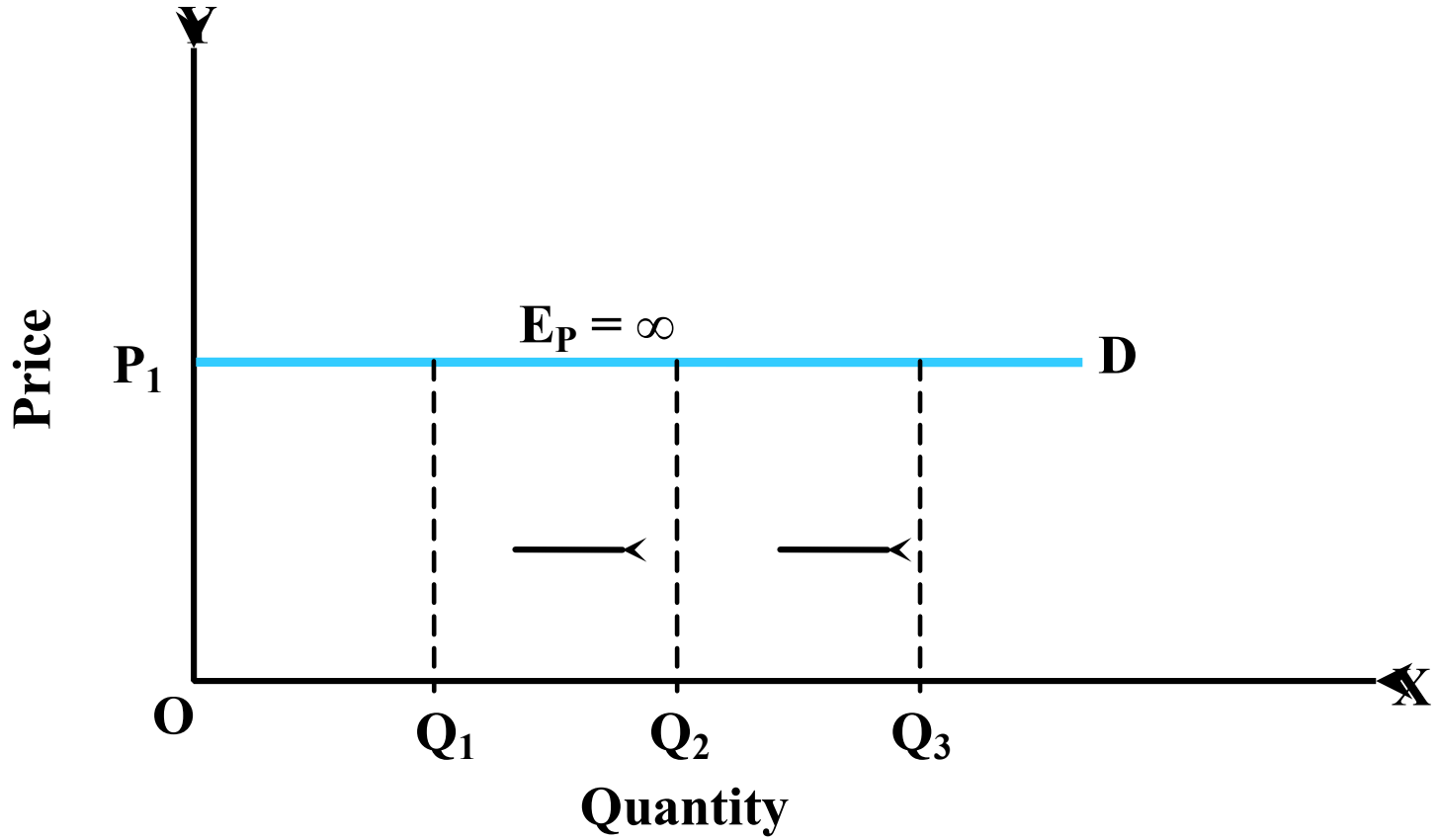
DP = Change in price

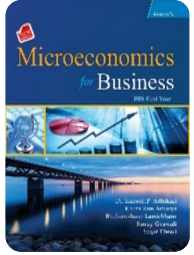


Types (Degrees) of Price Elasticity of Demand

1. Perfectly Elastic Demand ($E_P = \infty$)

Demand is said to be perfectly elastic if negligible change in price leads to infinite change in the quantity demanded. Perfectly elastic demand is theoretical concept. It is hardly found in practice or real life.

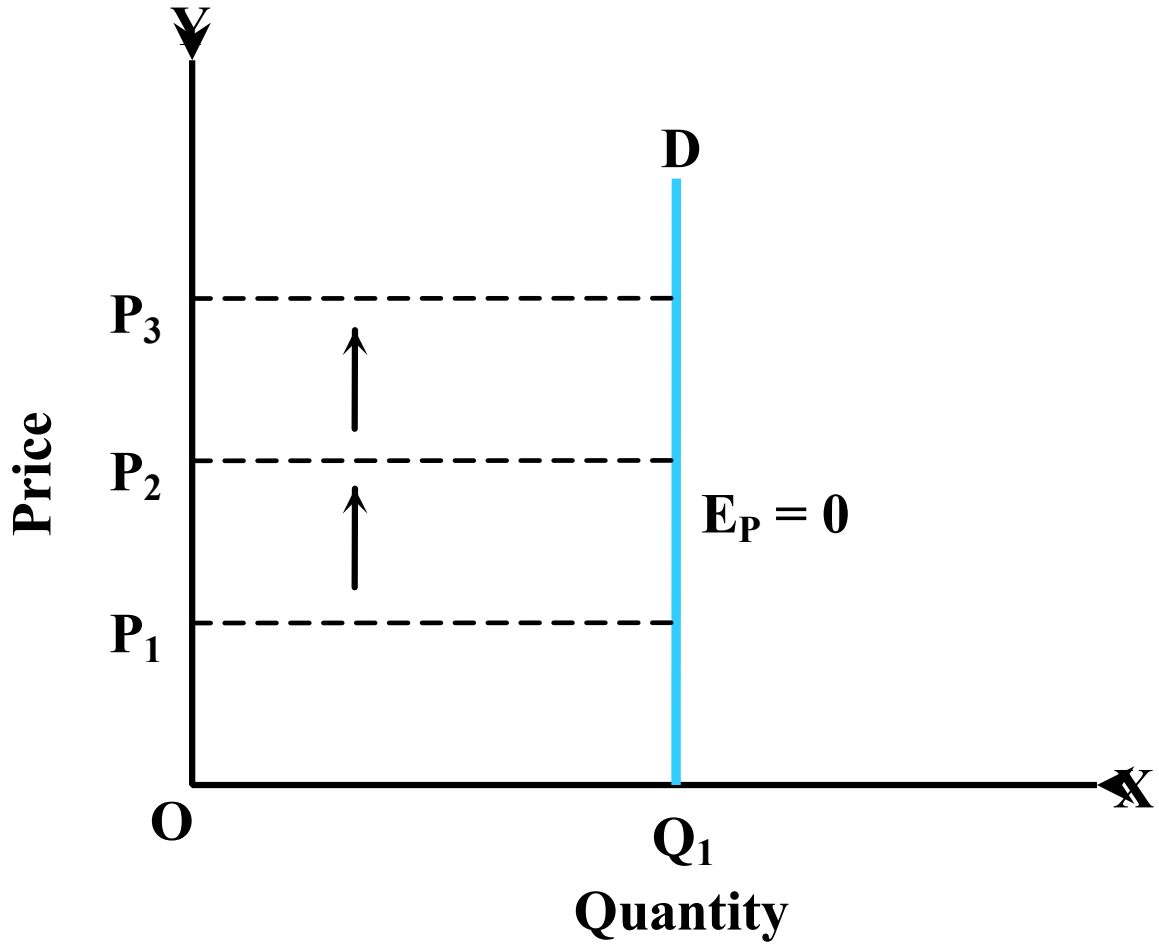


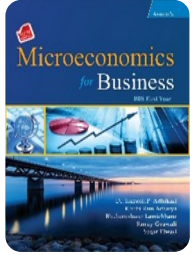


Types (Degrees) of Price Elasticity of Demand Contd.

2. Perfectly Inelastic Demand ($E_P = 0$)

When the demand for a commodity does not change with the change in its price, the demand is said to be perfectly inelastic demand. For example, medicine and salt have perfectly inelastic demand.

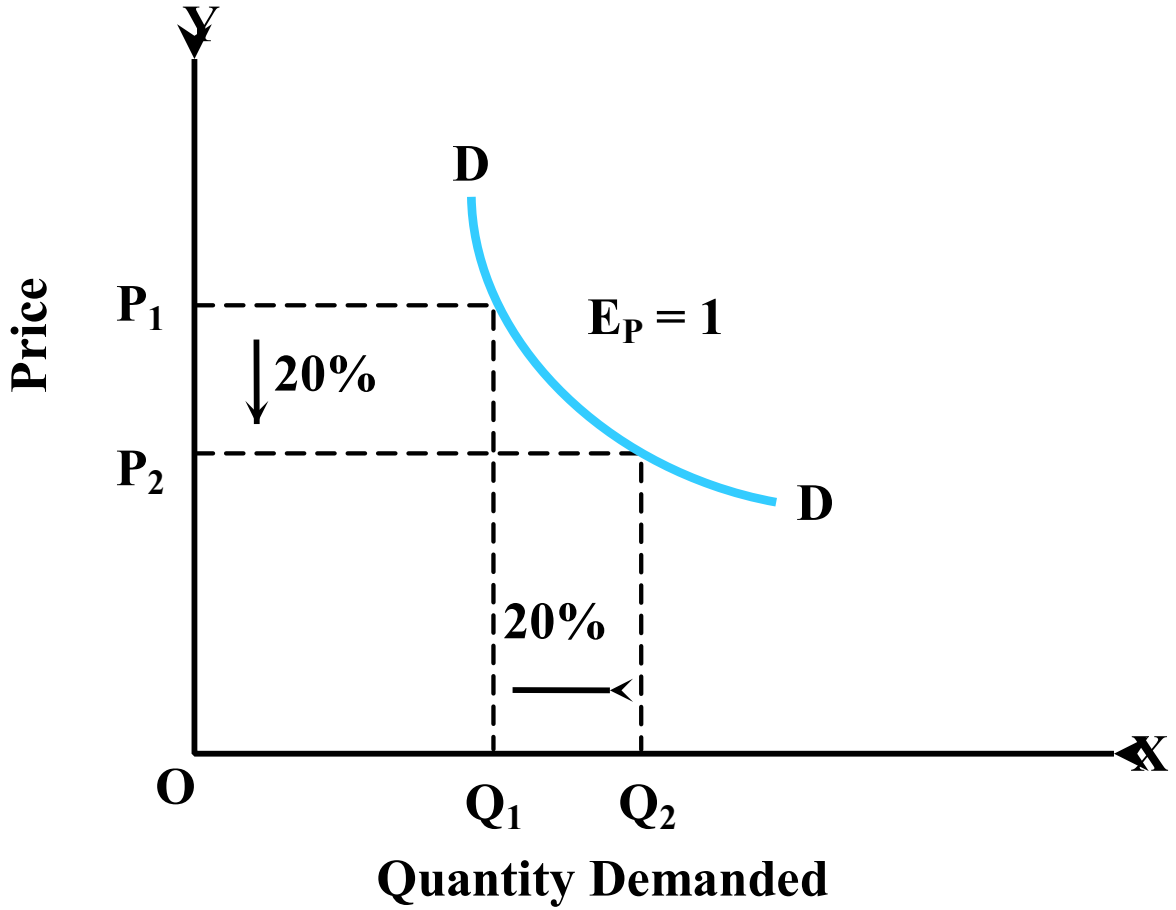


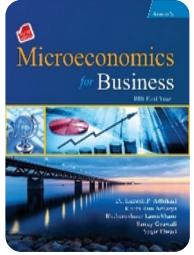


Types (Degrees) of Price Elasticity of Demand Contd.

3. Unitary Elastic Demand (E_P = 1)

When the percentage change in the quantity demanded is equal to the percentage change in price, the demand for a commodity is said to be unitary elastic demand.

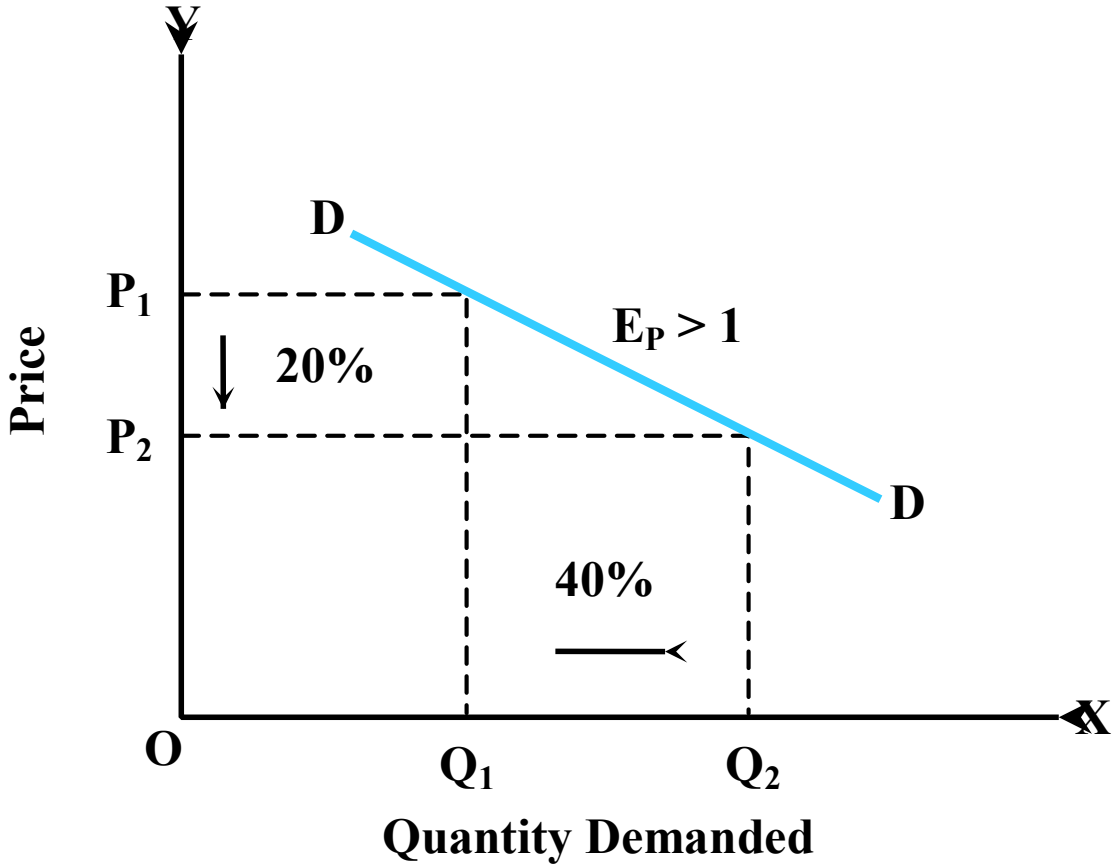


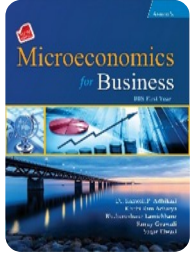


Types (Degrees) of Price Elasticity of Demand Contd.

4. Relatively Elastic Demand ($E_P > 1$)

When the percentage change in the quantity demanded for a commodity is more than percentage change in its price, it is called relatively elastic demand. Such kind of elasticity of demand is found in case of luxury goods like LED television, refrigerator, car, etc.

