Semester –II
B.Com (GENERAL)
Name of Subject: Principles of Economics
Subject Code: CHG GE -2
TOPIC: Theory of Consumer Behaviour
Sub topic-Elasticities of demand & Elasticity of supply

Elasticity of Demand

We have seen that the demand for a commodity is determined by its own price, income of the consumer, prices of related goods etc. Quantity demanded of a good will change as a result of a change in the size of any of these determinants of demand.

Elasticity measures the sensitivity of one variable to another. Specifically, it is a number that tells us the percentage change that will occur in the variable in response to one percent increase in another variable. Therefore, elasticity of demand refers to the sensitiveness or responsiveness of quantity demanded of a good to a change in its own price, income and prices of related goods. Accordingly, there are three kinds of elasticity of demand .They are

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

Price elasticity of demand measures the sensitivity of quantity demanded to change in own price of g good. Income elasticity of demand measures the sensitivity of quantity demanded to change in income of the consumer. While cross elasticity of demand analyses the responsiveness of quantity demanded of one good to changes in the price of another good.

Price elasticity of demand

Price elasticity of demand refers to the responsiveness or sensitiveness of quantity demanded of a good to changes in its own price. In order to have a measure of the responsiveness of quantity demanded of a good to change in its price that is independent of units of measurement, Alfred Marshall, defined in terms of percentage or relative change in quantity demanded to price. As such, price elasticity of demand is given by the percentage change quantity demanded of a good divided by the percentage change in its price. The elasticity is usually symbolised by Greek letter eta (η). Thus, we have

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

Now denoting ΔQ for change in quantity demanded and ΔP for the change in price (the symbol Δ is Greek letter delta; it means "the change in") we have the formula for the price elasticity of demand as

$$\eta = \frac{\Delta Q/Q}{\Delta P/P}$$

That is, $\eta = \frac{\Delta Q}{Q} \cdot \frac{P}{\Delta P}$

Or

$$\eta = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Since, price and quantity demanded are inversely related the coefficient of price elasticity of demand (η) is a negative number. In order to avoid dealing with negative values, a minus sign is often introduced into the formula of price elasticity of demand. That is

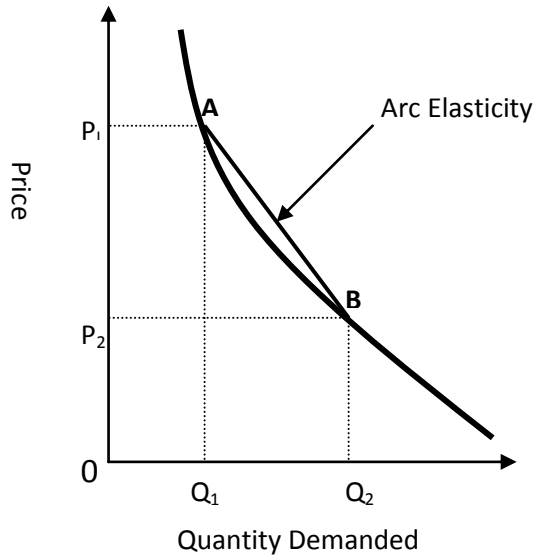
$$\eta = -\frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Thus price elasticity of demand is measured by a ratio; the percentage change in quantity demanded divided by the percentage change in the price that brought it about. For normal negatively slopped demand curves, price elasticity will be negative, but two Elasticities are compared by comparing their absolute values. As such, price elasticity of demand is a pure number that is it has no units of measurement attached to it. This allows meaningful comparison between the price elasticity of demand of different commodities.

The above formula is called point elasticity formula of demand because it measures elasticity at a point on the demand curve. The value obtained for η is just a number like 2 or 5 or ½ and is referred to as the coefficient of elasticity. Since price elasticity is being measured at a point on the market demand curve we are assuming that all other factors that affect market demand remain fixed. The demands for some goods are more responsive to changes in price than those of others. That is, demands for some goods are more 'elastic' than those for others or the price elasticity of demand of some goods is greater than those of others. It should be noted that the terms elastic and inelastic are used in relative sense. In other words, elasticity is a matter of degree only.

The Arc Elasticity Formula

Formula of point elasticity of demand measures the elasticity at particular point on the demand curve. It can be conveniently used when the changes in the price and resultant quantity demanded are infinitesimally smaller. However, when the price change is large, we have to measure elasticity over an arc of the demand curve rather than at a specific point on it. The arc elasticity measures elasticity of demand between two points on the demand curve. That is, arc elasticity is a measure of average elasticity. Consider the following figure.



The initial price is P_1 and corresponding quantity is Q_1. When price falls to P_2, quantity demanded increases to Q_2. The arc elasticity measures elasticity at the point of the cord that connects the two points A and B on the demand curve defined by the initial and new price level. By taking the average of the two prices and average of two quantities, we can obtain the following formula for the price elasticity of demand

$$\eta = - \frac{\Delta Q}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1+Q_2)/2}$$

Or

$$\eta = - \frac{\Delta Q}{\Delta P} \cdot \frac{(P_1 + P_2)}{(Q_1+Q_2)}$$

The new formula is called the arc elasticity of demand formula or average elasticity of demand formula because it measures η between two points on the demand curve. Arc elasticity of demand treats the price and quantity as if they were midway between the initial and new prices and quantities and then uses the point elasticity at this midpoint

Arc elasticity formula should be used when the change in price is somewhat large, but not very large. On the other hand, when the two points on the demand curve are very close together, arc becomes almost identical with the true demand curve and the arc elasticity measurement becomes almost identical with the point elasticity measurement on the demand curve.

Total Outlay Method

Another method to measure price elasticity of demand is known as total outlay or expenditure method. In this method, changes in the total expenditure made on the good as a result of change in its price is analysed to measure price elasticity of demand. But with the total outlay method, we can know only whether price elasticity is equal to one, greater than one or less than one. With this method, we cannot find out the exact coefficient of price elasticity of demand.

