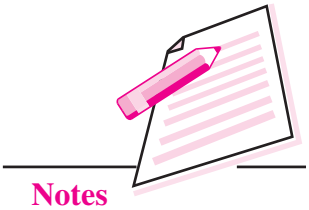

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PRICE ELASTICITY OF SUPPLY

The law of supply tells us the direction of relationship between price and quantity supplied of a commodity. But it does not tell us about the quantum of change in supply due to a certian change in price of the commodity. For this purpose, we have to study the concept of elasticity of supply. This lesson will focus on concepts related with elasticity of supply. We will also learn how to measure price elasticity of supply.

OBJECTIVES

After completing this lesson, you will be able to:

- define price elasticity of supply;
- understand different degrees of price elasticity of supply;
- represent different degrees of price elasticity of supply;
- explain the percentage method of calculating price elasticity of supply;
- solve numerical example of price elasticity supply;
- understand the geometric method of calculating price elasticity of supply; and
- identify factors affecting price elasticity of supply.

20.1 MEANING OF PRICE ELASTICITY OF SUPPLY (e_s)

Price elasticity of supply measures the degree of responsiveness of quantity supplied of a commodity to change in its price. But the problem is that all the commodities do not respond in the same way to change in price. Some commodities are more responsive to change in price than others. For example, if the price of a commodity increases by 20 percent and it quantity supplied increase by 40 percent. In this case the supply of the commodity is very elastic because percentage in quantity supplied of the commodity is double the percentage change in its price.

We can explain it with the help of the following supply curves.

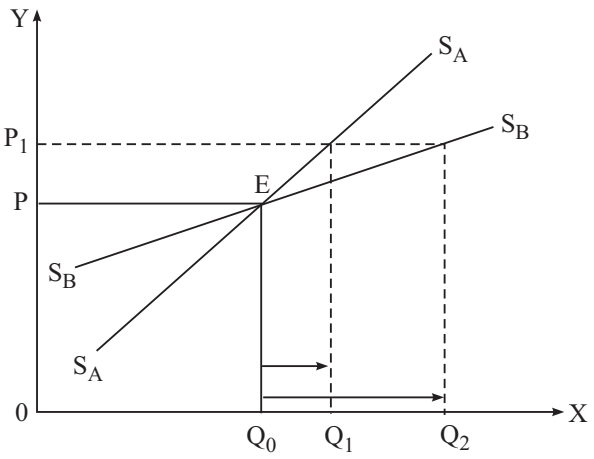


Fig. 20.1

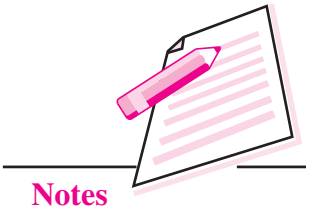
In the above figure there are two commodities A and B′ supply curve for commodity A is represented by S_AS_A and for commodity B by supply curve S_BS_B. At price OP the quantity supplied of both the commodities is OQ_0. But when the price increases to OP_1, the quantity supplied of commodity A in areas to OQ_1 and that of commodity B increased to OQ_2. The distance of OQ_0 to OQ_2 is greater than the distance of OQ_0 to OQ_1. So the increase in quantity supplied of commodity B is more than increase in quantity supplied of commodity A. So we can say that the price elasticity of supply of commodity B is more than the price elasticity of supply of commodity A. We can easily notice in the figure that the supply curve of commodity B is flatter than the supply curve of commodity A. So we can easily conclude that the elasticity of supply at flatter supply curve is more than a steeper supply curve.

$$e_s = \frac{\% \text{ change in } Q_x}{\% \text{ change in } P_x}$$

where Q_x = Quantity of good , P_x = Price of good x

20.2 DEGREES OF PRICE ELASTICITY OF SUPPLY

The co-efficient of price elasticity of supply varies from zero to infinity. On the basis of co-efficient of price elasticity of supply the following five degrees of price elasticity of supply are taken into consideration



(i) Perfectly inelastic supply ($e_s = 0$)

(ii) Inelastic or less than unit elastic supply ($e_s < 1$)

(iii) Unitary elastic supply ($e_s = 1$)

(iv) Elastic or more than unit elastic supply ($e_s > 1$)

(v) Perfectly elastic supply ($e_s = \infty$)

The explanation of each is given below.