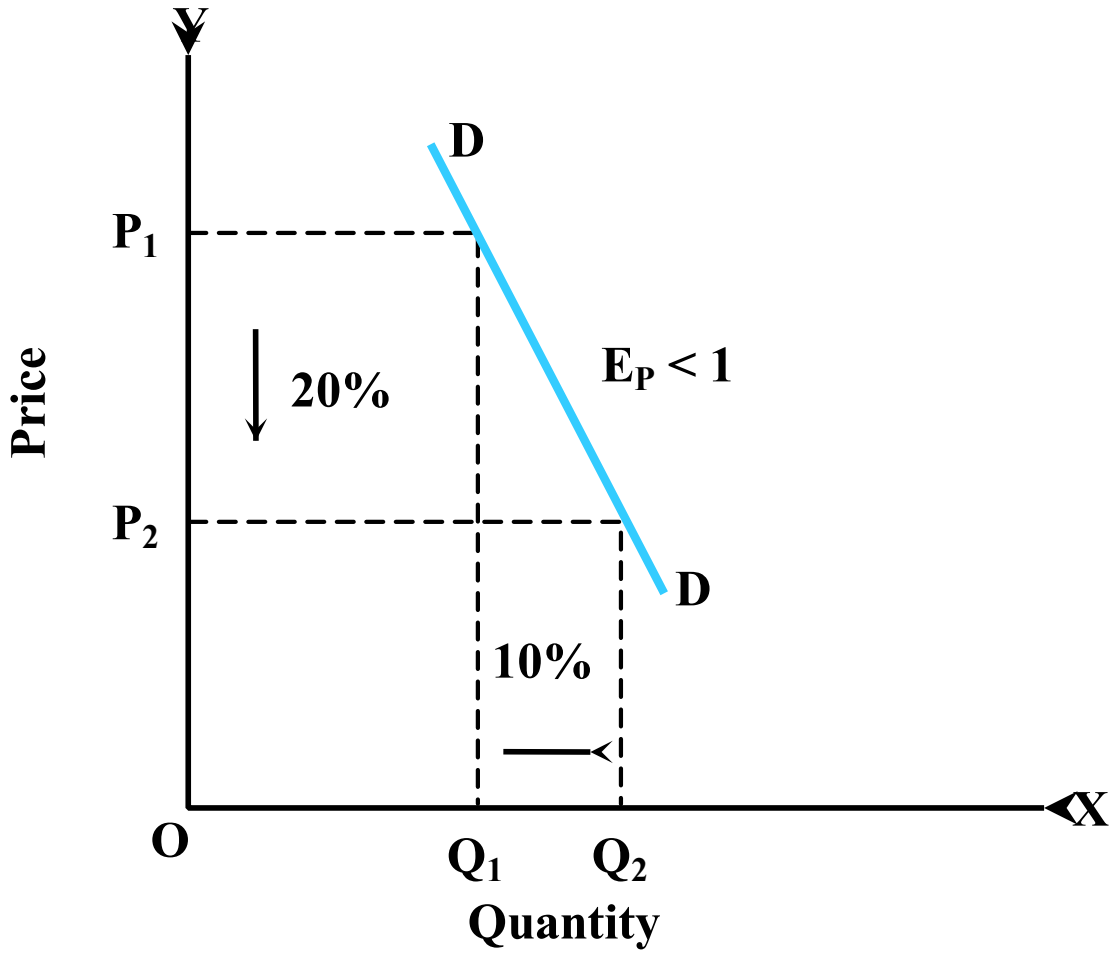


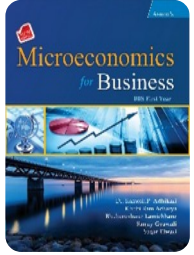


Types (Degrees) of Price Elasticity of Demand Contd.

5. Relatively Inelastic Demand ($E_P < 1$)

If the percentage change in the quantity demanded of a commodity is less than the percentage change in its price, it is called relatively inelastic demand. It is found in case of necessity or basic good like rice, vegetable, clothes, etc.





Calculation of Price Elasticity of Demand

1. Percentage/ Proportionate Method

Percentage method was developed by **Prof. Flux** as an improvement over the outlay method. The price elasticity of demand is measured by its coefficient. The coefficient (E_P) measures the percentage change in the quantity demanded of a commodity resulting from a given percentage change in its price.

$$E_P = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

$$= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

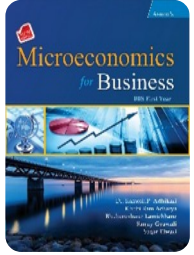
where

Q = Initial quantity demanded

ΔQ = Change in quantity demanded

P = Initial price

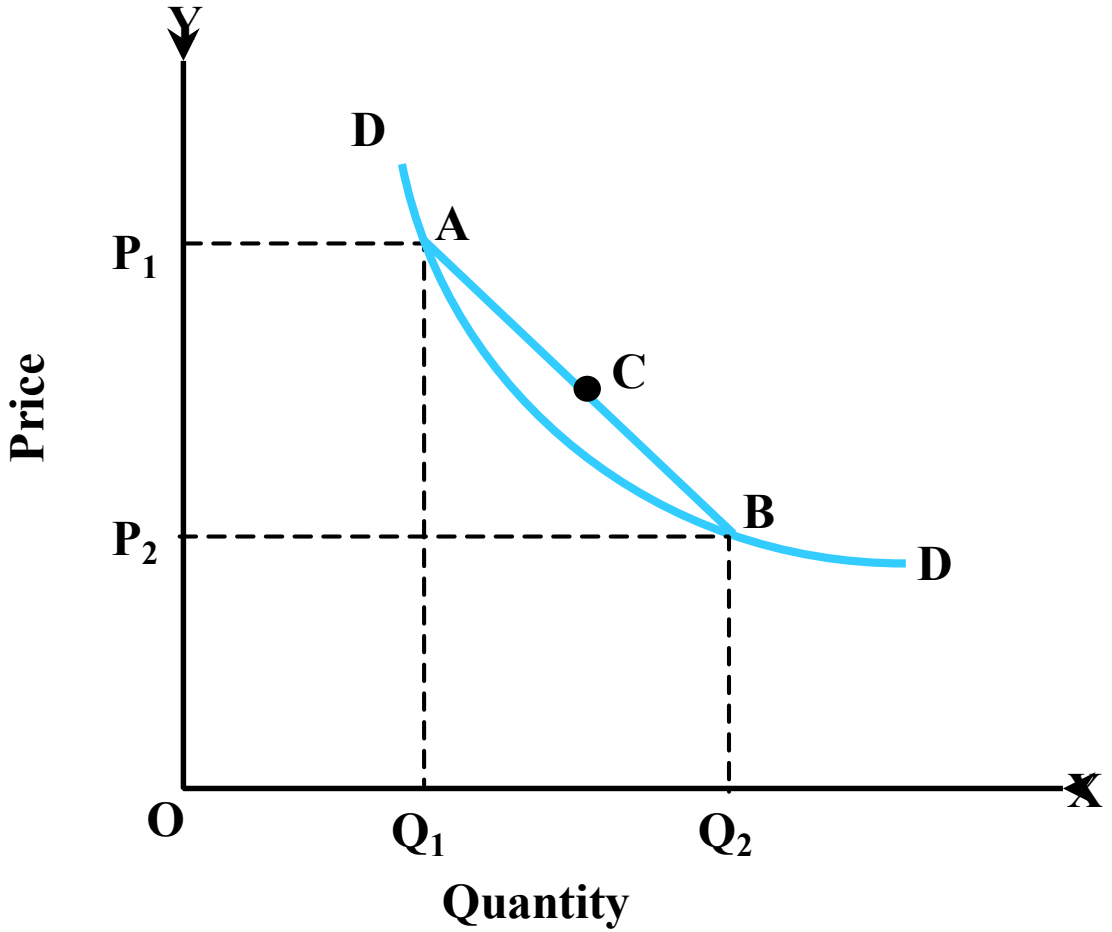
ΔP = Change in price



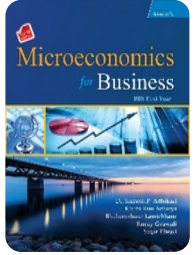
Calculation of Price Elasticity of Demand Contd.

2. Average Method (Arc Method)

The coefficient of price elasticity of demand between two points on a demand curve is called average or arc elasticity of demand. This method is used when there is large change in price and quantity demanded. Any two points on a demand curve make an arc as in figure.



Calculation of Price Elasticity of Demand Contd.



$$E_P = \frac{\left(\frac{\text{Change in quantity demanded}}{\text{Average quantity demanded}}\right)}{\left(\frac{\text{Change in Price}}{\text{Average Price}}\right)}$$

$$= \frac{\frac{DQ}{\frac{Q_1 + Q_2}{2}}}{\frac{DP}{\frac{P_1 + P_2}{2}}} = \frac{DQ}{DP} \times \frac{P_1 + P_2}{Q_1 + Q_2} = \left(\frac{Q_2 - Q_1}{P_2 - P_1}\right) \times \frac{P_1 + P_2}{Q_1 + Q_2}$$

where

Q_1 = Initial quantity demanded

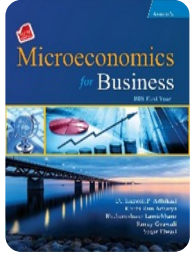
Q_2 = New quantity demanded

DQ = Change in quantity demanded

P_1 = Initial Price

P_2 = New Price

DP = Change in Price



Point Elasticity of Demand

Prof. Marshall developed point method for measuring price elasticity of demand at a point on a demand curve. Point elasticity is the measure of price elasticity at a particular point on a demand curve. In other words, point elasticity is the measure of the percentage change in quantity demanded in response to a very small percentage change in price. It may be symbolically expressed as

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

where

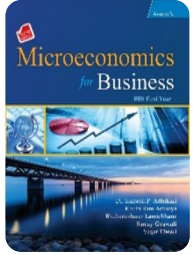
Q = Initial quantity

ΔQ = Change in quantity demanded

P = Initial price

ΔP = Change in price

The method of measuring price elasticity on linear and non-linear demand curve is explained below:

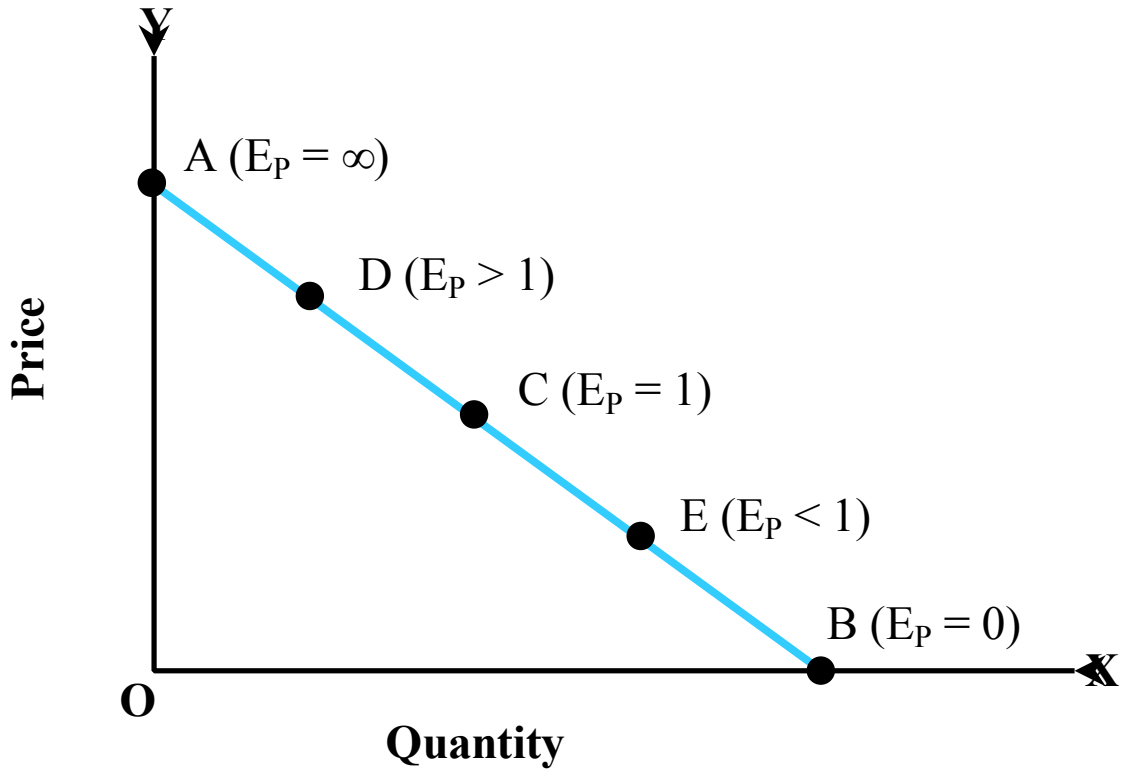


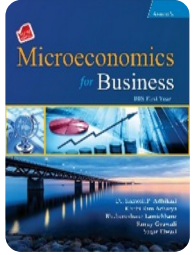
Point Elasticity of Demand Contd.

i. Point Elasticity on a Linear Demand Curve

In Figure, AB represents a linear demand curve. Let us suppose, C is the middle point of the demand curve. Using the formula of point elasticity of demand, we can find out coefficient of price elasticity as follows:

$$E_P = \frac{RB}{RA} = \frac{\text{Lower segment}}{\text{Upper segment}}$$





Point Elasticity of Demand Contd.

$$E_P \text{ at point C} = \frac{\text{Lower segment}}{\text{Upper segment}} = \frac{CB}{AC} = 1 \ (\because AC = CB)$$

It is the case of unity elastic demand.

$$E_P \text{ at point A} = \frac{\text{Lower segment}}{\text{Upper segment}} = \frac{AB}{0} = \infty$$

It is the case of perfectly elastic demand.

$$E_P \text{ at point D} = \frac{\text{Lower segment}}{\text{Upper segment}} = \frac{DB}{AD} > 1 \quad (\because DB > AD)$$

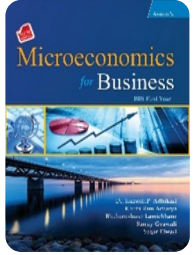
It is the case of relatively elastic demand.

$$E_P \text{ at point E} = \frac{\text{Lower segment}}{\text{Upper segment}} = \frac{EB}{AE} < 1 \quad (\because EB > AE)$$

It is the case of relatively inelastic demand.

$$E_P \text{ at point B} = \frac{\text{Lower segment}}{\text{Upper segment}} = \frac{0}{AB} = 0$$

It is the case of perfectly inelastic demand.