If as a result of the change in price of the commodity total expenditure remains the same, then elasticity of demand for the commodity will be equal to unity. This is so because total expenditure made on the commodity can remain the same only if the proportional change in the quantity demanded is equal to proportional change in price. On the other hand, due to fall in price of the commodity, quantity demanded rises and, as result, total expenditure made on the commodity increases, then price elasticity of demand is said to be greater than unity. This is so because with the fall in price of the commodity, total expenditure can increase only if the proportional change in quantity demanded is greater than the proportional change in the price.

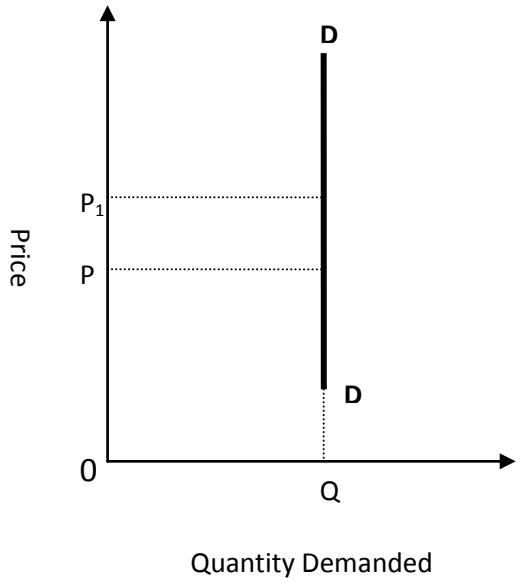
If as a result of fall in the price of the commodity total expenditure decreases, then price elasticity of demand will be less than unity. This is for the reason that with the fall in price, total expenditure can decrease only if proportional increase in quantity demanded is less than proportional change in price. Thus, through the total outlay method, we can find out whether prices price elasticity is equal to unity or greater than unity or less than unity. Note that with this method, we cannot know the precise value of the price elasticity.

Degrees of Elasticity of Demand

The value of price elasticity of demand ranges from zero to infinity. That is, $0 \leq \eta \leq \infty$. Based on the value of elasticity or degree of responsiveness of quantity demanded, price elasticity of demand is classified into five categories. They are: (i) Perfectly inelastic demand, (ii) Inelastic demand, (iii) Unitary elastic demand, (iv) Elastic demand, (v) Perfectly elastic demand. Now let us analyse each of them in detail:

(1) Perfectly inelastic demand

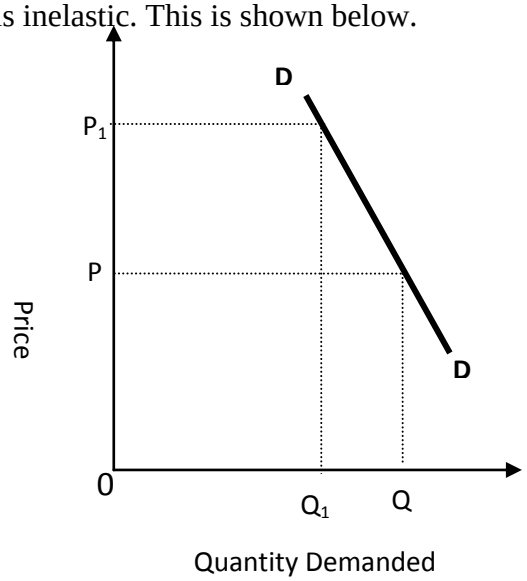
When quantity demanded does not change as a result of change in price, demand is said to be perfectly inelastic. Quantity demanded is unchanged when price changes or demand shows no response to change in price. In other words, same quantity will be bought whatever the price may be. Numerical value of elasticity will be zero ($\eta = 0$) when there is perfectly or completely inelastic demand. The following figure illustrates the case of perfectly inelastic demand.



A change in price from P to Pl leaves quantity demanded unchanged at Q units. That is, quantity demanded does not change at all when price changes.

(2) Inelastic Demand

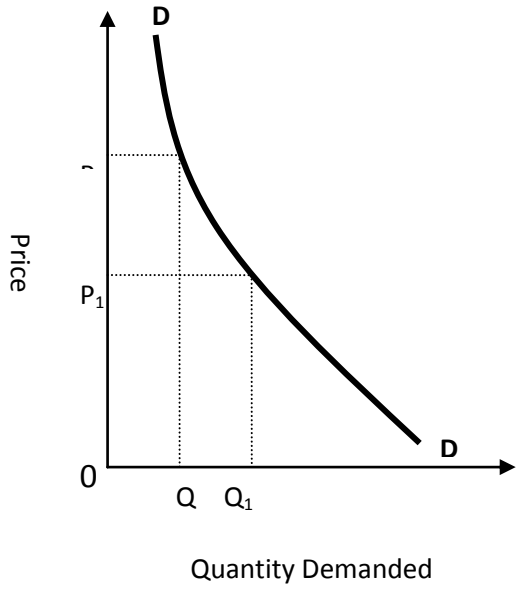
As long as there is some positive response of quantity demanded to change in price, the absolute value of elasticity will exceed zero. The greater the response, the larger the elasticity. However, when percentage change in quantity demanded is less than percentage change in price, demand is said to be inelastic. That is, a certain percentage change in price leads to a smaller percentage in quantity demanded. The coefficient of elasticity will be less than one but greater than zero ($0< \eta <1$) when demand is inelastic. This is shown below.



When change in price from OP to OPl causes a less than proportionate change in quantity demanded. That is, quantity demanded changes by a smaller percentage than the change in price.