(i) Perfectly inelastic supply ($e_s = 0$)

Supply of a commodity is said to be perfectly inelastic when the quantity supplied of a commodity does not change at all in response to change in price of the commodity. It means that the price of the commodity may increase or decrease but its quantity supplied remained the same. In such cases the price elasticity of supply is zero and supply curve is a vertical line parallel to y-axis. It can be explained with the help of the following supply schedule and supply curve.

Supply schedule of eggs

Price per dozen (₹)	Quantity supplied (in dozens)
10	50
20	50
30	50

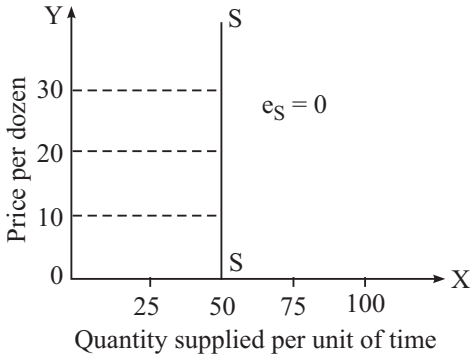


Fig. 20.2

In the above supply schedule and curve we see that the quantity supplied of the egg remains at 50 dozens whether the price is ₹ 10 or ₹ 20 or ₹ 30 per dozen.

(ii) Inelastic or less than unit elastic supply ($e_s < 1$)

When the percentage change in quantity supplied of a commodity is less than the percentage change in its price, the supply of the commodity is said to be inelastic or less than unit elastic. It happens generally in case of perishable goods as it is very difficult to store them. It is shown in the following supply schedule and supply curve.

Supply schedule of tomatoes

Price per kg (₹)	Quantity (Quintals)
20	100
40	150

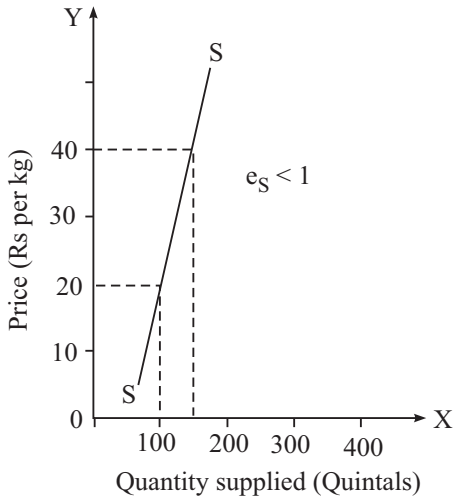
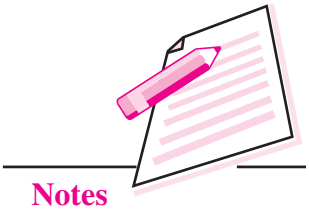


Fig. 20.3

In the above supply schedule the quantity supplied of the tomatoes has increased only 50 percent in response to 100 percent increase in its price. The supply curve if extended touches x-axis to the right of the origin. In such cases the supply curve has a steeps slope and price elasticity of supply is less than one but greater than zero.

(iii) Unitary elastic supply ($e_s = 1$)

When the percentage change in quantity supplied of a commodity is equal to percentage change in its price, the supply of the commodity is said to be unitary elastic. It means if the price of the commodity increases by 50 per cent its quantity supplied will also increase by 50 percent. It can be explained with the help of the following supply schedule and supply curve.