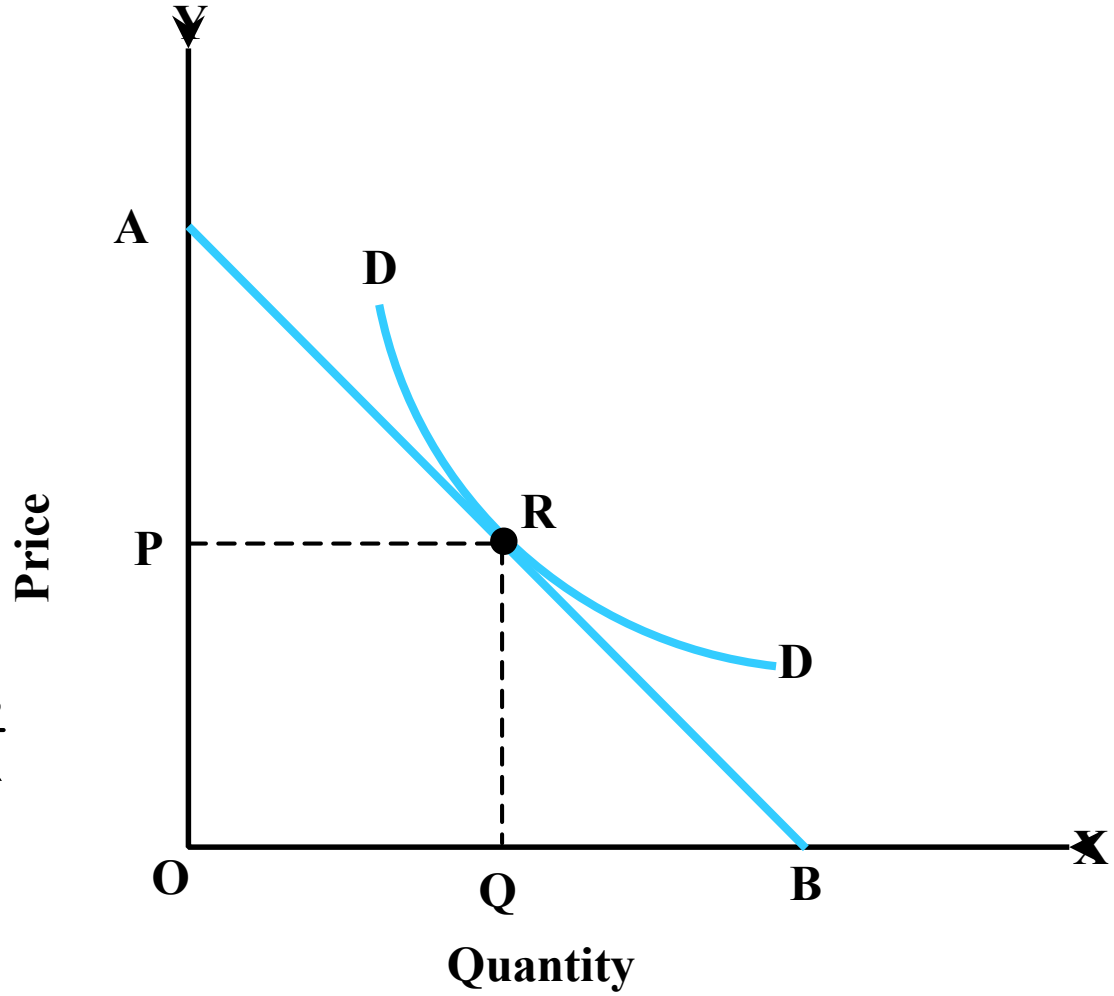


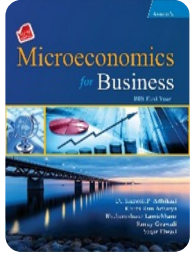
Point Elasticity of Demand Contd.

ii. Point Elasticity on a Non-linear Demand Curve

Point elasticity on a non-liner demand cure is measured by drawing a tangent to the demand curve at the chosen point and measuring the elasticity of the tangent at this point. This gives the elasticity of the demand curve at the chosen point.

$$E_P = \frac{\text{Lower segment of the tangent line}}{\text{Upper segment of the tangent line}} = \frac{RB}{AR}$$





Price Elasticity of Demand and Total Expenditure

Total outlay method is also known as the total expenditure method of measuring price elasticity of demand. Marshall developed this method to measure price elasticity of demand. According to this method, we compare total outlay of a consumer before and after the variations in price. Total outlay is the price multiplied by the quantity of a good purchased.

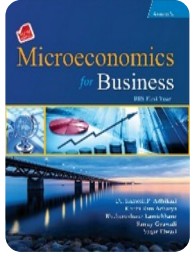
Total outlay (Total Expenditure) = Price × Quantity Purchased

i. **Elasticity greater than unity ($E_P > 1$):** When total expenditure increases with the fall in price and decreases with the rise in price, the demand is said to be elastic demand.

ii. **Elasticity less than unity ($E_P < 1$):** If with the fall in price, the total expenditure decreases and with the rise in price, the total expenditure increases, demand is said to be less than unity.

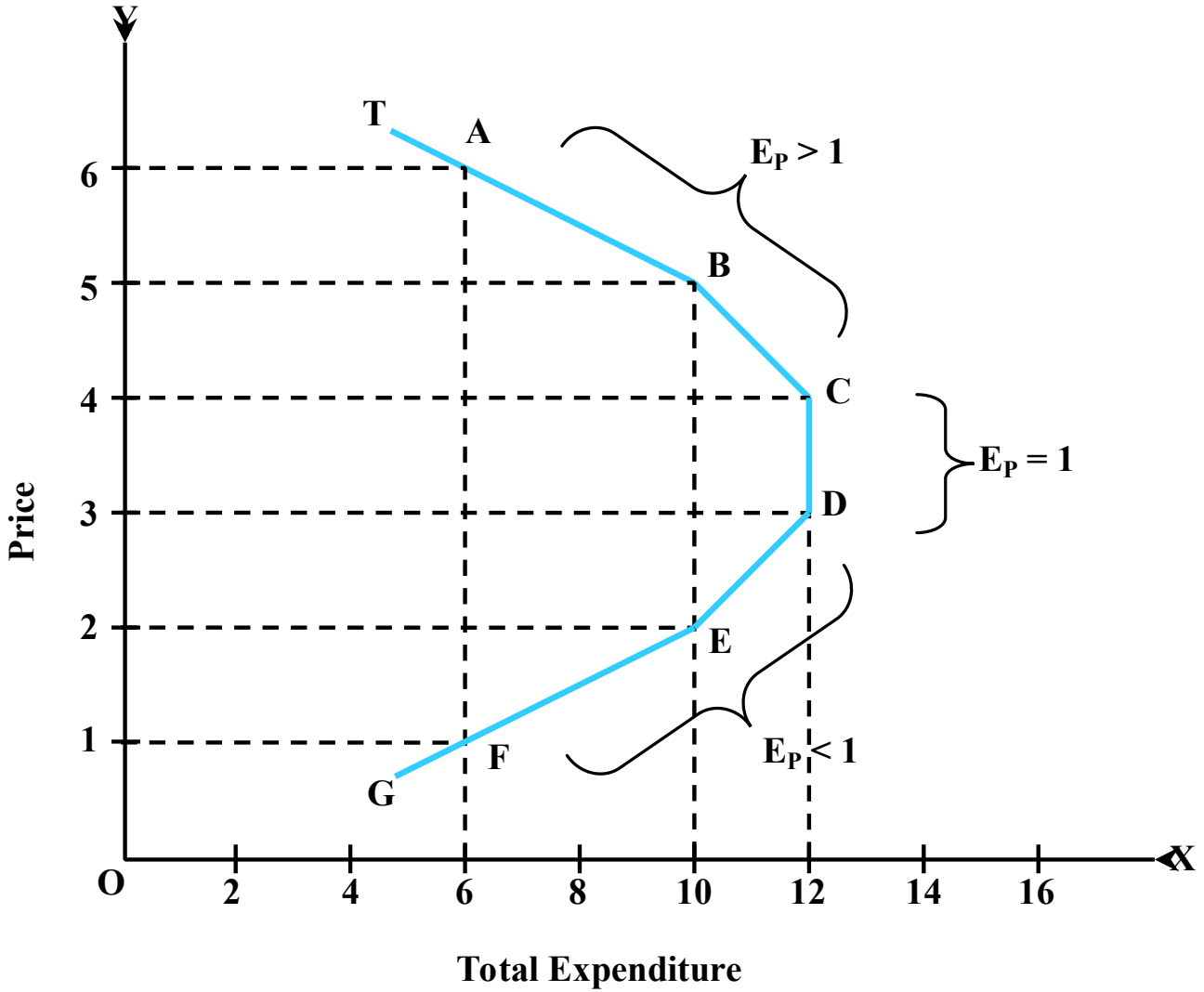
iii. **Elasticity equal to unity ($E_P = 1$):** When the total expenditure remains unchanged with a fall or rise in price, the price elasticity of demand is said to be equal to unity.

Price Elasticity of Demand and Total Expenditure Contd.

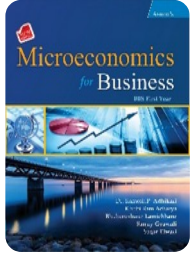


Situation	Price (P) (in Rs.)	Quantity (Q) (in unit)	Total Expenditure $TE = P \cdot Q$	EP
I	6	1	6	EP > 1
	5	2	10	
II	4	3	12	EP = 1
	3	4	12	
III	2	5	10	EP < 1

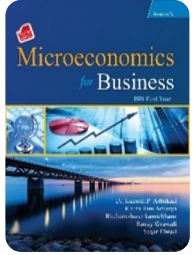
Price Elasticity of Demand and Total Expenditure Contd.



Uses or Importance of Price Elasticity of Demand



1. Monopoly price determination
2. Price determination under discriminating monopoly
3. Price determination of public utilities
4. Price determination of joint products
5. Wage determination
6. International trade
7. Importance to finance minister



Income Elasticity of Demand (E_Y)

Income elasticity of demand is defined as the degree of responsiveness of demand for a commodity to the change in the income of the consumer. In other words, income elasticity of demand is the ratio of the percentage change in demand for a commodity to the percentage change in income.

$$E_Y = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

$$= \frac{\dfrac{\text{Change in quantity demanded}}{\text{Initial quantity demanded}} \times 100}{\dfrac{\text{Change in income}}{\text{Initial income}} \times 100} = \frac{\dfrac{\Delta Q}{Q} \times 100}{\dfrac{\Delta Y}{Y} \times 100} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

where

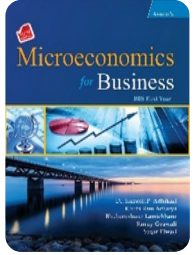
E_Y = Coefficient of income elasticity of demand

Q = Initial quantity demanded

ΔQ = Change in quantity demanded

Y = Initial income

ΔY = Change in income



Types (Degrees) of Income Elasticity of Demand

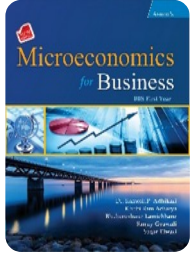
1. Positive Income Elasticity of Demand ($E_Y > 0$)

If increase in income leads to increase in demand for a commodity and decrease in income leads to decrease in demand for a commodity, it is called positive income elasticity of demand. The commodity, which has positive income elasticity is called normal good. Positive income elasticity can be divided into three types:

a. Income elasticity greater than unity ($E_Y > 1$)

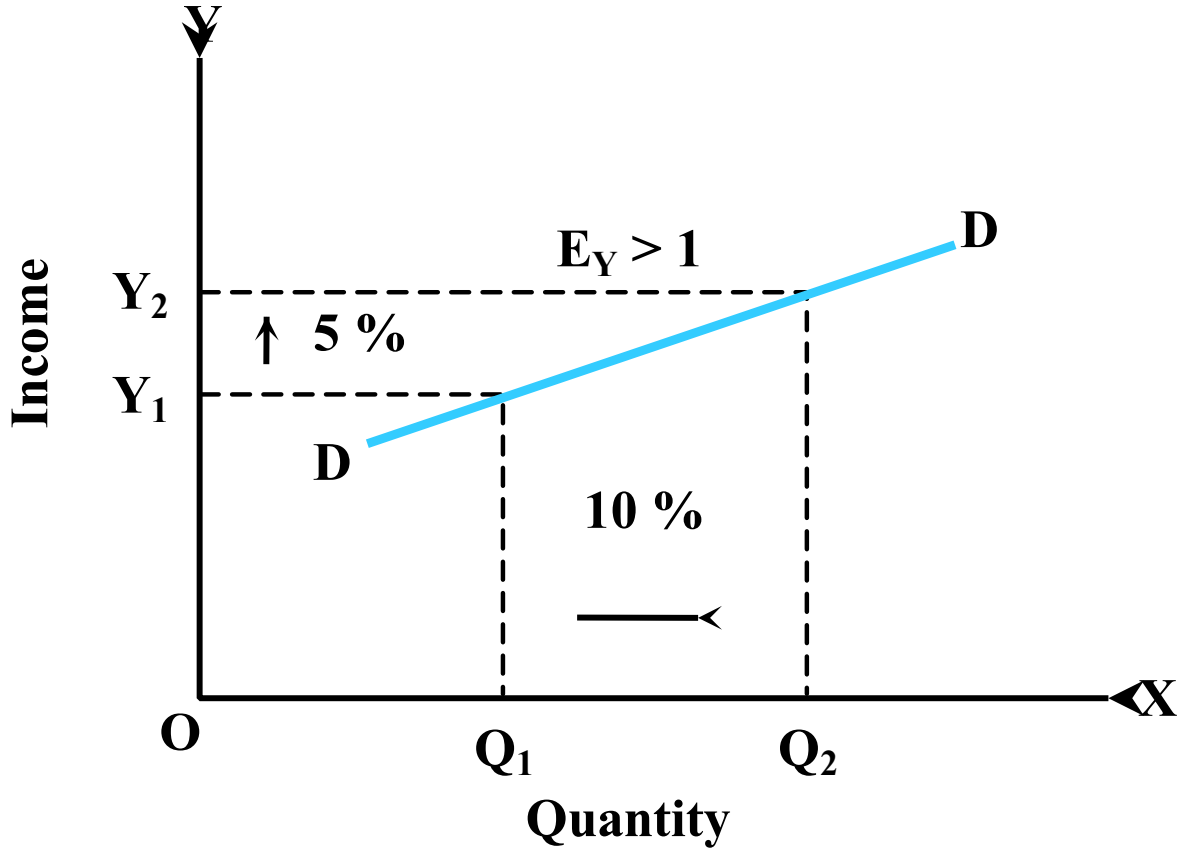
b. Income elasticity less than unity ($E_Y < 1$)

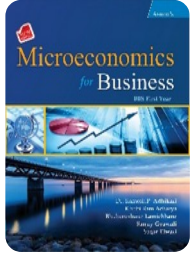
c. Income elasticity equal to unity ($E_Y = 1$)



Types (Degrees) of Income Elasticity of Demand Contd.