(3) Unitary Elastic Demand

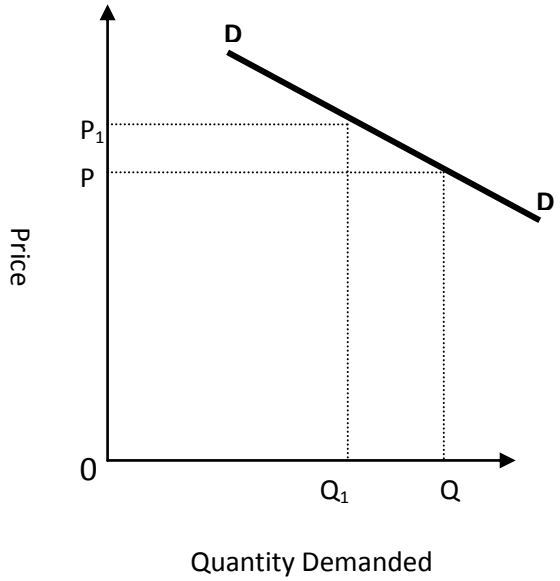
If a certain percentage change in price leads to an equal percentage change in quantity demanded, then demand said to have unitary elasticity. Unitary elasticity is the boundary between elastic and inelastic demand. The coefficient of elasticity will be equal to one when demand is unitary elastic ($\eta=1$). The demand curve having unitary elasticity over its whole range is shown below



OP and OQ are the initial price and quantity. A fall in price from OP to OP_1 causes an equal proportional change in quantity demanded from OQ to OQ_1.

(4) Elastic Demand

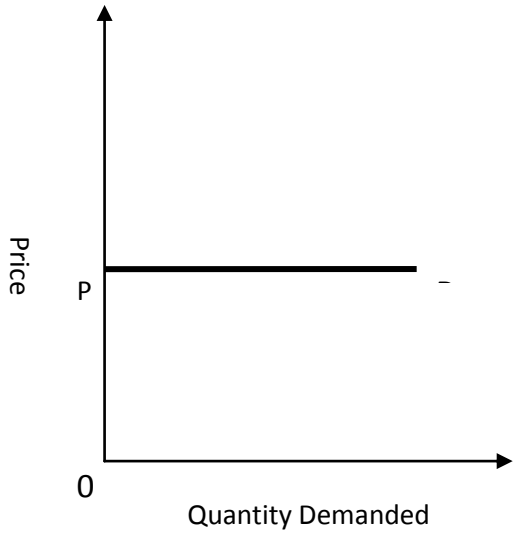
When the percentage change in quantity demanded exceeds the percentage change in price, the demand is said to be elastic. That is, a certain percentage change in price leads to a greater percentage change in quantity demanded. The value of coefficient of elasticity will be greater than one but less than infinity when demand is elastic ($1<\eta<\infty$). This is shown below.



An increase in price from OP to OPl causes a more than proportionate increase in quantity demanded as shown by the change in quantity demanded from OQ to OQl. Thus, a small rise in price brings in more than proportionate fall in quantity demanded.

(5) Perfectly Elastic demand

If a small change in price leads to an infinitely large change in quantity demanded, we can say that demand is perfectly elastic. When demand is perfectly elastic, small price reduction will raise demand to infinity. At the same time, a slightest rise in price causes demand to fall to zero. At the going price, consumers will buy an infinite amount (if available).above this price, they will buy nothing. The coefficient of elasticity will be infinity when demand will be infinite when demand is perfectly elastic ($\eta = \infty$). The graph for perfectly elastic demand is shown below.



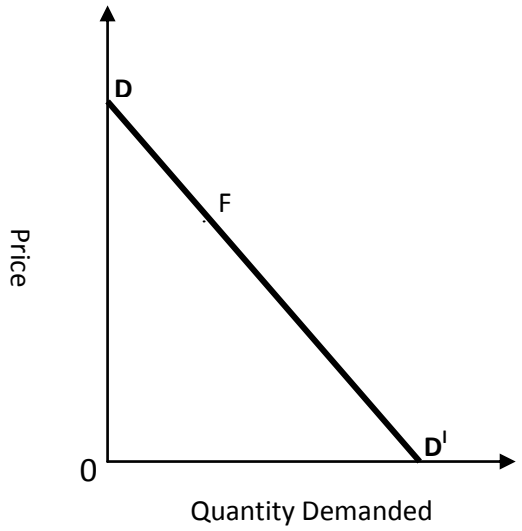
When it is perfectly elastic, demand curve is a horizontal straight line. In his case an infinitely large amount can be sold at the going price OP. A small price increase from OP decreases quantity demanded from an infinitely large amount to zero (hyper sensitive demand).

The following table summarises the terminology of price elasticity of demand

Term	Numerical Measure of elasticity	Shape of the demand curve	Verbal description
Perfectly inelastic	Zero	Vertical (parallel to Y-axis that measures price)	Quantity demanded does not change an price changes
Inelastic	Greater than zero but less than one	Steeper	Quantity demanded changes by a smaller percentage than does price
Unitary elastic	One	Rectangular hyperbola	Quantity demanded changes exactly the same percentage as does price
Elastic	Greater than one but less than infinity	Flatter	Quantity demanded changes by a larger percentage than does price
Perfectly elastic	Infinity	Horizontal (parallel to X-axis that measures quantity)	Buyers are prepared to buy all they can at some price and none at all at higher prices.

