3. CONCEPT OF ELASTICITY

The quantity demanded of a good is affected mainly by
- changes in the price of a good,
- changes in price of other goods,
- changes in income and c
- changes in other relevant factors.

Elasticity is a measure of just how much the quantity demanded will be affected by a change in price or income or change in price of related goods.

Different elasticities of demand measures the responsiveness of quantity demanded to changes in variables which affect demand so:
1. **Price elasticity of demand**- measures the responsiveness of quantity demanded by changes in the price of the good
2. **Income elasticity of demand** – measures the responsiveness of quantity demanded by changes in consumer incomes.
3. **Cross elasticity of demand** – measures the responsiveness of quantity demanded by changes in price of another good

3.1. Price elasticity of demand

Assume that the price of coke increases by 1 %. If the quantity demanded consequently falls by 20%, then there is very large drop in quantity demanded in comparison to the change in price. The price elasticity of coke would be said to be very high.

If quantity demanded fall by 0.01%, then the change in quantity demanded is relatively insignificant compared to the large change in price and the price elasticity of coke would be said to be low.

Economists choose to measure responsiveness in term of percentage changes. So **price elasticity of demand** which is the degree of responsiveness in changes in quantity demanded to changes in price is calculated by using the formula:
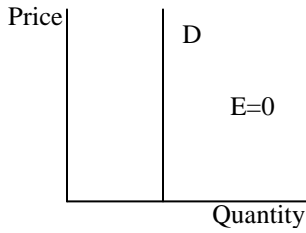
$$\frac{\% ChangeInQuantityDemanded}{\% ChangeIn\,Price}$$

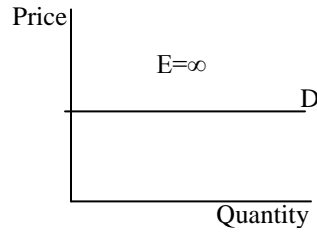| Change in price (%)	Change in quantity demanded (%)	Elasticity
10	20	2
50	25	0.5

$$\text{Price elasticity} = \frac{\% \Delta inQuantity}{\% \Delta in\,Price} \Rightarrow \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} \Rightarrow \frac{\Delta Q}{Q} \times \frac{P}{\Delta P} \Rightarrow \frac{P}{Q} \times \frac{\Delta Q}{\Delta P}$$
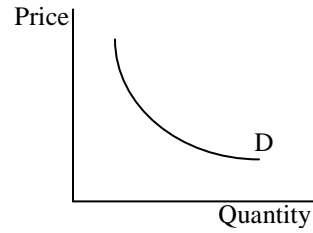
GRAPHICAL PRESENTATION

Perfectly inelastic (A)

Price

D

E=0

Quantity

Perfectly elastic (B)

Price

E=∞

D

Quantity

Unitary elastic (C)

Price

D

Quantity

	Verbal description of response to a change in price	Numerical measure of elasticity
Perfectly inelastic	Quantity demanded does not change at all as P changes	zero
Inelastic	Quantity demanded changes by a smaller percentage than does price	0 - 1
Unitary elasticity	Quantity demanded changes by exactly the same percentage as does price	1
Elastic	Quantity demanded changes by a larger percentage than does price	1 - infinity
Perfectly elastic	Buyers are prepared to purchase all they can obtain at some given price but none at all at a higher price	infinity

Calculate the following examples

1. Quantity demanded originally is 100 at a price of $2. There is a rise in price to $3 resulting in a fall in demand to 75. Calculate the price elasticity of demand and draw the graph.

2. Quantity demanded originally is 20 units at a price of $5000. There is a fall in price to $4000 resulting in a rise in demand to 32 units. Calculate the price elasticity of demand and draw the graph.

3.Explain whether you think that the following goods would be elastic or inelastic in demand if their price increased by 10 percent whilst all other factor remained constant.

A) petrol   B) fresh tomatoes   C) holidays offered by a major tour operator

D) Ford car   E) Mars bar   E) Music magazine

DETERMINANTS OF PRICE ELASTICITY OF DEMAND

Availability of substitutes – the better the substitute for a product the higher the price elasticity of demand will tend to be. For instance salt has few substitutes. When price of salt increases, the demand will change a little, thus elasticity is low. On the other hand, spaghetti has many substitutes – other pastas, rice, potato, bread etc. Increase in price of spaghetti when all other food prices remain constant is likely to have a significant affect on the demand for spaghetti. Elasticity of demand for spaghetti is likely to be higher than that for salt.