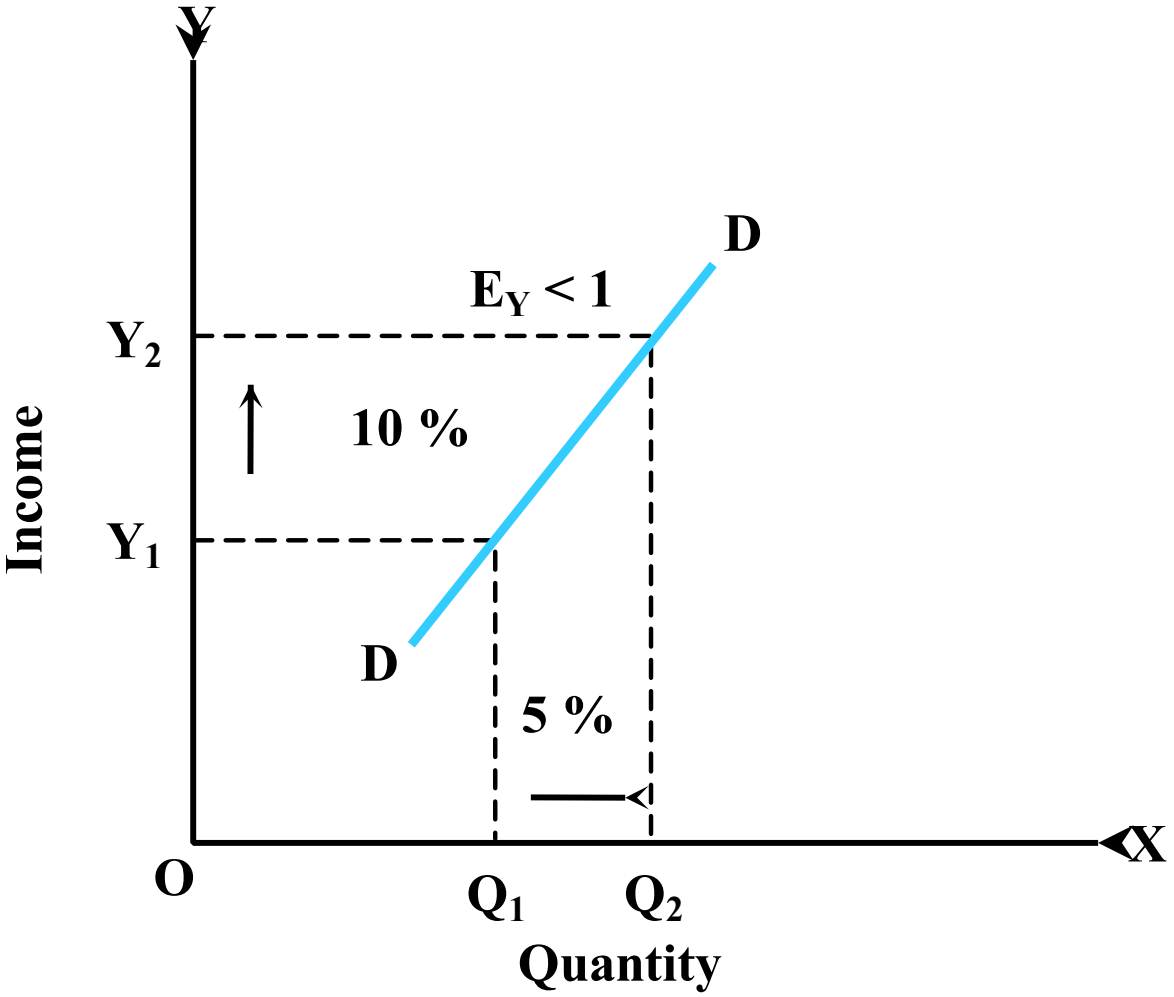
a. **Income elasticity greater than unity ($E_Y > 1$):** The income elasticity of demand is greater than unity when the demand for a commodity increases more than percentage to rise in income. In case of luxury goods, income elasticity of demand is more than unity.

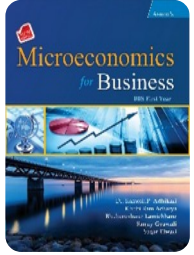




Types (Degrees) of Income Elasticity of Demand Contd.

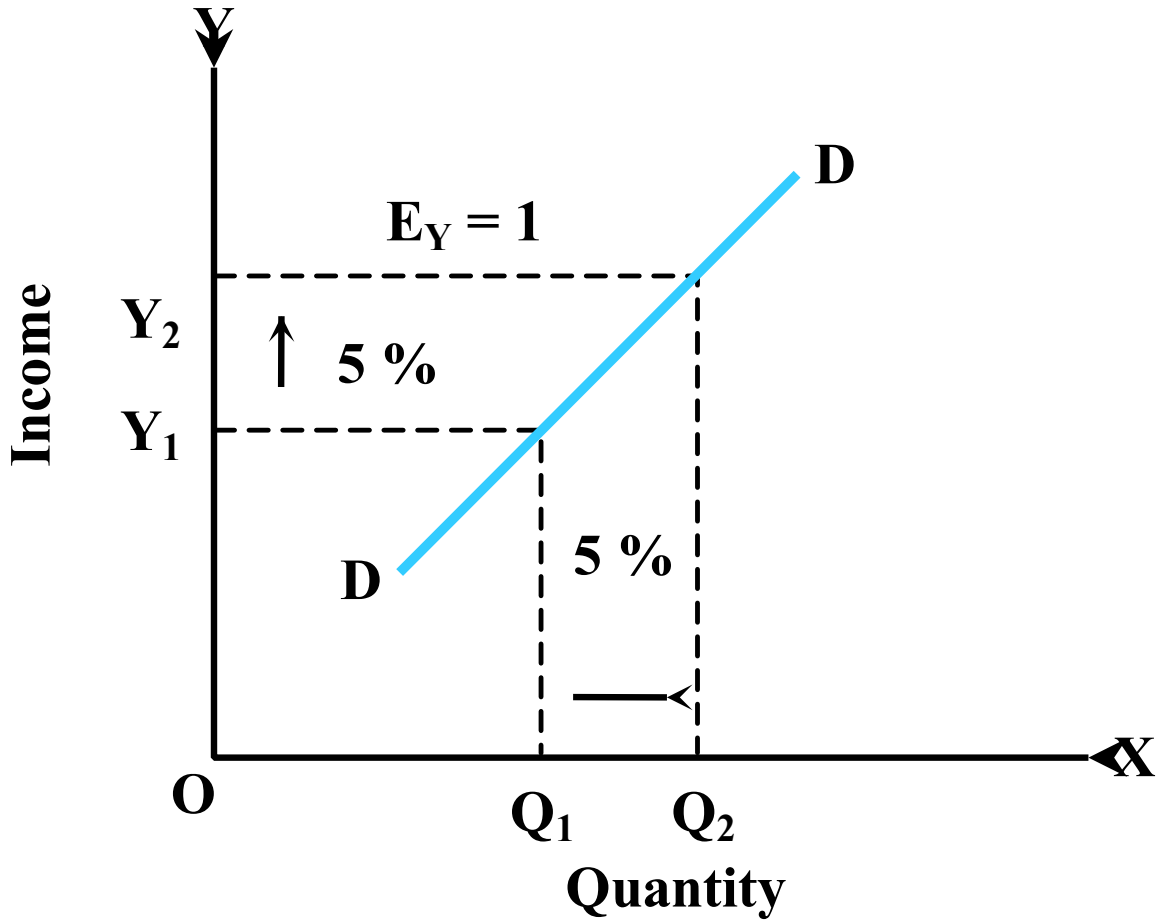
b. Income elasticity less than unity ($E_Y < 1$): Income elasticity of demand is less than unity when the demand for a commodity increases less than percentage to the rise in income. In case of normal necessities, income elasticity of demand is less than unity.

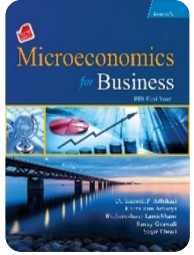




Types (Degrees) of Income Elasticity of Demand Contd.

c. **Income elasticity equal to unity ($E_Y = 1$):** Income elasticity is unity when the demand for a commodity increases in the same proportion as the rise in income. In case of comfortable goods, income elasticity of demand is equal to unity.

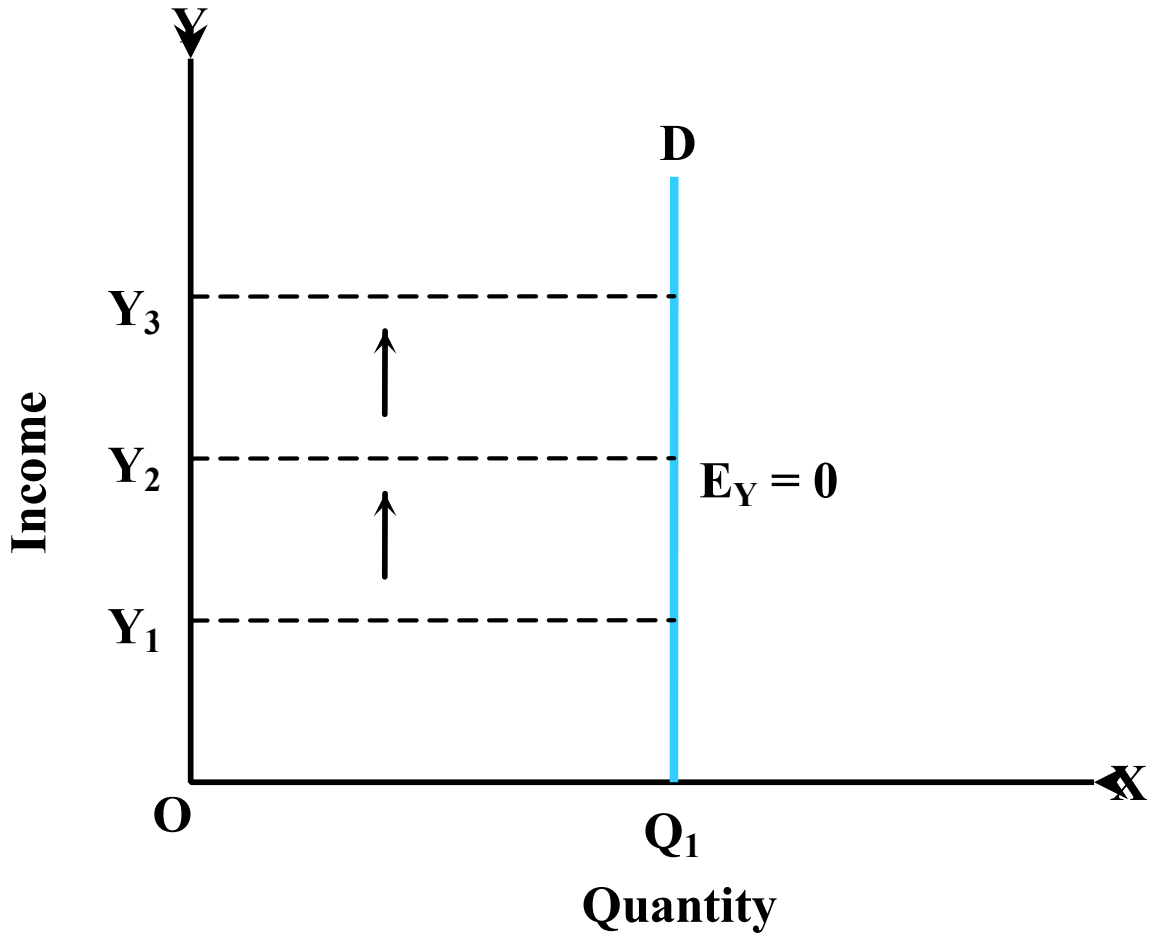


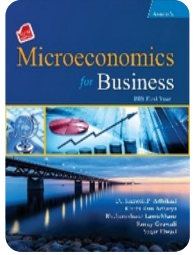


Types (Degrees) of Income Elasticity of Demand Contd.

2. Zero Income Elasticity of Demand ($E_Y = 0$)

If quantity demanded remains unchanged despite change in income and vice-versa, the income elasticity is said to be zero. In case of neutral goods like salt, income elasticity of demand is zero.

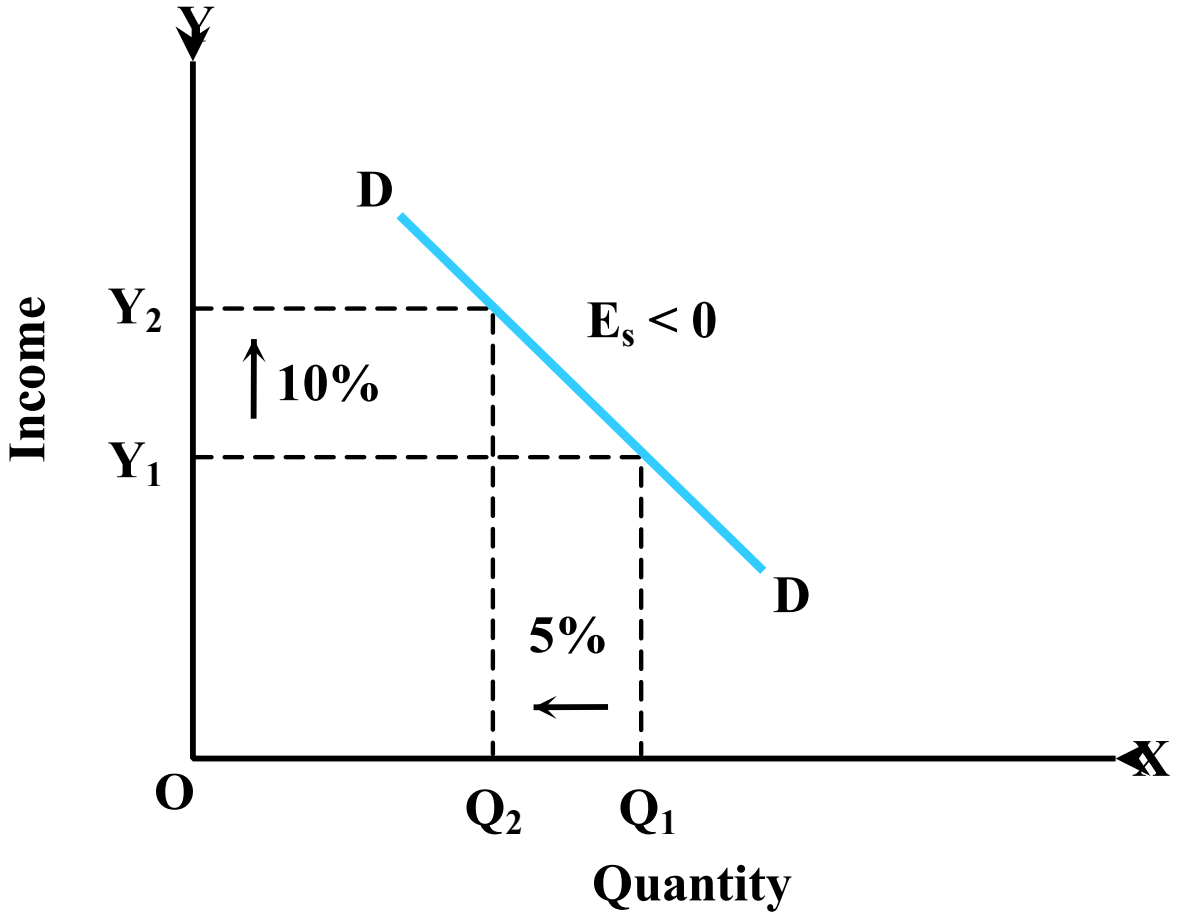


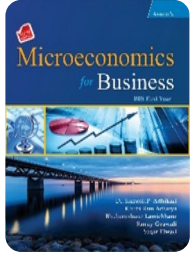


Types (Degrees) of Income Elasticity of Demand Contd.

3. Negative Income Elasticity of Demand ($E_Y < 0$)

In the case of inferior goods, the income elasticity of demand is negative. When the consumer reduces his demand with the rise in income and vice versa, the income elasticity of demand is said to be negative. It is found in case of inferior or low quality goods.