Supply schedule of commodity X

Price per unit (₹)	Quantity supplied (units)
10	20
20	40
30	60

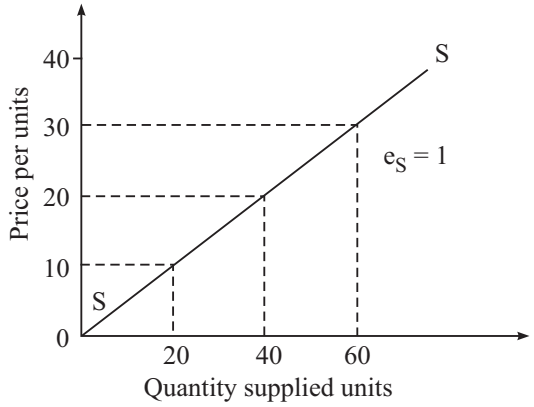


Fig. 20.4

The above supply schedule of commodity X shows that when the price increases by 100%, quantity supplied also increases by 100% and when the price increases by 50%, the quantity supplied also increases by 50%. The supply curve is passing through point of origin.

(iv) Elastic or more than unit elastic supply ($e_s > 1$)

When the percentage change in quantity supplied of a commodity is greater than the percentage change in its price, the supply of the commodity is said to be greater than unit elastic. It happens in case of durable goods because if the price falls they can be easily stored for future sale. If the price of such goods falls by 20%, their quantity supplied falls by more than 20%. In such cases, price elasticity of supply is greater than one. It can be explained with the help of the following supply schedule and supply curve.

Supply schedule of commodity A

Price per unit (₹)	Quantity supplied (units)
10	20
20	50

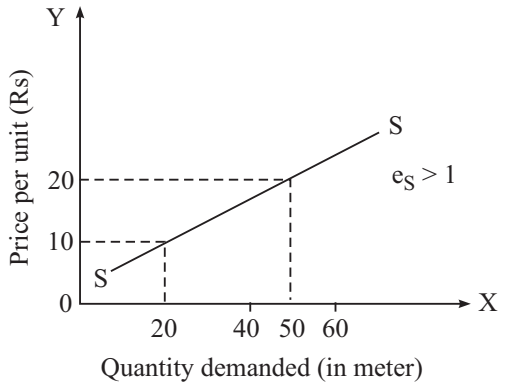


Fig. 20.5

In the above supply schedule price of the commodity increases by 100% but its quantity supplied increases by 150%. Thus, in this case, supply is more than unitary elastic.

(v) Perfectly elastic supply ($e_s = \infty$)

When the quantity supplied of a commodity expands or contracts to any extent without any change or with an infinitely small change in its price, the supply of the commodity is called perfectly elastic. Its supply curve is a horizontal line parallel to x-axis. It can be shown with the help of the following supply schedule and supply curve.

Supply schedule of commodity B

Price per units (₹)	Quantity supplied (units)
10	100
10	200
10	300
10	400

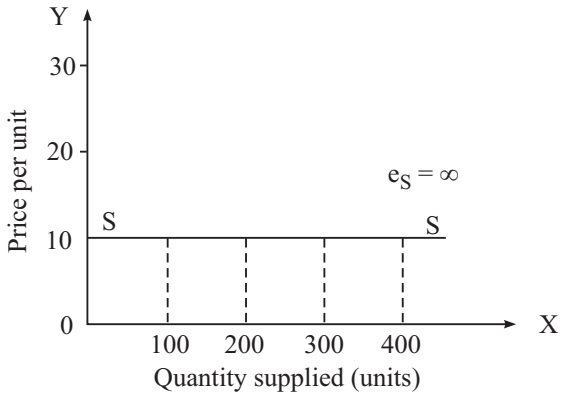
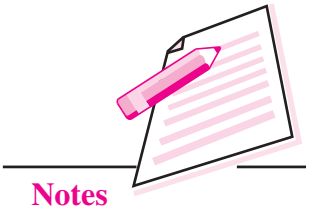


Fig. 20.6



The above supply schedule and supply curve show that at a price of ₹ 10 per unit the quantity supplied of the commodity may be 100, 200, 300 or 400 units. This type of supply is unrealistic because it is not possible in real life.

INTEXT QUESTIONS 20.1

1. Define price elasticity of supply.
2. What is the co-efficient of perfectly elastic supply.
3. What is the main feature of unitary price elasticity of supply.
4. What is price elasticity of supply if the supply curve cut y-aixs at a point above the point origin.
5. What is price elasticity of specify if the supply curve cuts x-axis in the positive range.
6. Define perfectly price inelastic supply.