Time – the longer the period of time, the more price elastic is the demand for a product. It is argued that in the short term, buyers are often locked into spending patterns through habit, lack of information or because of durable goods that have already been purchased. In the long run, they have the time and opportunity to change those patterns.

Necessities – It is argued that necessities have lower price elasticities than luxuries. Necessities by definition have to be bought whatever their price in order to stay alive, so an increase in price of necessities will barely reduce the quantity demanded. E.g. bread, milk, etc. Similarly luxuries are those goods that are not essential for existence. A rise in the price of luxuries should therefore produce a proportionate large fall in demand e.g. large cars, holidays.

Necessities are _____

Luxuries are _____

Example of necessities_____

Example of Luxuries _____

Relatively inexpensive goods – people are less likely to change their buying habits when the price of something that is relatively inexpensive increased or decreased. If for example the price of an item were doubled from 10 to 20, it would have less of an effect on demand even if the price had gone from 250 to 500.

Exercise:

Smoking is on the increase again in industrialized countries. In the 1970 and 1980s the numbers of smokers tended to decline. However, the 1990s have seen the start of reversal of the trend mainly because of an increase in the number of teenage smokers, particularly girls. There seems to be only a weak link between prices and tobacco smoking. In the UK, for instance, between 1980 and 1986, a large increase in real cigarette prices coincided with a small decline in the number of cigarettes that smokers consumed. Other factors seem to be more important in determining smoking.

The fall in consumption in the early 1980s, for instance coincided with a deep recession in the economy when unemployment rose from 1.5 million to 3 million. Rising awareness of health risks has also cut smoking, particularly amongst professional middle aged workers. Some have argued that the way forward is to deregulate the nicotine market. The main health hazards come not from nicotine but from tar and carbon monoxide associated with the smoking of cigarettes. At the moment, only tobacco companies and manufacturers of patches, gums and inhalers are licensed to sell nicotine based products. If any company could develop and sell nicotine products, there is a chance that one would come up with a safe nicotine delivery system which could compete with the cigarette.

- Explain what, according to the article is the price elasticity of demand of cigarettes.
- What might be the effect on price elasticity of demand for cigarettes if a manufacturer sold a nicotine based product which proved a satisfactory alternative to cigarettes?

3.2 Income elasticity of demand

The demand for a good will change if there is a change in consumers` income.
Income elasticity of demand is a measure of how much the quantity demanded of a good responds to a change in consumers' income.
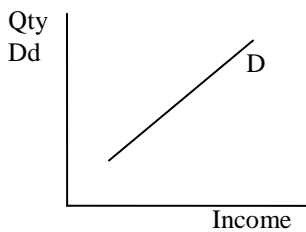Formula for measuring income elasticity of demand is

$$E_Y = \frac{\% \Delta in\,Quantity\,Demanded}{\% \Delta in\,Income} = \frac{\frac{\Delta Q}{Q}.100}{\frac{\Delta Y}{Y}.100} \Rightarrow \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} \Rightarrow \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

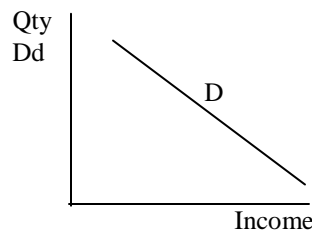So if there is a 20 % rise in demand when incomes rise by 5%, the $E_Y = 4$
But if there is a rise in income by 10% which cause a fall demand for inferior goods by 5%, the $E_Y = -0,5$

Normal goods: Any goods whose income elasticity of demand is greater than zero. Examples of items with a high income elasticity of demand are holidays and recreational activities, whereas washing up liquids tends to have a low income elasticity of demand.
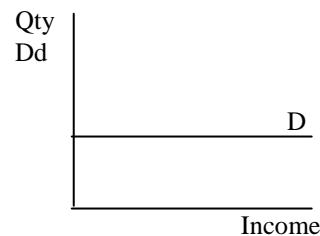
(A)

(B)

(C)

Positive Income Elasticity can be divided into 3 categories:
1. Income inelastic $\rightarrow E_Y < 1$ (Dd rises by a smaller proportion as Y)
2. Unit income elasticity $\rightarrow E_Y = 1$ (Dd rises by exactly the same proportion as Y)
3. Income elastic $\rightarrow E_Y > 1$ (Dd rises by a greater proportion than Y)

Question1 – Calculate the income elasticity of demand

Original		New		Income Elasticity num. value
Quantity demanded	Income	Quantity demanded	Income	
100	10	120	14	
15	6	20	7	
50	25	40	35	
12	100	15	125	
200	10	250	11	
25	20	30	18	

3.3 Cross elasticity of demand

The quantity demanded of a particular good varies according to the price of other goods. A rise in price of a good such as beef would increase the quantity demanded of a substitute such as pork;
On the other hand a rise in price of a good such as tennis racket would lead to a fall in quantity demanded of a complement such as tennis ball.