Calculation of Income Elasticity of Demand

1. Percentage/ Proportionate Method

According to the percentage method, income elasticity of demand is measured dividing percentage change in demand by percentage change in income.

$$E_Y = \frac{\text{Percentage change in demand}}{\text{Percentage change in income}} = \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta Y}{Y} \times 100} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

where

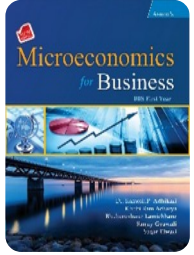
E_Y = Income elasticity

Q = Initial quantity

ΔQ = Change in quantity

Y = Initial income

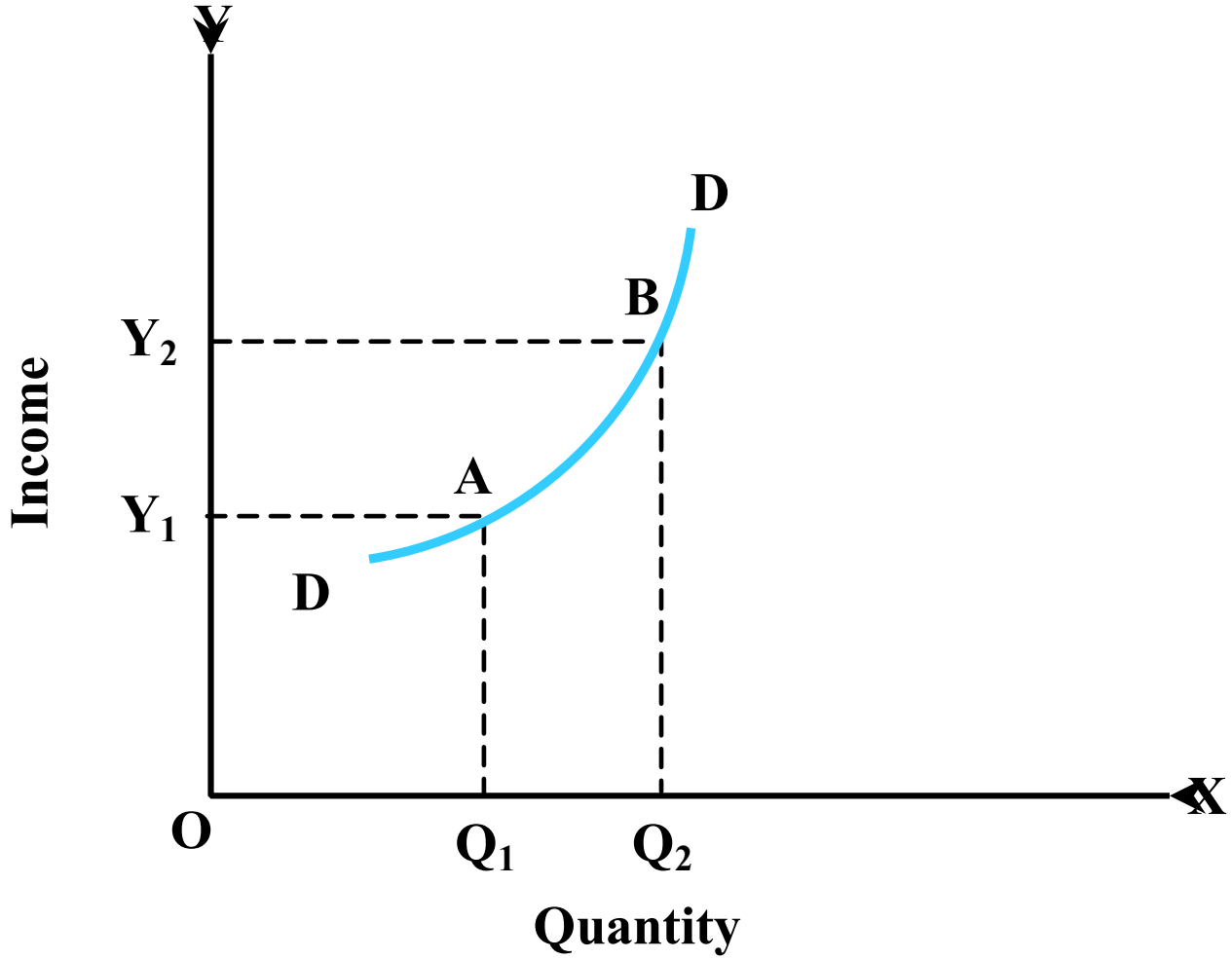
ΔY = Change in income

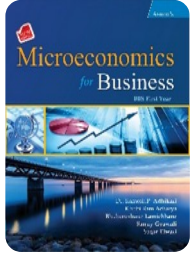


Calculation of Income Elasticity of Demand Contd.

2. Average/ Arc Method

The coefficient of income elasticity of demand between two points on an income demand curve is called average or arc elasticity of income demand. This method is used when there is big change in income and demand.





Calculation of Income Elasticity of Demand Contd.

Average or arc elasticity between point A and B income demand curve DD (E_Y),

$$E_Y = \frac{\left(\frac{\text{Change in demand}}{\text{Average demand}}\right)}{\left(\frac{\text{Change in Income}}{\text{Average Income}}\right)} = \frac{\frac{\Delta Q}{\frac{Q_1 + Q_2}{2}}}{\frac{\Delta Y}{\frac{Y_1 + Y_2}{2}}}$$

$$= \frac{\Delta Q}{\Delta Y} \times \left(\frac{Y_1 + Y_2}{Q_1 + Q_2}\right) \qquad = \left(\frac{Q_2 - Q_1}{Y_2 - Y_1}\right)\left(\frac{Y_1 + Y_2}{Q_1 + Q_2}\right)$$

where

E_Y = Coefficient of income elasticity of demand

Q_1 = Initial demand

Q_2 = New demand

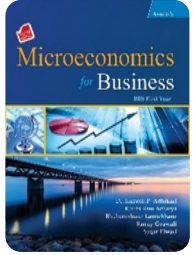
ΔQ = Change in demand

Y_1 = Initial income of the consumer

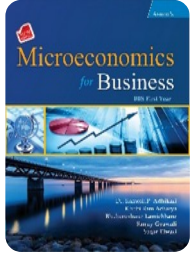
Y_2 = New income of the consumer

ΔY = Change in income

Uses or Importance of Income Elasticity of Demand



1. Useful to know about stage of trade cycle
2. Useful for forecasting demand
3. Useful for classification of normal and inferior goods
4. Useful for making marketing strategy



Cross Elasticity of Demand (E_{XY})

The cross elasticity of demand is defined as the percentage change in the quantity demanded of good-X resulting from a percentage change in the price of Y. In other words, the ratio of percentage change in the quantity demanded of good–X to a given percentage changes in the price of good-Y.

$$E_{XY} = \frac{\text{Percentage change in demand for good–X}}{\text{Percentage change in price of good–Y}}$$

$$= \frac{\dfrac{\text{Change in demand for good–X}}{\text{Initaial demand for good–X}} \times 100}{\dfrac{\text{Change in price of good–Y}}{\text{Initial price of good–Y}} \times 100} = \frac{\dfrac{\Delta Q_X}{Q_X} \times 100}{\dfrac{\Delta P_Y}{P_Y} \times 100} = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_Y}{Q_X}$$

where

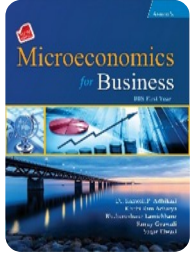
E_{XY} = Coefficient of cross elasticity of demand

Q_X = Quantity of good-X

ΔQ_X = Change in the demand for good-X

P_Y = Price of good-Y,

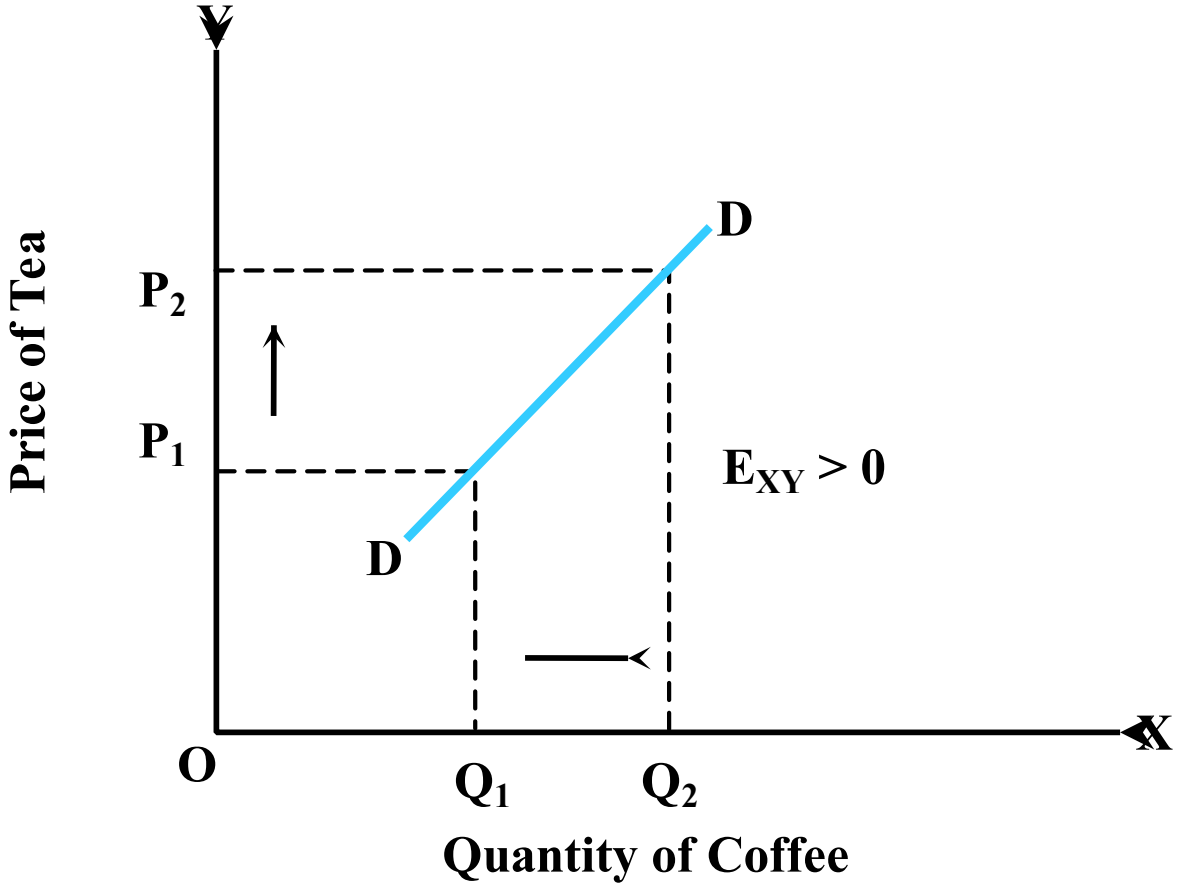
ΔP_Y = Change in the price of good-Y



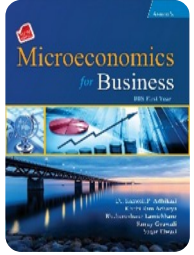
Types (Degrees) of Cross Elasticity of Demand

1. Positive Cross Elasticity of Demand ($E_{XY} > 0$)

When the quantity demand of a commodity and price of related commodity change into same direction, the cross elasticity of demand is positive. In the case of substitute goods, the cross elasticity of demand is positive

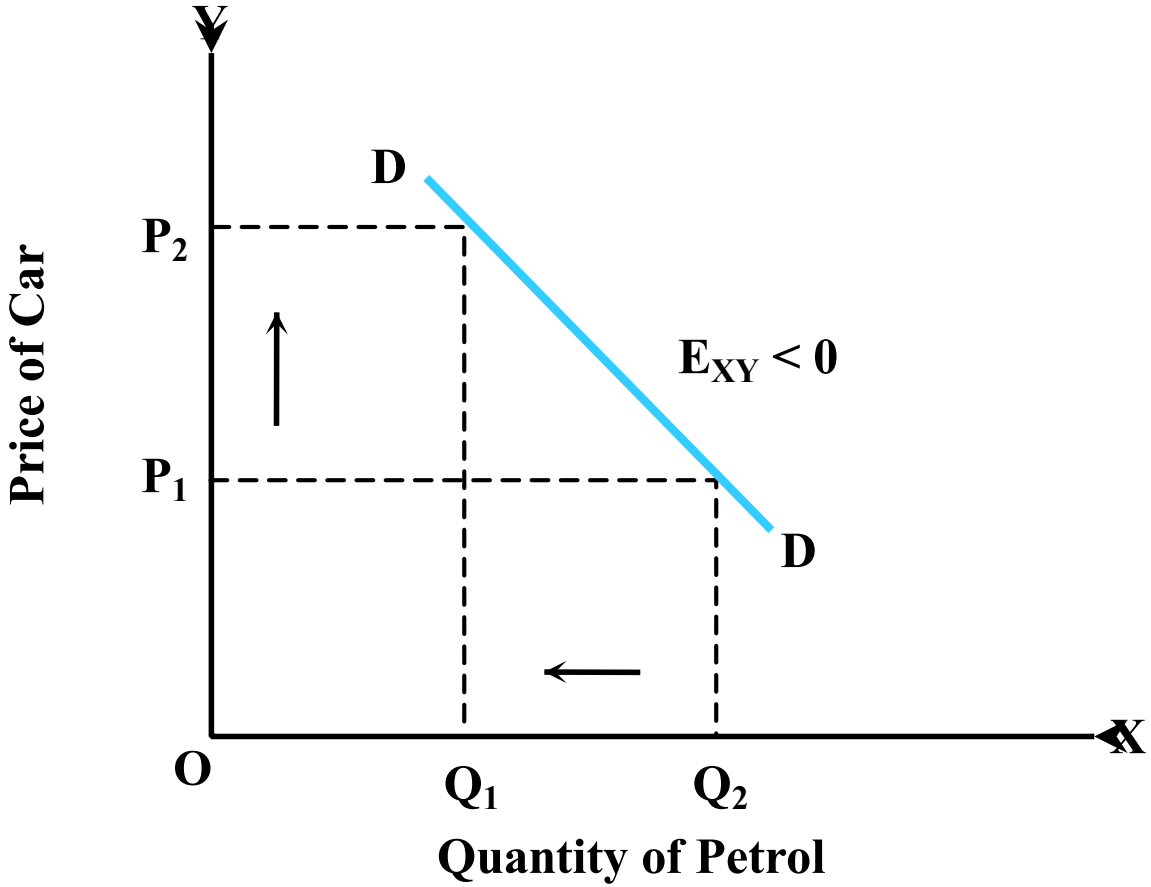


Types (Degrees) of Cross Elasticity of Demand Contd.

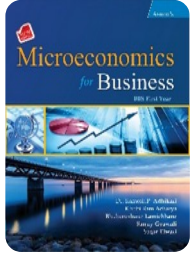


2. Negative Cross Elasticity of Demand ($E_{XY} < 0$)

When demand for a commodity and price of related commodity change into opposite direction, the cross elasticity of demand is negative. In the case of complementary goods, cross elasticity of demand is negative.

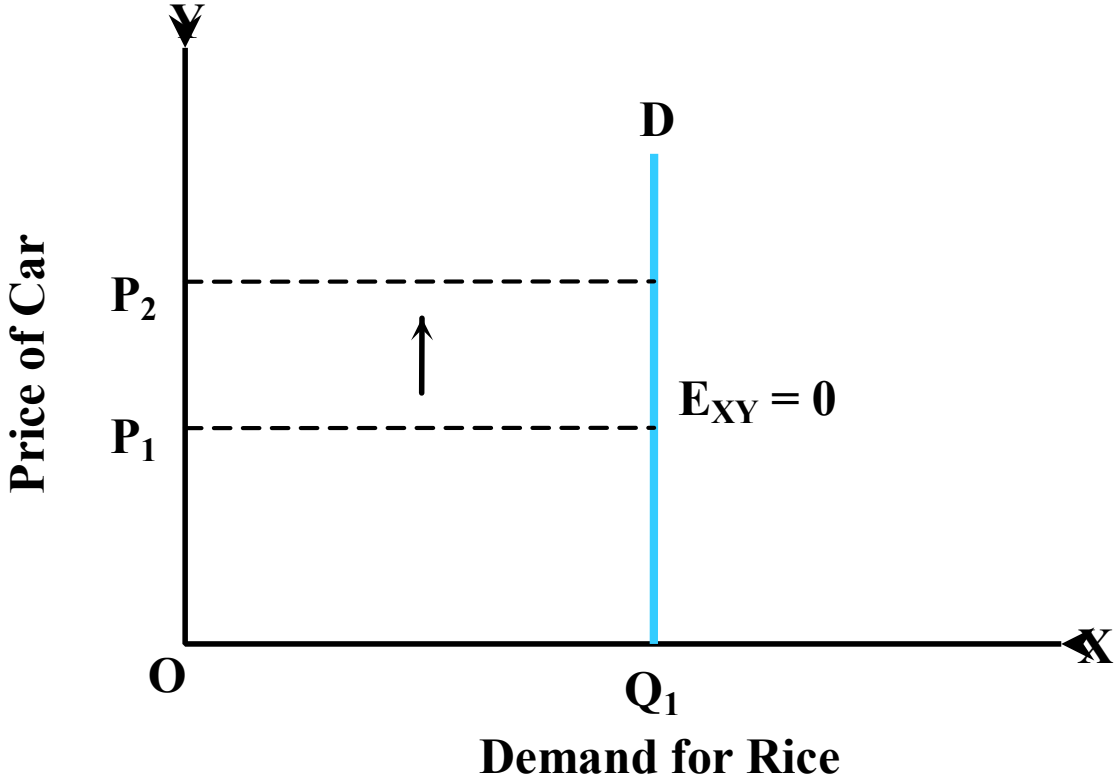


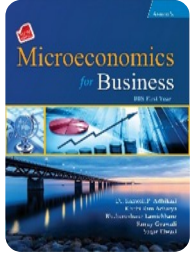
Types (Degrees) of Cross Elasticity of Demand Contd.