Price elasticity on a linear Demand Curve

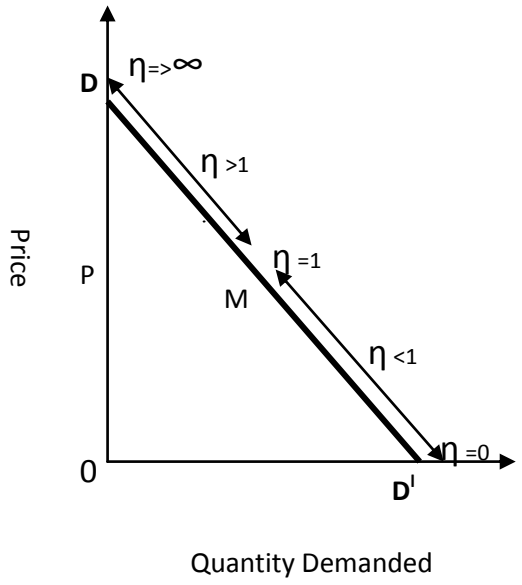
When demand curve is linear, the price elasticity can be computed graphically. Consider the following linear demand curve.



Graphically, the point elasticity of a linear demand curve is the ratio of the segment of the line to the right and to the left of the particular point. That is,

$\eta = \frac{\text{Lower segment}}{\text{Upper segment}}$

In the above demand curve, the elasticity at point F is the ratio FD^l/FD. Given this graphical measurement of point elasticity, it is obvious that at mid-point of a linear demand curve, price elasticity will be equal to unity ($\eta = 1$), as shown below.



In the figure, at the mid-point of the curve M, the coefficient of elasticity $\eta = 1$. At points to the right of M, elasticity is less than unity ($\eta < 1$). At any points to the right of M, elasticity will be greater than unity ($\eta > 1$). At point D the elasticity approaches infinity ($\eta => \infty$). At point D^1, the coefficient of elasticity is zero ($\eta = 0$).

Thus, elasticity of a negatively slopped demand curve varies between infinity at the price axis to zero at the quantity axis. At the price axis, since Q=0, elasticity is infinity. As we move down the demand curve price falls and quantity demanded rises steadily, elasticity falls. At the quantity axis, where P=0, elasticity is also zero.

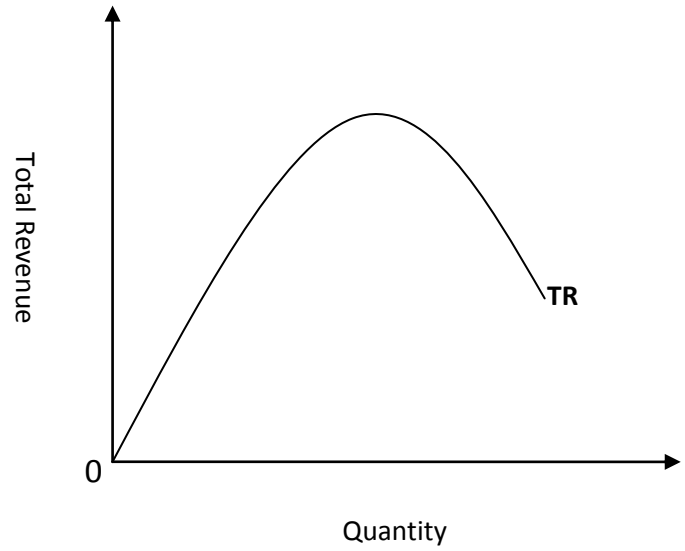
Marginal Revenue, Price and Elasticity

So far we analyzed price elasticity of demand from the consumer's side only. However, consumer's expenditures on a commodity are the receipts or the total revenues of the sellers of the sellers of the commodity. Thus, another way of looking at the price elasticity of demand for a good or service is to see what happens to the total revenue as the price of the good or service changes.

The total amount of money earned by sellers of a commodity is called total revenue (TR). Total revenue is derived from the sale of any commodity is the price of the product (P) multiplied by the quantity sold (Q). That is,

$$TR = P.Q$$

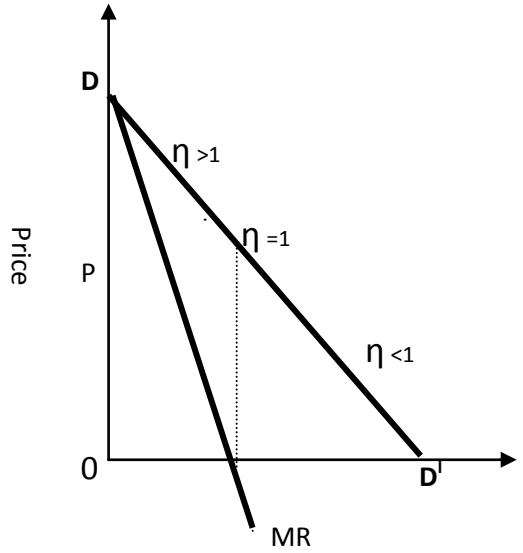
If the market demand is linear, the total revenue curve will initially slopes upwards, reaches a maximum point and then start declining, as shown below.



The marginal revenue (MR) is the changes in total revenue resulting from selling an additional unit of a commodity. That is, marginal revenue is the addition made to the total revenue by selling an additional unit of the commodity. Marginal revenue is calculated by dividing the changes in total revenue (ΔTR) by the change in quantity sold (ΔQ)

That is, $MR = \Delta TR / \Delta Q$

Graphically, the MR curve is the slope of TR curve at any one level of output. If the demand curve is linear, it is obvious that in order to sell additional units of the commodity price must fall. Thus MR curve will lie below the demand curve. It starts at the same point on the vertical axis as demand curve and is everywhere else below the demand curve. This is illustrated in the following figure.



The important relationship among marginal revenue, price and price elasticity of demand is given by:

$MR = P (1-1/\eta)$

This is a crucial relationship for the theory o pricing. If $\eta = 1$, then MR is equal to zero and TR reaches its maximum point. That is, if

$$\eta = 1, \text{ hence } MR = P (1-1/\eta)=0.$$

If $\eta>1$, MR will be positive and TR curve has a positive slope and hence has not reached its maximum point. That is,

$$\eta > 1, \text{ then } MR = P (1-1/\eta)>0 \text{ since } P>0$$

If $\eta<1$, MR will be negative and TR curve has a negative slope. That is, TR curve is falling. If

$$\eta < 1, \text{ then } MR = P (1-1/\eta) <0 \text{ since } P>0$$

We can summarise these results as follows.