Cross elasticity of demand is a measure of how much the quantity demanded of one good responds to a change in the price of another good.
The formula for calculating the cross elasticity of demand for good is X:

$$E_X = \frac{\% \Delta in Quantity DemandedOfGoodX}{\% \Delta in\Pr iceofAnoth erGoodY} = \frac{\frac{\Delta Q_X}{Q_X}.100}{\frac{\Delta P_Y}{P_Y}.100} \Rightarrow \frac{\Delta Q_X}{Q_x} \times \frac{P_Y}{\Delta P_Y}$$

Two goods, which are **substitutes**, will have a **positive** cross elasticity.
Two goods, which are **complements**, will have a **negative** cross elasticity.

The cross elasticity of two goods which have little relationship to each other would be zero e.g. a rise in the price of cars of 10% is likely to have no effect (0%) change on the demand for tipp-ex.

Question1
Explain what value you would put on the cross elasticity of demand of:
c) Gas for electricity   b)tennis shorts for tennis rackets   c) Luxury cars for petrol
e) d) paper for tights   e) compact discs for audio cassettes f) Virgin Cola for Coca Cola

Question 2
The demand and supply schedule below relate to the price of ice – cream

Price per ice-cream	Quantity demanded per month	Quantity supplied per month
60p	1 000	8000
50p	2500	5500
40p	4000	4000
30p	5500	3000
20p	7000	2000

1. Plot and label on an appropriate graph of demand and supply for ice cream
2. What is the market price and quantity traded?
3. Imagine now that the supply of ice-cream increases by 2500 at every possible price.
   A) Draw the new supply curve
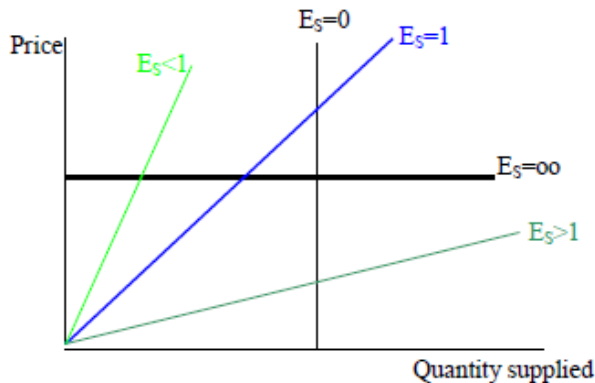   B) What is the new market price and quantity traded?

4. Calculate the price elasticity of demand for ice-cream between the original market price and the new market price. Comment on its value, and what has happened to ice cream producers' revenue?
5. The cross elasticity of demand between frit salad and ice-cream is 7. What type of goods are they?
6. A 20% rise in the total income of the economy Has caused the demand for ice-creams to rise by 3000 at each and every price.
   a) Draw in the new demand curve on the same graph
   b) What is the new market price and quantity traded?
   c) Calculate the income elasticity of demand for ice-creams if demand has risen. Comment on its value and state what type of good ice-cream is.

3.4 Price elasticity of supply

Price elasticity of supply measures the responsiveness of quantity supplied to changes in price
The formula for measuring price elasticity of supply is:

$$ES = \frac{\%\Delta inQuantity\,Supplied}{\%\Delta in\,Price} = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} \Rightarrow \frac{\Delta Q}{Q} \times \frac{P}{\Delta P} \Rightarrow \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

1. $E_S=0$ – perfectly inelastic supply – no response in supply to the change in price – quantity supplied of a commodity remains the same whatevet its price
2. $E_S<1$ – inelastic supply
3. $E_S=1$ – unitary elastic supply - % change in quantity supplied is the same as the % change in price
4. $E_S>1$ – elastic supply
5. $E_S=\infty$ – perfectly elastic supply – producers are willing to supply as much as they can at one particular price and supply nothing at any other price

EXAMPLE
Below is the supply schedule for daffodils in the springtime.