3. Zero Cross Elasticity of Demand ($E_{XY} = 0$)

When the change in price of one good has no effect on the demand for another good, the cross elasticity of demand is zero.





Calculation of Cross Elasticity of Demand

1. Percentage/ Proportionate Method

According to percentage method, cross elasticity of demand is measured dividing percentage change in demand for a good –X divided by percentage change in price of good-Y. Let us suppose, two related goods X and Y.

$$E_{XY} = \frac{\text{Percentage change in demand for good X}}{\text{Percentage change in price of good Y}}$$

$$= \frac{\frac{\Delta Q_X}{Q_X} \times 100}{\frac{\Delta P_Y}{P_Y} \times 100} = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_Y}{Q_X}$$

where

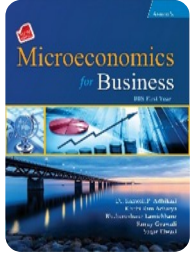
E_Y = Cross elasticity of demand between good –X and good Y

Q_X = Initial quantity of good X

P_Y = Initial price of good Y

ΔQ_X = change in demand for good X

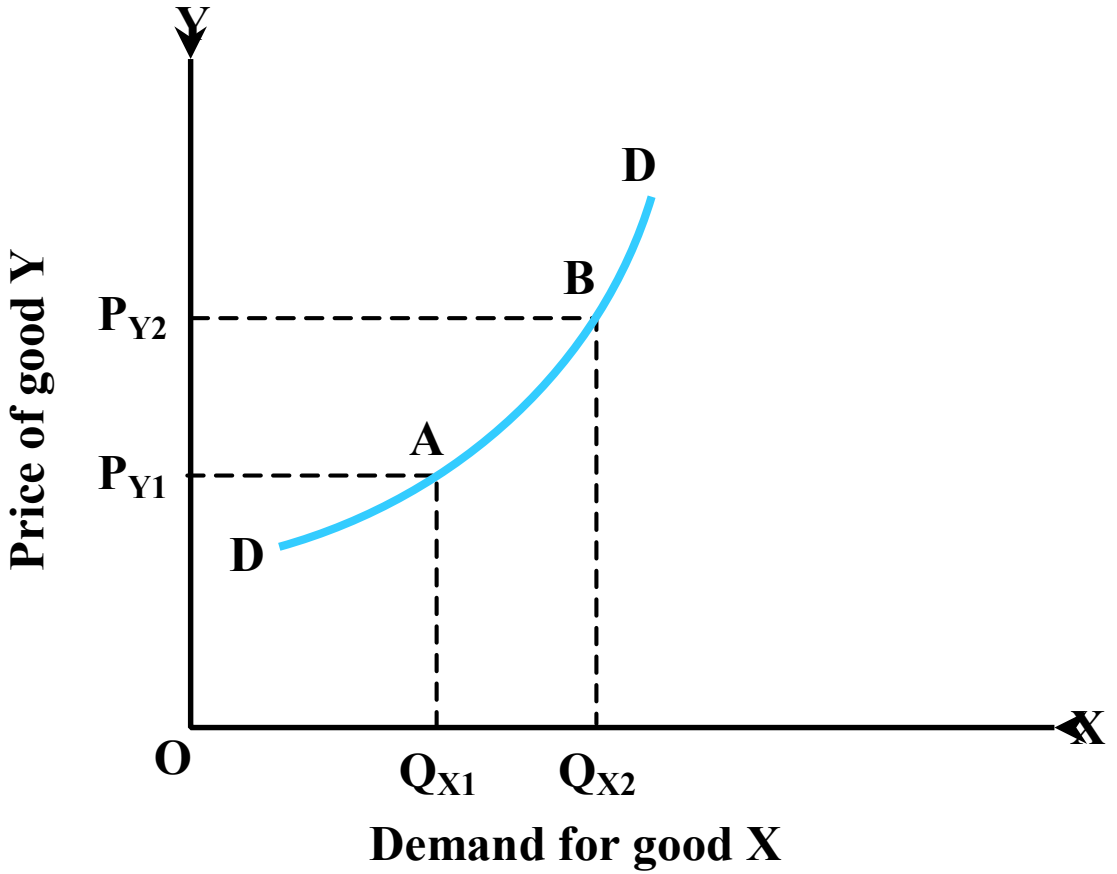
ΔP_Y = Change in price of good Y

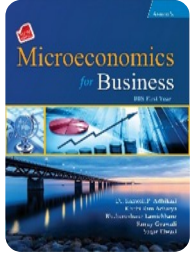


Calculation of Cross Elasticity of Demand Contd.

2. Average/ Arc Method

The coefficient of cross elasticity of demand between two points on a cross demand curve is called arc elasticity of demand. This method is used to measure the cross elasticity of demand when there is greater change in price and quantity demanded.





Calculation of Cross Elasticity of Demand Contd.

In **Figure**, DD represents cross demand curve of substitute goods X and Y. The cross elasticity between two points A and B is measured by using following formula:

$$E_{XY} = \frac{\left(\frac{\text{Change in demand for good X}}{\text{Average demand for good X}}\right)}{\left(\frac{\text{Change in Price of good Y}}{\text{Average Price of good Y}}\right)}$$

$$= \frac{\frac{\Delta Q}{\frac{Q_{X1} + Q_{X2}}{2}}}{\frac{\Delta P_Y}{\frac{P_{Y1} + P_{Y2}}{2}}} = \frac{\Delta Q_X}{\Delta P_Y} \times \left(\frac{P_{Y1} + P_{Y2}}{Q_{X1} + Q_{X2}}\right) = \left(\frac{Q_{X2} - Q_{X1}}{P_{Y2} - P_{Y1}}\right) \times \left(\frac{P_{Y1} + P_{Y2}}{Q_{X1} + Q_{X2}}\right)$$

where

E_{XY} = Coefficient of cross elasticity of demand

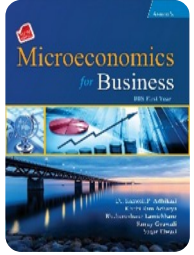
Q_{X1} = Initial demand for good X

Q_{X2} = New demand for good X

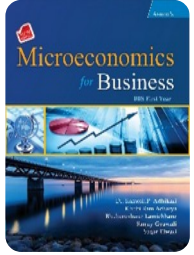
P_{Y1} = Initial price of good Y

P_{Y2} = New price of good Y

Uses or Importance of Cross Elasticity of Demand



1. Classification of goods
2. Classification of market
3. Pricing policy
4. Determination of boundaries between industries



Advertising Elasticity of Demand (E_A)

The ratio of percentage change in quantity demanded and percentage change in advertisement expenditure is called advertising elasticity of demand. In other words, it is responsiveness of change in demand to the change in advertisement expenditure.

$$E_A = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in advertisement expenditure}}$$

$$= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta A}{A} \times 100} = \frac{\Delta Q}{\Delta A} \times \frac{A}{Q}$$

where

E_A = Coefficient of advertisement elasticity of demand

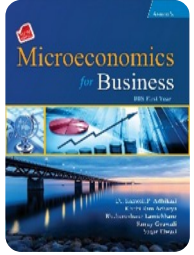
Q = Initial demand

ΔQ = Change in quantity demanded

A = Advertisement expenditure

ΔA = Change in advertisement expenditure

Advertising Elasticity of Demand (E_A) Contd.



The arc or average advertising elasticity of demand between any two advertising expenditure is as

$$E_A = \frac{\Delta Q}{\Delta A} \times \frac{A_1 + A_2}{Q_1 + Q_2} = \frac{Q_2 - Q_1}{A_2 - A_1} \times \frac{A_1 + A_2}{Q_1 + Q_2}$$

where

Q_1 = Initial demand

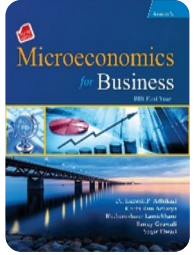
Q_2 = New demand

A_1 = Initial advertisement expenditure

A_2 = New advertisement expenditure

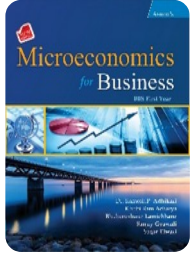
Since, there is always positive relationship between quantity demanded and advertisement expenditure, the coefficient of advertising elasticity of demand is positive

Types (Degrees) of Advertisement Elasticity of Demand



There are three types of advertisement elasticity of demand which are as follows:

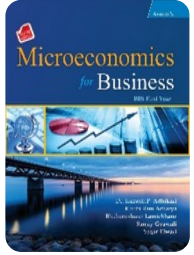
1. **Advertisement elasticity of demand equal to 1 ($E_A = 1$):** If percentage change in demand is equal to percentage change in advertisement expenditure, it is called advertisement elasticity of demand equal to 1.
2. **Advertisement elasticity of demand more than 1 ($E_A > 1$):** If percent change in demand is more than percentage change in advertisement expenditure, it is called advertisement elasticity more than 1.
3. **Advertisement elasticity of demand less than 1 ($E_A < 1$):** If percentage change in quantity demanded is less than the percentage change in advertisement expenditure, it is called advertisement elasticity of demand less than 1.



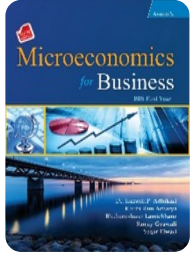
Uses or Importance of Advertising Elasticity of Demand in Decision Making

- An important advantage of the study of advertising elasticity of demand is that it helps the management in deciding whether the expenditure on advertisement should be increased or decreased or maintained at present level
- Study of this concept helps the management to know the effect of advertisement on the sales revenue. If the management finds saturation point has been arrived, expenditure on advertising should be stopped.
- Study of this concept helps in evaluating the effectiveness of various media of advertisement.

Determinants of Elasticity of Demand



1. Nature of the commodity
2. Substitute
3. Goods having several uses
4. Joint demand
5. Income of the consumer
6. Postpone of the consumption
7. Habits
8. Price level
9. Time factor



Price Elasticity of Supply

The price elasticity of supply is defined as the responsiveness of quantity supplied of a commodity to the change in its price. The price elasticity of supply is also defined as the ratio between percentage change in quantity supplied and percentage change in price of a commodity.

$$E_s = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

$$= \frac{\dfrac{\text{Change in quantity supplied}}{\text{Initial quantity supplied}} \times 100}{\dfrac{\text{Change in price}}{\text{Initial price}} \times 100} = \frac{\dfrac{\Delta Q}{Q} \times 100}{\dfrac{\Delta P}{P} \times 100} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where

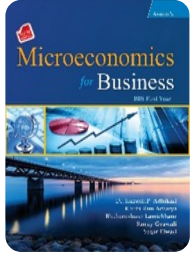
E_s = Coefficient of price elasticity of supply

Q = Initial quantity supplied

P = Initial price

ΔQ = Change in quantity supplied

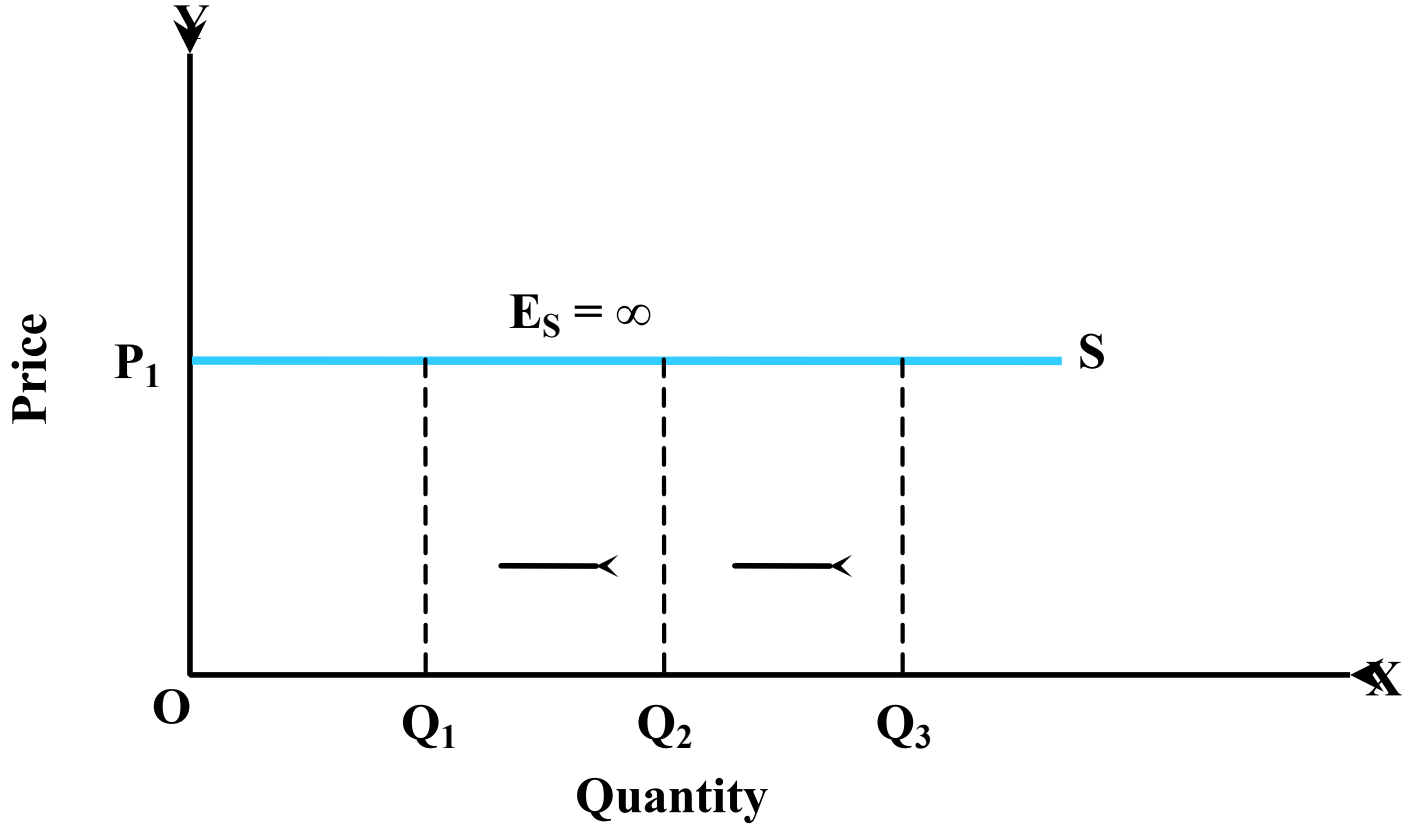
ΔP = Change in price

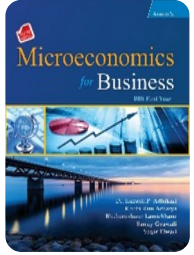


Types (Degrees) Price of Elasticity of Supply

1. Perfectly Elastic Supply ($E_s = \infty$)

Supply is said to be perfectly elastic supply if negligible change in price leads to infinite change in the quantity supplied. Visibly, no change in price causes infinite change in supply..