(1) If the price elasticity of demand has a unitary elasticity ($\eta = 1$) total revenue is not affected by changes in the price. This is because if $\eta = 1$, then MR=0.
(2) If demand is elastic ($\eta > 1$) an increase in price will results in decrease in the total revenue while a decrease in price will results in an increase in total revenue (MR>o).
(3) If demand is inelastic ($\eta < 1$) an increase in price lead to increase in total revenue and a decrease in price leads to fall in total revenue (MR >0).

Determinants of price Elasticity of Demand

Important determinants of elasticity of demand of a commodity with respect to its own price are explained below.

(1) Availability of Substitutes

One of the most important factors likely to influence the price elasticity of demand for a commodity or service is whether or not substitutes are available. If a commodity has many close substitutes, its demand is likely to be elastic. This is so because if the price of that commodity rises buyers will switch to some of many close substitutes available. Hence quantity demanded of that commodity will tend to fall significantly. The greater the possibility of substitution, the greater the price elasticity of demand for it. On the other hand, if there are not many substitutes quantity demanded will tend to fall as a result of the higher price, but not by much. That is, if there are few or no close substitutes, demand tend to be inelastic.

(2) Nature of the commodity

Whether the commodity is a luxury or a necessity has some effect on its price elasticity of demand. In general, necessities are price inelastic. If the price of a basic necessity increases, say by 10%, quantity demanded will not probably fall by that proportion. Consumers tend to sacrifice some other commodities rather than a substantial reduction in the quantity of necessities. On the other hand, luxury goods are price elastic. An increase in the price of luxury good is likely to cause a more than proportionate decrease in the quantity bought, other things being equal.

(3) Time Period

The time period being considered will also have some effect on the elasticity of demand for the product. In general, the longer the time period being considered, the more elastic the demand is likely to be. This is largely due to the fact that it takes time for people to substitute one commodity for another. At the same time, in the short run, substitution of one commodity by another is not so easy. Hence demand tends to be relatively inelastic.

(4) Number of Uses

In general, the greater the number of uses of a commodity has, the more price elastic the demand for that commodity is likely to be. A decrease in the price of a commodity that has large number of uses (milk, for example) more of it will be bought to allocate to different uses. On the other hand, if the commodity has only one or two uses, it is unlikely that a fall in its price will cause a significant increase in quantity demanded.

(5) Proportion of income spent on the commodity

Another factor that is likely to affect price elasticity of demand is the proportion of income spent on the commodity. If only a negligible percentage of consumer's income is spend on the commodity, the demand for that commodity is likely to be inelastic. An increase in the price of such commodity has no appreciable effect on the consumer's budget. Example, matches, soap. The greater the proportion of income spent on the commodity the greater will be its price elasticity of demand.

Income Elasticity of Demand

The responsiveness or sensitiveness of quantity demanded of a commodity to changes in income of the consumer is termed as income elasticity of demand. It is the proportionate or percentage change in quantity demanded resulting from proportionate change in income. Thus we have

η_y = Percentage change in quantity demanded
Percentage change in income

Now denoting ΔQ for small change in quantity demanded and ΔY for the small change in income we may symbolically write the formula for the income elasticity of demand as

$\eta_y = \Delta Q/Q \ / \Delta Y/Y$ That is, $\eta_y = \Delta Q/ Q \ . Y/ \Delta Y$ Or $\eta_y = \Delta Q/ \Delta Y \ . Y/Q$

For the most commodities, increase in income leads to increase in quantity demanded. Therefore, income elasticity is positive. If the resulting percentage change in quantity demanded is larger than the percentage change in income, income elasticity will exceed unity ($\eta_y > 1$). Then the commodity's demand is said to be income elastic. If the percentage change in quantity demanded is smaller than the percentage change in income, income elasticity will be less than unity ($\eta_y < 1$). Then the commodity's demand is said to be income inelastic. If the percentage changes in income and quantity demanded are equal, income elasticity will be unity ($\eta_y = 1$). The commodity's demand is said to have unitary income elasticity of demand. Unitary income elasticity represents a useful dividing line.

There is also a relationship between income elasticity for a commodity and proportion of income spent on it. If the proportion of income spend on the commodity increases as income increases, then the income elasticity of demand for the commodity is greater than unity ($\eta_y > 1$). If the proportion of income spend on the commodity decreases as income rises, then the income elasticity of demand for the commodity is less than unity ($\eta_y < 1$). At the same time, if the proportion of income spend on the commodity remains the same as income rises, then the income elasticity of demand for the commodity is equal to unity ($\eta_y = 1$).

If the commodity is normal, a rise in income causes more of it to be consumed. Other things being equal, this means a rightward shift in the commodity's demand curve. Thus, income elasticity will be positive for normal commodities. In the case of such commodities, an increase in income leads to an increase in quantity demanded. On the other hand, if the commodity is inferior, a rise in income causes less of it to be demanded. This implies a leftward shift in the commodity's demand curve. Thus income elasticity for inferior commodities will be negative. In the case of inferior commodities increase in income will lead to fall in quantity demanded. The boundary case between normal and inferior commodities occurs when a rise income leaves quantity demanded unchanged so that income elasticity is zero. Zero income elasticity implies that quantity demanded of the commodity is quite unresponsive to changes in income. Zero income elasticity is significant because it represents a dividing line between positive income elasticity on one side and negative income elasticity on the other.

A normal commodity can be further classified as necessities and luxury using income elasticity. A commodity is considered as necessity if the income elasticity is less than unity. That is, in the case of necessities, the proportion of income spend on it falls as income rises. A commodity is considered to be luxury if its income elasticity is greater than unity. The proportion of consumer's income spend on luxuries rises as his income increases.