20.3 MEASUREMENT OF PRICE ELASTICITY OF SUPPLY

After knowing various degrees of price elasticity of supply we have to understand the methods of calculating price elasticity of supply. At this stage we shall discuss the following two methods that are used for calculating price elasticity of supply.

(i) Percentage or Proportionate method

(ii) Geometric method

Detailed description of each method is given below:

20.3.1 Percentage or proportionate method

This is the most popular method of measurement of price elasticity of supply. With the help of this method we can calculate the accurate value of price elasticity of supply. This method measures the degree of responsiveness of quantity supplied of a commodity to change in its price. The price elasticity of supply is the ratio of percentage change in quantity supplied of a commodity to percentage change in its price. It can be calculated with the help of the following method:

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

$$e_s = \frac{\Delta Q_s}{\Delta P} \times \frac{P}{Q_s}$$

Notes

where ΔQ_s = change in quantity supplied

ΔP = Change in price

P = Original price

Q_s = Original quantity supplied

$$\text{Percentage change in quantity supplied} = \frac{\Delta Q_s}{Q_s} \times 100$$

$$\text{Percentage change in price} = \frac{\Delta P}{P} \times 100$$

If we take original price as P_1 and changed price as P_2 this ΔP will be $P_2 - P_1$. In the same way if we take original quantity as Q_1 and changed quantity as Q_2 then ΔQ will be $Q_2 - Q_1$. The value of price elasticity of supply is always positive because there is a direct relationship between price and quantity supplied of commodity. Now we give some solved examples of price elasticity of supply with the help of which we can easily calculate price elasticity of supply of a commodity.

Example 1: Calculate the value of price elasticity of supply of commodity A if the percentage change in price of the commodity is 10% and percentage change in its quantity supplied is 18%.

Solution:

$$e_s = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}$$

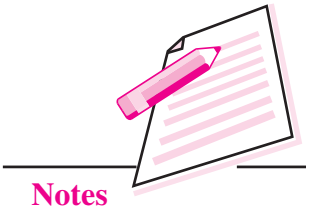
$$e_s = \frac{18}{10} = 1.80$$

Ans: Price elasticity of supply of commodity A is 1.80 (more than unit elasticity supply)

Example 2: A firm sells 40 units of commodity X when its price is ₹ 10. At what price it will sell 60 units of the commodity if its price elasticity of supply is 0.8.

Solution:

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



By putting the above question in a tabular form

$P_1 = 10$ $Q_1 = 40$

$P_2 = ?$ $Q_2 = 60$

Here $\Delta Q = 60 - 40 = 20$

$\Delta P = P2 - 10$

$e_s = 0.8$

$$0.8 = \frac{20}{P_2 - 20} \times \frac{10}{40}$$

$$0.8 \times 40(P_2 - 10) = 200$$

$$32P_2 - 320 = 200$$

$$32P_2 = 520$$

$$P_2 = 16.25$$

Ans: At a price of ₹ 16.25, the firm will supply 60 units of commodity X.

Example 3: If the price of oranges increases by 40% per kg and its quantity supplied increases from 100 to 125 kgs. Calculate price elasticity of supply of oranges.

$$e_s = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}$$

$$e_s = \frac{\frac{125 - 100}{100} \times 100}{40\%}$$

$$= \frac{25\%}{40\%} = 0.625$$

Ans: Price elasticity of supply of oranges is 0.625 (less than units elastic supply)