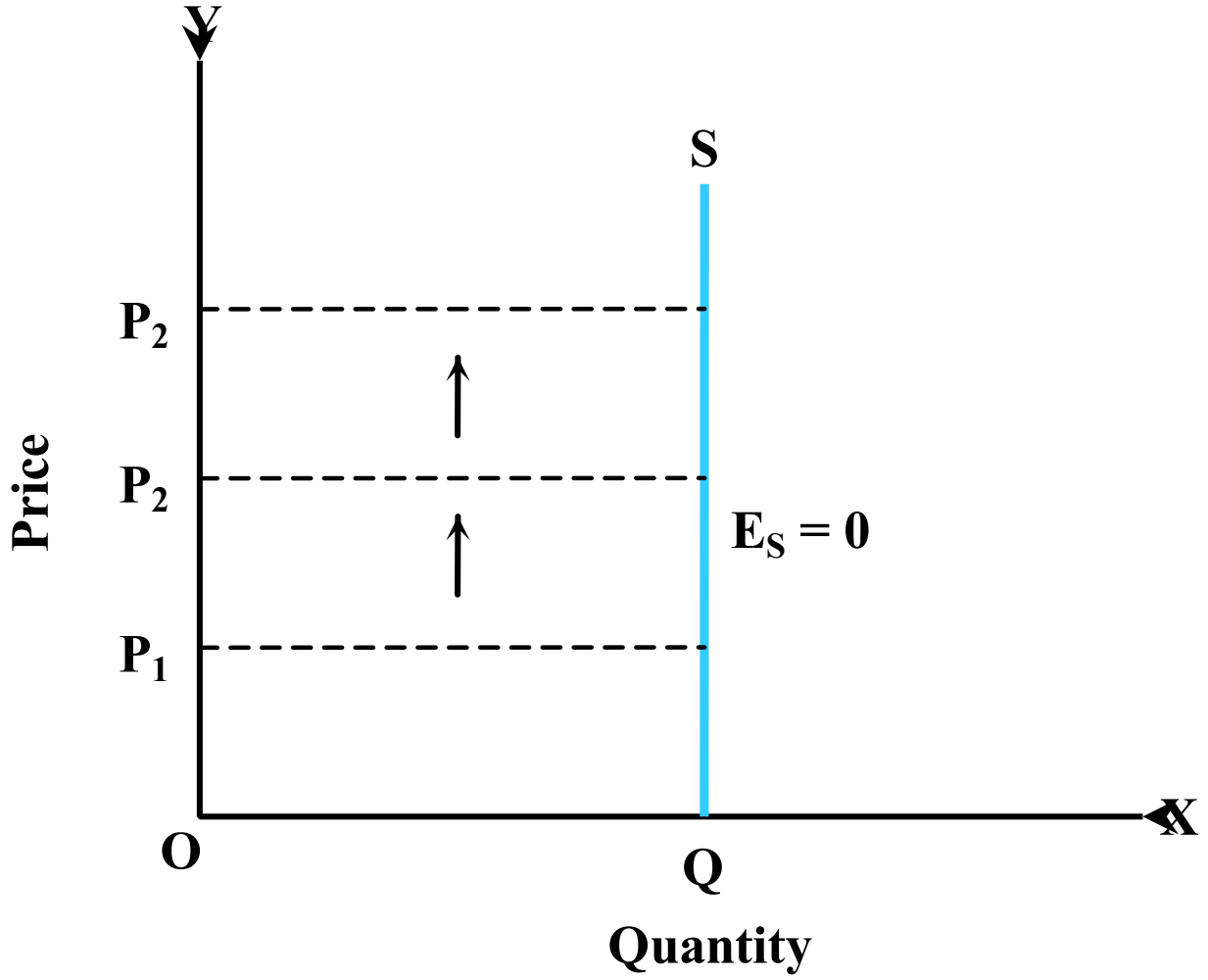


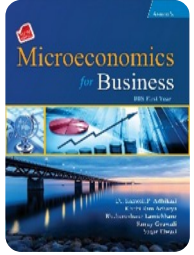


Types (Degrees) Price of Elasticity of Supply Contd.

2. Perfectly Inelastic Supply ($E_s = 0$)

When the supply of a commodity does not change despite the change price, the supply is said to perfectly inelastic supply.

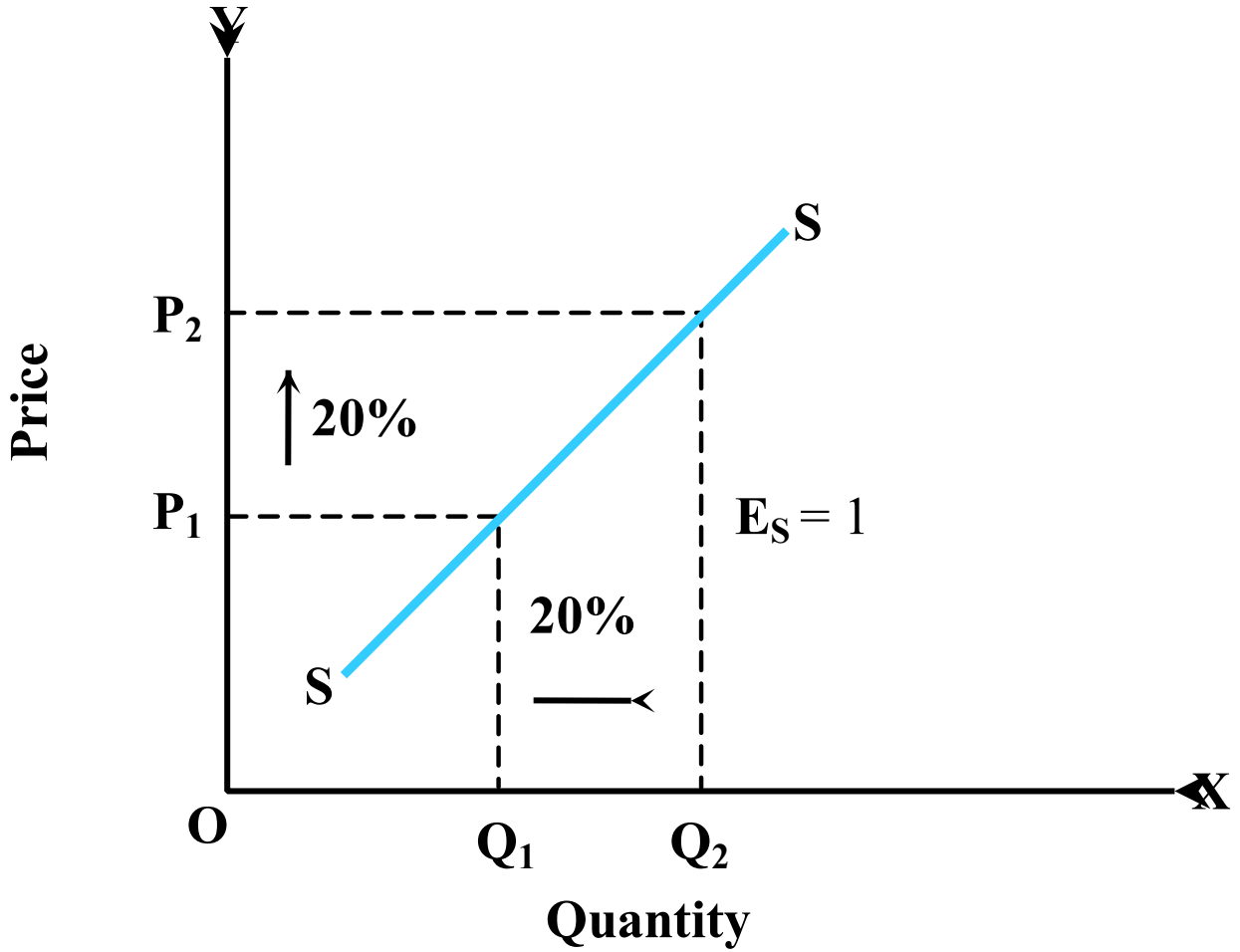


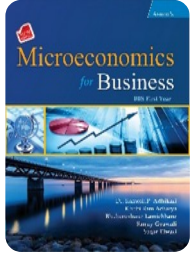


Types (Degrees) Price of Elasticity of Supply Contd.

3. Unitary Elastic Supply ($E_S = 1$)

When the percentage change in the quantity supplied is equal to the percentage change in price, the supply of a commodity is said to be unitary elastic.

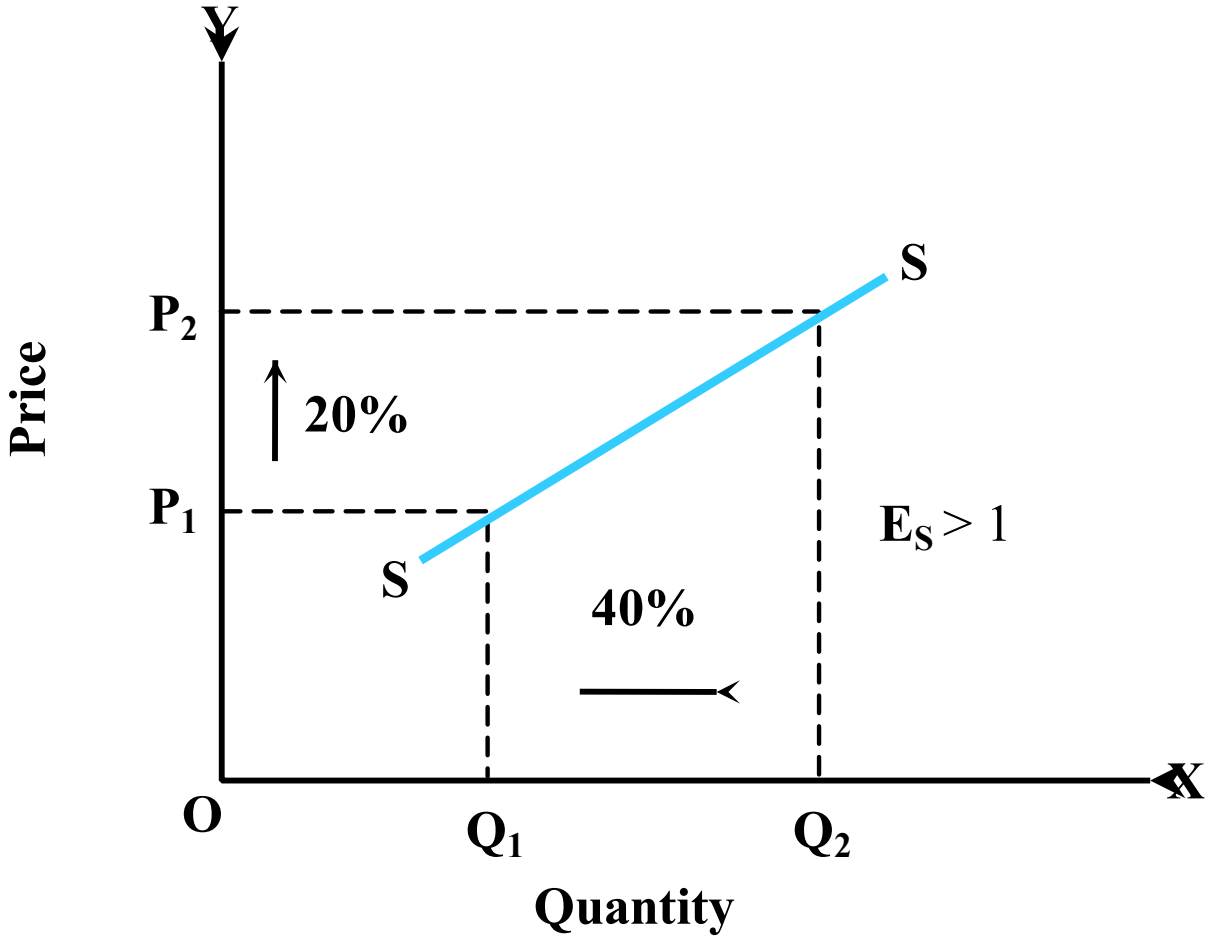


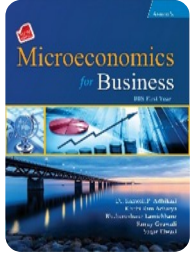


Types (Degrees) Price of Elasticity of Supply Contd.

4. Relatively Elastic Supply ($E_s > 1$)

When the percentage change in the quantity supplied of a commodity is more than the percentage change in price, it is called relatively elastic supply..

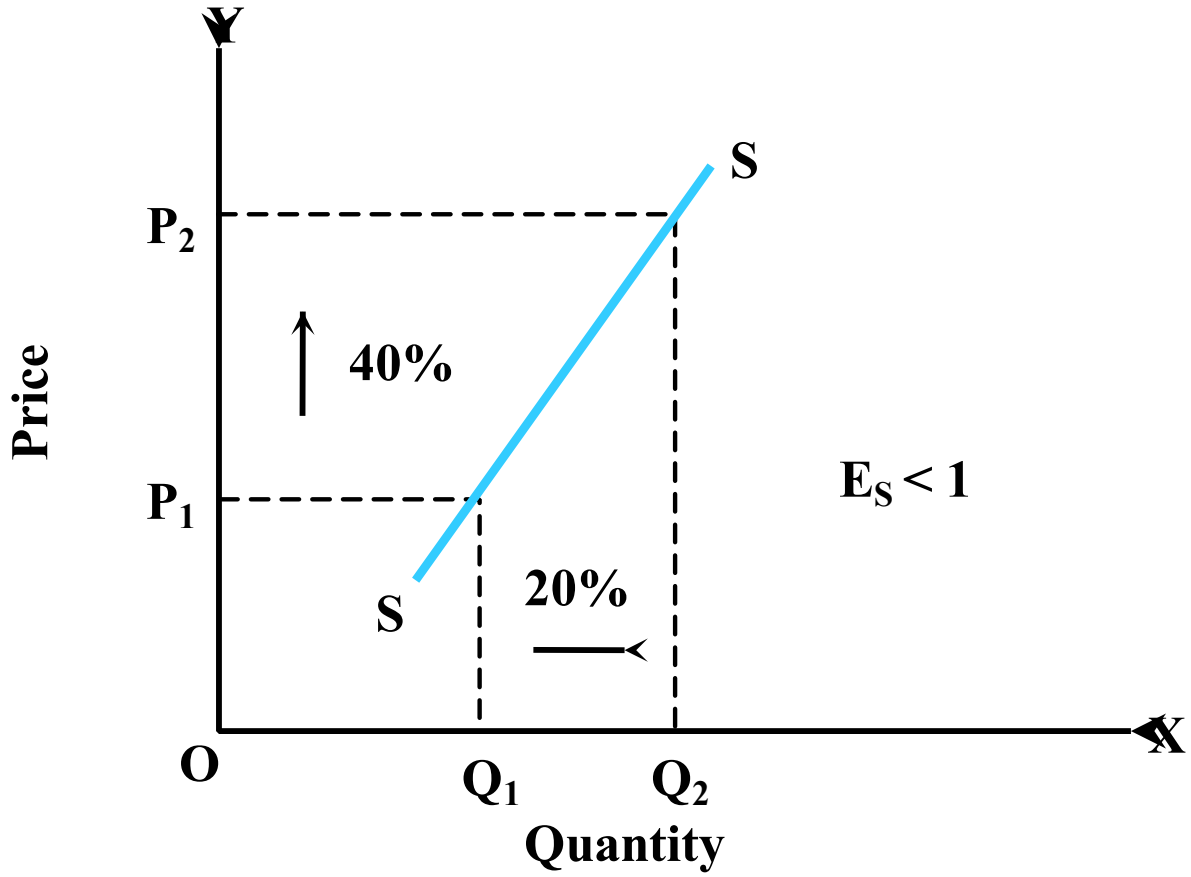


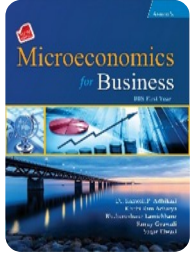


Types (Degrees) Price of Elasticity of Supply Contd.