It should be said that, sometimes, the same commodity can be regarded as a luxury by some individuals or at some income levels and as a necessity or even as inferior commodity by other individuals or at other income levels. The terminology of income elasticity is summarised in the following table.

Type of Goods	Numerical Measure of Income elasticity	Verbal description
(1)Inferior Goods	Negative	Quantity demanded decreases as income increases
(2)Normal goods	Positive	Quantity demanded increases an income increases
2.1 Necessity	Less than one	Quantity demanded increases less than proportion to increase in income
2.2 Luxury	Greater than one	Quantity demanded increases more than proportion to increase in income

Cross Elasticity of Demand

The responsiveness of quantity demanded of one commodity to changes in the prices of other commodities if often of considerable interest. The responsiveness or sensitiveness of quantity demanded of one commodity to the changes in the price of another commodity is called cross elasticity of demand. Thus, cross elasticity of demand can be defined as percentage or proportionate change in quantity demanded of commodity X resulting from a proportionate change in the price of commodity Y. the cross elasticity of commodity X with respect to the price of Y (η_{XY}) can presented as

η_{XY} = Percentage change in quantity demanded of X
Percentage change in price of Y

We may symbolically write the formula for the cross elasticity of demand as:

$\eta_{XY} = \Delta Q_X/Q_X \ / \ \Delta P_Y/P_Y$; That is, $\eta_{XY} = \Delta Q_X / Q_X \ . \ P_Y / \Delta P_Y$

Or

$$\eta_{XY} = \Delta Q_X / \Delta P_Y \ . \ P_Y / Q_X$$

Where ΔQ_X is the change in quantity demanded of X, ΔP_Y is the change in price of Y, P_Y is the original price of Y and Q_X is the original quantity of X. The coefficient of cross elasticity can vary from minus infinity to plus infinity. Substitute goods have positive cross elasticity and complementary goods have negative cross elasticity.

If η_{XY} is positive, the commodities X and Y are said to be substitutes. X and Y are substitutes if more of X is purchased when price of Y goes up. That is, an increase in P_Y leads to an increase in Q_X as X is substituted for Y in consumption. For example, consumers usually purchase more coffee when price of tea rises. Thus coffee and tea are substitutes or competing goods. In response to the rise in the price of one good, the demand for the other good rises.

On the other hand, if η_{XY} is negative, X and Y are said to be complementary goods. When X and Y are complementary goods, less of X will be purchased when the price of Y goes up. That is, an increase in P_Y leads to a reduction in Q_X (and Q_Y). For example consumers usually purchase fewer scooters when the price of petrol goes up. Thus scoter and petrol are complements. Other examples of commodities that are complements are bread and butter, tea and sugar and so on. In the case of complements, a rise in the price of one good brings about a decrease in demand for the other, as they are consumed together. If η_{XY} is zero, X and Y are independent commodities. A change in price of Y has no effect on the quantity demanded of X. this may be the case with cars and pencils, telephones and chewing gum and so on.

It should be noted that the value of η_{XY} is not equal to the value of η_{YX} since the responsiveness of Q_X to the change in P_Y need not be equal to the responsiveness of Q_Y to the change in P_X. For example, a change in the price of tea is likely to have a greater effect on the quantity of sugar (a complement of tea) demanded than the other way around, since tea is more important of the two in terms of total expenditure.

The concept of cross elasticity of demand is very significant in economic theory. The classification of commodities into substitutes and complementary is in terms of cross elasticity of demand. Again, a high positive cross elasticity of demand is often used to define an industry since it indicates that various commodities are similar. Besides we can also classify different market structures on the basis of cross elasticity of demand.

Following table summarizes terminology of cross elasticity of demand

Type of goods	**Numerical measure of cross elasticity**	**Verbal description**
Substitutes	Positive	Quantity demanded of a good increases if the price of substitutes increases
Complementary	Negative	Quantity demanded of a good decreases if the price of complements increases
Independent	Zero	Quantity demanded of a good remains unchanged to change in the price of other good

Elasticity of Supply

The concept of elasticity of supply closely parallels that of elasticity of demand. Though quantity supplied is influenced by a number of factors, we will focus on the commodity's own price as a factor influencing supply. That is, we will be concerned with price elasticity of supply.

Price elasticity of supply measures the responsiveness or sensitiveness of quantity supplied of a commodity to a change in its price. It is given by the percentage change in the quantity supplied of a commodity divided by the percentage change in price. Letting ε (Greek letter epsilon) stand for the coefficient of price elasticity of supply, we have,

$$\varepsilon = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

Being expressed in terms of relative or percentage changes, the price elasticity of supply is a pure number. That is, it has no units attached to it. The value of price elasticity of supply does not change when the units of measurement are changed. This allows meaningful comparisons in the price elasticity of supply of different commodities.

Using the point elasticity formula

$$\varepsilon = \frac{\Delta Q/Q}{\Delta P/P}$$

That is,

$$\varepsilon = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Where ΔQ represents change in the quantity supplied and ΔP represents change in price. Since quantity supplied and price move in the same direction, supply curves normally have positive slope. Therefore, supply elasticity is normally positive. It will be anything between zero and infinity ($0 \leq \varepsilon \leq \infty$).