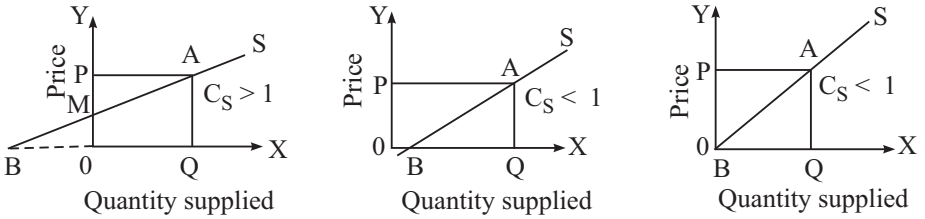
20.3.2 Geometric method

Geometric method is also called the point method of calculating price elasticity of supply as with the help of this method we can calculate price elasticity of supply of a commodity at a point on the supply curve. Under this method we can calculate price elasticity of supply at a given point on the supply curve with the help of the following method. To measure price elasticity of supply at a point we extend the

supply curve so that it meets the x-axis at point B in its negative range, positive range or exactly at the point of origin. For this purpose we use the following formula:

$$e_s = \frac{BQ \text{ (Horizontal segment)}}{OQ \text{ (Quantity supplied)}}$$

See the figures below and use this formula.



(a) (b) (c)

Fig. 20.7

In figure (a) the supply curve cuts price axis at point M. When we extend the supply curve it meets x-axis in its negative range at point B. Price elasticity of supply is calculated as under:

In figure (a) $e_s = \frac{BQ}{OQ} > 1$ because BQ > OQ

So supply curve cutting price axis is elastic in nature.

In figure (b) the supply curve meets x-axis in it positive range at points B. Price elasticity of supply is calculated as under

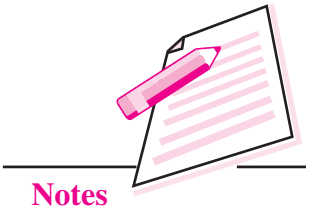
In figure (b) $e_s = \frac{BQ}{OQ} < 1$ because BQ < OQ

Hence supply curve cutting quantity axis is in elastic in nature.

In figure (c) supply curve it meets x-axis at the point of origin. Here the point O and B coincide. Price elasticity of supply is calculated as under:

In figure (c) $e_s = \frac{BQ}{OQ} = 1$ because BQ = OQ

So supply curve through the origin is unitary elastic.



So we can conclude that a straight line supply curve which intersects x-axis in its negative range imply $e_s > 1$. A straight line supply curve which intersect x-axis in its positive range implies $e_s < 1$ and a straight line supply curve which passes through the point of origin implies $e_s = 1$ irrespective of low steep or flat it is.

INTEXT QUESTIONS 20.2

1. When the price of a commodity increases by 20%, its supply increases by 30%. What is the price elasticity of supply?
2. At a price of ₹ 100 per unit, a seller supplies 300 units of a commodity. Calculate price elasticity of supply if he supplies 450 units of the commodity at a price of ₹ 200 per unit.
3. A seller supplies 100 unit of a commodity at a price of ₹ 40 per unit. How much quantity of the commodity will be supply at a price of ₹ 60 per unit if the price elasticity of supply is unity.
4. A seller of commodity A supplies 200 units at a price of ₹ 2 per unit. At which price will he supply 300 units of it, if the price elasticity of supply is 0.5.
5. What is price elasticity of supply of a straight line supply curve passing through the point of origin and making an angle of 70° to the x-axis.
6. What is price elasticity of supply if the straight line supply curve meets x-axis in its negative range.

20.4 FACTORS INFLUENCING ELASTICITY OF SUPPLY

In all the cases, the price and quantity supplied of a commodity are directly related. Here we shall study the factors that determine the degree of elasticity of supply of a commodity to a change in its price. The main factors determining elasticity of supply are given below.

(i) Nature of the commodity

The supply of perishable goods like fresh vegetables and fresh fruits is generally inelastic because it is very difficult to store them for future sale. These goods are prone to getting spoiled quickly and can not be kept for long period of time. So the supply of such goods does not change according to change in price. It is so because the seller prefers to sell them at cheaper rates than to spoil the goods totally.

On the other hand durable goods made by the industries do not get easily spoiled. If the price of such goods falls, they can easily be stored for sale when the price rises. So, the supply of such goods is more elastic to change in price. The goods whose supply can be postponed for future are more elastic than the goods whose supply can not be postponed for future.