5. Relatively Inelastic Supply ($E_s < 1$)

When the percentage change in the quantity supplied of a commodity is less than percentage change in price, it is called relatively inelastic supply.





Calculation of Price Elasticity of Supply

1. Percentage/ Proportionate Method

According to this method, price elasticity of supply is calculated dividing percentage change in quantity supplied divided by percentage change in price.

$$E_S = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

$$= \frac{\left(\frac{\text{Change in quantity supplied}}{\text{Initial quantity supplied}} \times 100\right)}{\left(\frac{\text{Change in Price}}{\text{Initial Price}} \times 100\right)} = \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where

E_S = Coefficient of price elasticity of supply

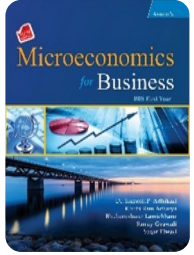
Q = Initial quantity supplied

ΔQ = Change in quantity supplied

P = Initial Price

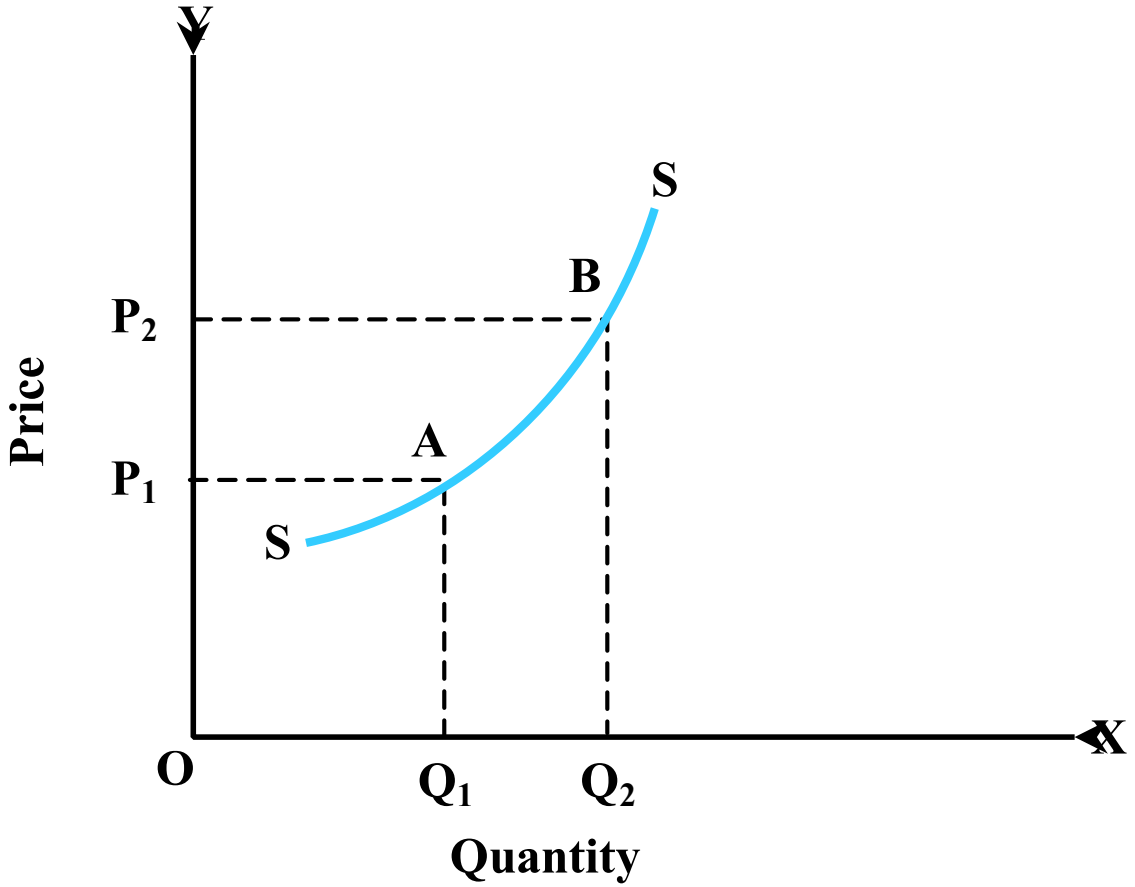
ΔP = Change in price

Calculation of Price Elasticity of Supply Contd.

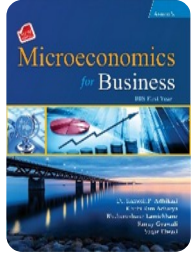


2. Average/ Arc Method

The coefficient of elasticity of supply between two points on a supply curve is called average or arc elasticity of supply. This method is used to measure elasticity of supply when there is greater change in price and quantity supplied.



Calculation of Price Elasticity of Supply Contd.



$$E_S = \frac{\left(\frac{\text{Change in quantity supplied}}{\text{Average quantity supplied}}\right)}{\left(\frac{\text{Change in Price}}{\text{Average Price}}\right)}$$

$$= \frac{\left(\frac{\Delta Q}{\frac{Q_1 + Q_2}{2}}\right)}{\left(\frac{\Delta P}{\frac{P_1 + P_2}{2}}\right)} = \frac{\Delta Q}{\Delta P} \times \left(\frac{P_1 + P_2}{Q_1 + Q_2}\right) = \left(\frac{Q_2 - Q_1}{P_2 - P_1}\right)\left(\frac{P_1 + P_2}{Q_1 + Q_2}\right)$$

where

E_S = Coefficient of price elasticity of supply

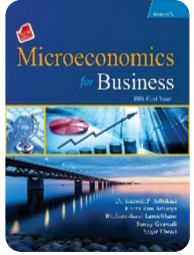
Q_1 = Initial quantity supplied

Q_2 = New quantity supplied

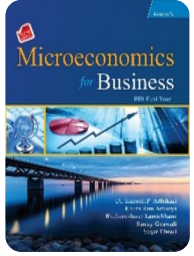
P_1 = Initial Price

P_2 = New Price

Factors Influencing Price Elasticity of Supply



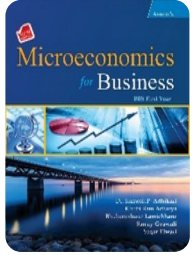
1. Nature of the commodity
2. Cost of production
3. Time element
4. Producers expectation
5. Technical condition of production



Numerical Examples 1

Calculate the price elasticity of demand by percentage and average method, when price decrease from Rs. 20 to Rs. 10 in the following example:

Price (Rs.)	20	10
Demand	40	80



SOLUTION

Proportionate Method

Initial price (P) = Rs. 20 Initial quantity (Q) = 40

New price (P_1) = Rs. 10 New quantity (Q_1) = 80

$\Delta P = -10$ $\Delta Q = 40$

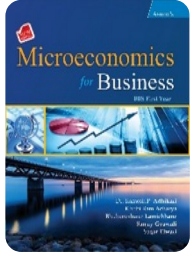
$$E_P = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \left(\frac{40}{-10} \times \frac{20}{40}\right) = -2$$

Since, E = - 2, the demand is relatively elastic.

Arc Method/ Mid Point Method/ Average Method

$$E_P = \left(\frac{Q_2 - Q_1}{P_2 - P_1}\right) \times \frac{P_1 + P_2}{Q_1 + Q_2} = \frac{80 - 40}{10 - 20} \times \frac{20 + 10}{40 + 80} = -1$$

Since, E = -1, the demand is unitary price elastic.



Numerical Examples 2

From the following table calculate income elasticity of demand for commodity X when income rises from Rs. 10,000 to Rs. 15,000 and determine what type of goods is commodity X:

Q_X	100	250
Y	Rs. 10,000	Rs. 15,000

Here,

Initial demand (Q_X) = 100

New demand (Q_{X1}) = 250

Change in demand (ΔQ_X) = $Q_{X1} - Q_x$ = 250 – 100 = 150 units

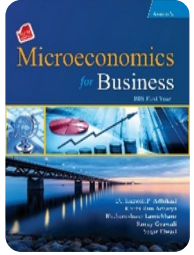
Initial income (Y) = Rs. 10,000

New income (Y_1) = Rs. 15,000

Change in income (ΔY) = $Y_1 - Y$ = 15,000 – 10,000 = Rs. 5,000

$$E_Y = \frac{\Delta Q_X}{\Delta Y} \times \frac{Y}{Q} = \frac{150}{5,000} \times \frac{10,000}{100} = 3$$

Since, $E_Y = 3$ is positive and greater than 1, the commodity is luxury.



SOLUTION

Here,

Initial demand (Q_X) = 100

New demand (Q_{X1}) = 250

Change in demand (ΔQ_X) = $Q_{X1} - Q_x$ = 250 – 100 = 150 units

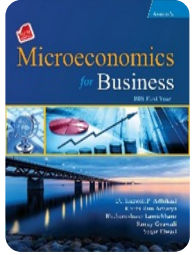
Initial income (Y) = Rs. 10,000

New income (Y_1) = Rs. 15,000

Change in income (ΔY) = $Y_1 - Y$ = 15,000 – 10,000 = Rs. 5,000

$$E_Y = \frac{\Delta Q_X}{\Delta Y} \times \frac{Y}{Q} = \frac{150}{5,000} \times \frac{10,000}{100} = 3$$

Since, E_Y = 3 is positive and greater than 1, the commodity is luxury.



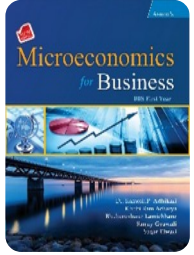
Numerical Examples 3

Consider the following supply schedule:

Points	A	B	C	D
Price (P_X)	0	5	10	15
Supply (Q_X)	10	20	30	40

a. Compute the price elasticity of supply at the movement from B to C by percentage method.

b. Compute the price elasticity of supply by average method between C and D.



SOLUTION

a. Initial quantity supplied (Q_X) = 20

New quantity supplied (Q_{X1}) = 30

Change in quantity supplied (ΔQ_X) = $Q_{X1} - Q_X$ = 30 – 20 = 10

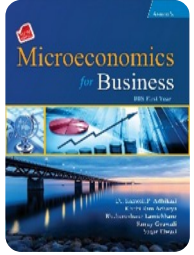
Initial price of good X (P_X) = Rs. 5

New price of good X (P_{X1}) = Rs. 10

Change in price of good X (ΔP_X) = 10 – 5 = 5

$$E_S = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_Y}{Q_X} = \frac{10}{5} \times \frac{5}{20} = \frac{1}{2} = 0.5 < 1$$

Interpretation: Since, E_S = 0.5 < 1, the supply is relatively inelastic. One percentage increase in price results 0.5 percentage increase in quantity supplied and vice-versa.



b. Initial quantity supplied (Q_{X1}) = 30

New quantity supplied (Q_{X2}) = 40

Initial Price (P_{X1}) = Rs. 10

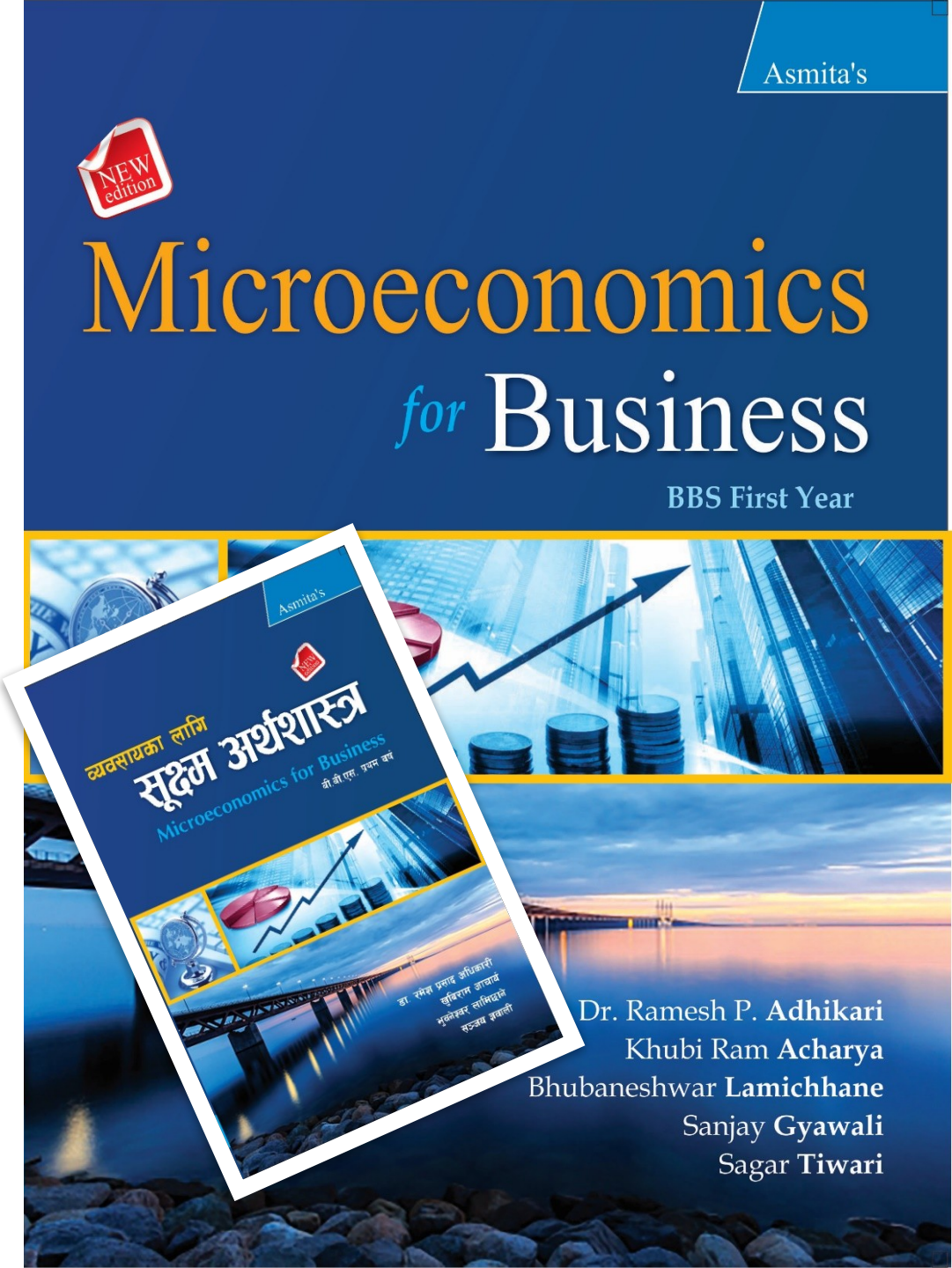
New Price (P_{X2}) = Rs. 15

$$E_S = \frac{(Q_{X2} - Q_{X1})}{(P_{X2} - P_{X1})} \times \frac{(P_{X1} + P_{X2})}{(Q_{x1} + Q_{X2})}$$

$$= \frac{(40 - 30)}{(15 - 10)} \times \frac{(10 + 15)}{(30 + 40)} = \left(\frac{10}{5}\right) \times \left(\frac{25}{70}\right) = 0.71$$

Interpretation: Since, $E_S = 0.71 < 1$, the supply is relatively inelastic. One percentage increase in price results 0.71 percentage increase in quantity supplied and vice-versa.

Thank You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