Point elasticity of supply measures elasticity at a particular point on the supply curve. More frequently, we measure elasticity of supply by using arc elasticity formula between two points on the supply curve. Arc elasticity of supply measures the average of two prices and the average of two quantities. Letting P_l refer to the lower of the two prices and Q_l being quantity and P_2 to the higher of the two prices and Q_2 the corresponding quantity, we can measure arc elasticity of supply by

$$\varepsilon = \frac{\Delta Q}{\Delta P} \cdot \frac{(Pl + P2)/2}{(Q1+Q2)/2}$$

Or

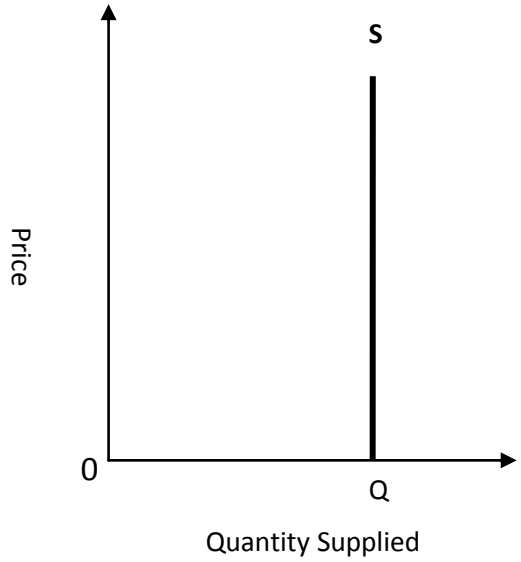
$$\varepsilon = \frac{\Delta Q}{\Delta P} \cdot \frac{(Pl + P2)}{(Q1+Q2)}$$

Degrees of Supply Elasticity

When the supply curve is upward sloping, the elasticity of supply will be anything between zero and infinity. On the basis of the value of the coefficient of elasticity of supply we can classify it into the following five categories: (i) Perfectly inelastic supply, (ii) Inelastic supply, (iii) Unitary elastic supply , (iv) Elastic supply, (v) Perfectly elastic supply. Let us each one of them in detail.

(1) **Perfectly Inelastic Supply**

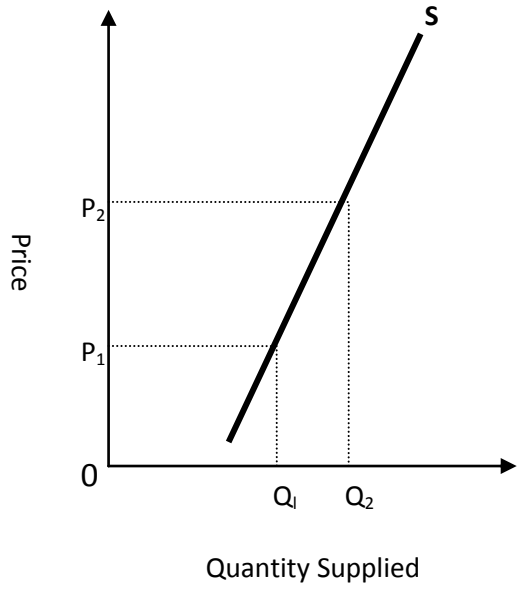
When the quantity supplied of a commodity does not change at all in response to the change in price, elasticity of supply is said to be perfectly inelastic. This is the case of zero elasticity (ε = o) and the supply curve will be vertical straight line, as shown below.



The supply curve has zero elasticity since the same quantity Q is supplied whatever the price.

(2) **Inelastic Supply**

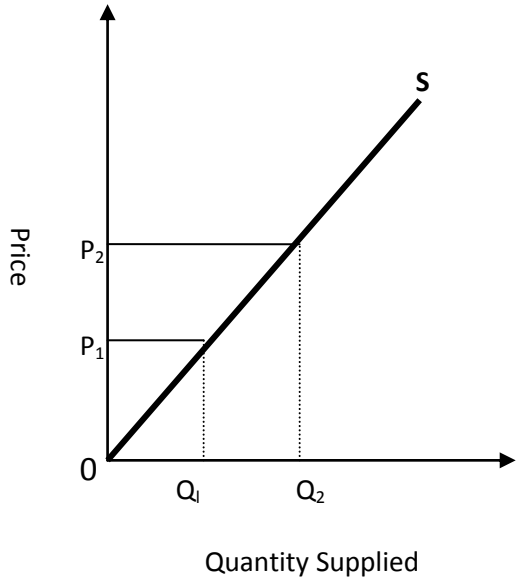
If the percentage change in quantity supplied is smaller than the percentage change in price, supply is said to be inelastic. The value of the coefficient of supply will be greater than zero but less than unity ($0<\varepsilon<1$). If a linear supply curve crosses or cuts the horizontal (quantity) axis, supply is inelastic, as shown below.



A change in price from P_1 to P_2 causes less than proportional change in quantity supplied from Q_1 to Q_2.

(3) Unitary Elastic Supply

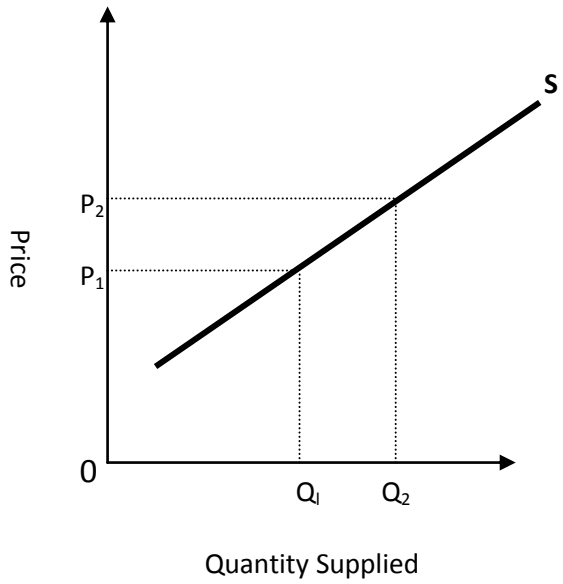
If the percentage change in quantity supplied is equal to percentage change in price, supply is said to be unitary elastic. The value of coefficient of elasticity will be equal to one ($\varepsilon = 1$) when supply is unitary elastic. If linear supply curve passes through the origin, supply is unitary elastic regardless of its scope. This is illustrated below.