Notes

(ii) Cost of production of additional units of a good

If the cost of production of additional units of a commodity increases sharply, the profit may not rise even if the price increases. In such cases, the producer is not interested in increasing the production in substantial quantity. The supply of such goods is relatively inelastic.

On the other hand if the marginal cost of additional unit decreases per unit, the producer will be motivated to increase the output with a little increase in price. In such a case the supply of the commodity is more elastic.

(iii) Time Period

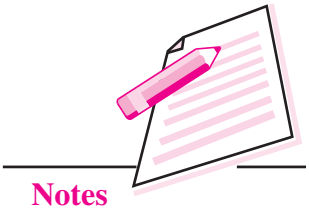
Time period also influences the case with which the supply of the commodity can be changed. During very short period, supply can not be changed according to change in price. So the supply of the commodity is perfectly inelastic. During short period, the supply of the commodity can be changed by changing only variable factor and keeping all other factors as constant. So the supply can be changed only upto a certain extent to change in price. The supply of the commodity in short period is relatively inelastic. But during long period, the supply of the commodity can be changed to any extend by changing all the factor of production. So, in the long period the supply of the commodity can easily be changed. This makes the supply of the commodity more elastic.

INTEXT QUESTIONS 20.3

1. What is the elasticity of supply of a commodity in the short period?
2. What is the value of elasticity of supply in the long period.
3. How does the cost of production of additional units of output influences the elasticity of supply of a commodity.
4. How does nature of the commodity influence the elasticity of supply of a commodity?

WHAT YOU HAVE LEARNT

- Elasticity of supply is the degree of responsiveness of quantity supplied of a commodity to change in its price.
- There are five degrees of price elasticity of supply i.e. (i) perfectly inelastic supply (ii) less than unit elastic supply (iii) unitary elastic supply (iv) more than unitary elastic supply (v) perfectly elastic supply.



- There are two method of measuring price elasticity of supply (i) percentage or proportionate method (ii) geometrical method
- Price elasticity of supply depend on the following factors (i) nature of commodity (ii) cost of production of the additional units (iii) time period.

TERMINAL EXERCISE

1. Define price elasticity of supply.
2. If two supply curves intersect each other at a point which of them is more elastic.
3. What is meant by perfectly elastic supply?
4. What is the distinguishing feature of unitary elastic supply?
5. What is the value of elasticity of supply in very short period?
6. What is the value of elasticity of supply in the long period?
7. State any three factors determining price elasticity of supply.
8. Explain the percentage method of determining elasticity of supply.
9. State the geometric method of measuring elasticity of supply on a straight.
10. Explain the three factors that affect the elasticity of supply.
11. At a price of ₹ 100 per unit, a seller sells 200 unit of the commodity and at a price of ₹ 50 per unit, he sells 100 units of the commodity. Calculate elasticity of supply.
12. Price elasticity of supply of a commodity is 1.5. The seller sells 1000 unit of the commodity at a price of ₹ 4 per unit. How many unit of the commodity will be sold at a price of ₹ 5 per unit.
13. At a price of ₹ 10 per unit, a firm earns total revenue as ₹ 5000. When the price rises ₹ 15, the firm earns ₹ 10000 as total revenue. Calculate its elasticity of supply and comment on it.
14. The price elasticity of supply of a commodity is 3. When its price falls from ₹ 10 to ₹ 8 its quantity suppled falls by 400 units. Calculate quantity supplied at reduced price.

ANSWERS TO INTEXT QUESTIONS

20.1

1. Read section 20.1
2. $e_s \propto$ [Read section 20.1 (v)]

Notes

3. Read section 20.1 (iii)
4. $e_s > 1$ [Read section 20.1 (iv)]
5. $e_s < 1$ [Read section 20.1 (iv)]
6. Read section 20.1 (i)

20.2

1. $e_s = 1.5$
2. $e_s = 0.5$
3. Quantity supplied is 150 units
4. Price = 4
5. Unitary elastic
6. $e_s > 1$

20.3

1. $e_s < 1$ [Read section 20.4 (iii)]
2. Read section 20.4 (iii)
3. Read section 20.4 (ii)
4. Read section 20.4 (i)