The figure shows that any straight line has a unitary elasticity indicating that the percentage change in quantity equals the percentage change in price between any two points on the curve.

(4) Elastic Supply

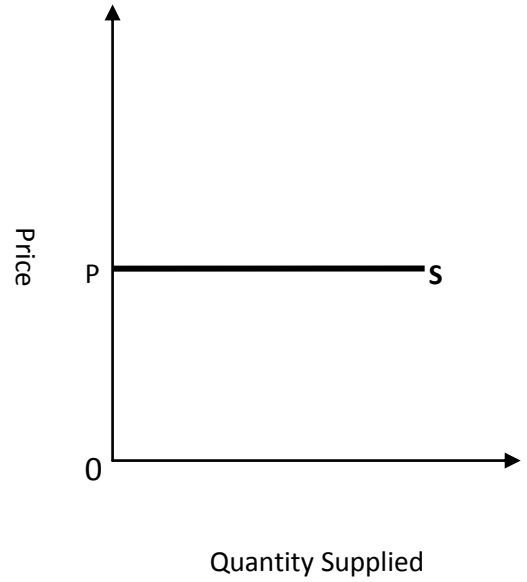
If the percentage change in quantity supplied is greater than percentage change in price, supply is said to be elastic. The value of the coefficient of elasticity will be greater than unity ($1<\varepsilon<$) when the supply is elastic. A linear supply curve indicates an elastic supply if it cuts the vertical (price) axis.



An increase in price from P_1 to P_2 causes more than proportionate increase in quantity supplied from Q_1 to Q_2.

(5) Perfectly Elastic Supply

At any given price infinite quantity is supplied, supply is said to be perfectly elastic. The coefficient of elasticity will be infinity ($\varepsilon=\infty$) when supply is perfectly elastic. Perfectly elastic supply curve is depicted by a horizontal supply curve parallel to quantity axis.



The supply curve has infinite elasticity at price OP. Nothing at all will be supplied at price below OP, while an infinitely large quantity will be supplied at price OP.

Determinants of Elasticity of Supply

The following are important factors that affect elasticity of supply

(1) Time

The time period under consideration has a significant effect on the price elasticity of supply. If the time period is very short, an increase in price does not significantly affect the quantity offered for sale. If a certain quantity of a commodity has already been produced and brought to the market, an increase in price does not cause a large quantity to be offered for sale, because the quantity is fixed. As the time period under consideration becomes longer, supply tends to become more elastic. Sellers will be able to respond more easily to changes in the prices of their products.

(2) Change in cost of Production

Elasticity of supply of a commodity depends upon the ease with which increases in output can be obtained without bringing about a rise in cost of production. It also depends on how easily producers can shift from the production of other products to the one whose price has risen. For example, if agricultural land and labor can be readily shifted from one crop to another, the supply of any one crop will be more elastic than if labor cannot be shifted.

(3) Storage Cost

The elasticity of supply for goods that are not perishable and can be stored at relatively low cost tends to be greater than that for perishables and goods with high storage cost. If price of item that can be stored cheaply falls, sellers may respond by withdrawing the items from the market and storing it. If the price of such an item rises, suppliers may be in a position to release some extra quantities from storage onto the market. These options may not be feasible in the face of high cost of storage.

(4) Responsiveness of Producers

The elasticity of supply for a product depends on the responsiveness of producers to change in price. If producers do not respond positively to the increases in prices, the quantity supplied of the product would not increase as a result of rise in its price. A producer is said to be rational if he raises the supply following the rise in price to maximize his profit. However, producers do not always exhibit profit maximizing behavoiur and as r result do not raise the supply in response to the rise in price.

(5) Production substitutes and complements

If a product has large number of substitutes in production, its supply is likely to be elastic. If the price of such a product falls, producers can shift resources into the production of any of the many substitutes. On the other hand, production complements are goods that are produced together. These are joint products. The supply of relatively minor joint product is likely to be inelastic.

Uses of Elasticity

Knowledge of elasticity of demand is very useful and often necessary in reaching correct decisions in business and government. The following are the important uses and applications of elasticity of demand.

(1) Pricing Decisions of Business Firms

The business firms must take into account the elasticity of demand when they take decisions regarding pricing of products. This is because change in price of a product will bring about change in quantity demanded depends upon the coefficient of elasticity. If the demand for the product of the firm happens to be elastic, then any attempt on the part of the firm to raise the price will bring about a fall in total revenue. Thus instead of gaining from the increase in price, it will lose substantial part of its revenue. On the other hand, if the demand for the product happens to be inelastic, then increases in price will lead to increase in total revenue. Thus, for fixing an optimum or profit maximizing price, the firm cannot ignore the elasticity of demand for the product.

(2) Government Tax Policy

The elasticity of demand is also significant in the field of tax policy by the government. Government must take into account the elasticity of demand for the product before imposing and/or tax on it. This is because it is only when tax is imposed on the commodity with price inelastic demand, which will raise a great deal of revenue of the government. At the same time, if the demand for the commodity is price elastic, a rise in price caused by tax will bring about large decline in quantity demanded and as a result government revenue will also decline

(3) Importance in international trade

The concept of elasticity of demand is also important in the field of international economics. The decisions of country's to undertake devaluation of their currencies or not to the improve balance of payment depends upon the coefficient of elasticity of exports. As a result of devaluation, rice of imports will increase and price of exports will fall. If the world demand for country's exports is inelastic, the fall in the prices of exports as a result of devaluation will lower their export earnings rather than increasing it. On the other hand, if the world demand for country's exports is elastic, then the fall in the prices of exports due to devaluation will bring about large increase in their quantity demanded which increase export earnings and will improve balance of payment position of the country.

THANK YOU

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