Price per bunch of five daffodils	Quantity supplied per month
$1	10 000
$2	12 000

$$\%\text{ change in quantity supplied} = \frac{12000-10000}{10000} \times 100 = 20\%$$

$$\%\text{ change in price} = \frac{2-1}{1} \times 100 = 100\%$$

$$E_s = \frac{\%\Delta inQuantitySupplied}{\%\Delta in\,Price} = \frac{20}{100} = 0.2$$

The price elasticity of supply of daffodils is less than one, that is supply is price inelastic. This is because even if there is a large rise in price more daffodils cannot be grown very quickly.

Exercise
Below are the supply schedules for natural rubber and man-made rubber.

Price per kg	Quantity supplied of natural rubber per month
$ 0,80	1 000
$ 1,00	1 100
Price per kg	Quantity supplied of man-made rubber per month
$ 0,80	2 000
$ 1,00	2 800

1. Calculate the price elasticity of supply for natural rubber and man-made rubber.
2. Comment on their values and suggest reasons why they differ.

<center>**Determinants of elasticity of supply**</center>

1. The availability of resources (substitutes)
Substitutes here are not consumer substitutes, but producer substitutes. These are goods, which a producer can easily produce as alternatives.
For instance one model of car is a good producer's substitute for another model. On the other hand oranges don't have so many substitutes, which mean that the farmer cannot easily switch from the production of oranges to car production.
- If a product has many substitutes, then producers can easily alter the pattern of production if its price rises or fall. Its elasticity will be relatively high.
- If producer have no alternative to substitute goods and it is difficult to change the pattern of production if the prices changed, the price elasticity of supply will be low.

If a firm wishes to expand production it will need more of the factors of production of land, labour and capital. If the economy is already using most of its scarce resources then firms will find it difficult to employ more and so output will not be able to rise. The supply of most goods and services will therefore be price inelastic.
If, however, there is much unemployment of resources, for example, labour, firms will be able to use them when they want to raise output and supply will be more price elastic.
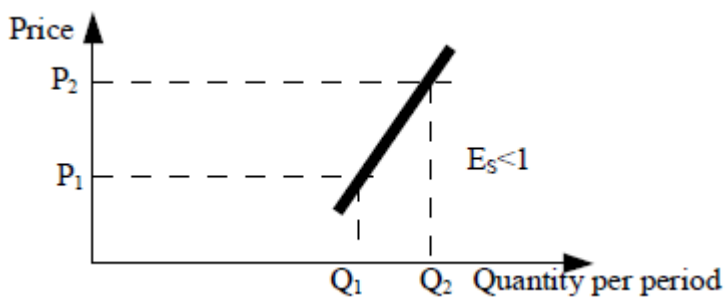
2. Time
The daffodil example illustrates how the price elasticity of supply can vary over time. Supply of most goods and services, including daffodils, will be fixed at any one moment in time.
For example, a shop will only have a certain amount of records, books, joints of beef. A market still will only have a fixed amount of daffodils to sell. It will take time to get more of these things. In this special case the supply curve is a vertical line showing that whatever the price the quantity
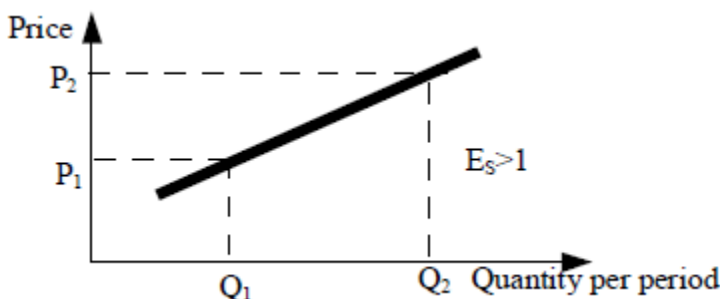supplied will be the same.

Perfectly price inelastic, that is, price elasticity of supply is 0,when supply at any one moment is fixed-**momentary period**

In the short run, firms can produce some more goods for sale, but only by using more labour, that is, by working overtime or employing more workers. More daffodils can be picked and sent to the market as price rises. However, supply can only rise a little because the amount of land, seeds and the season needed to grow the daffodils, will soon run out.

Supply is **price inelastic** in the **short run**. – A rise in price from P1 to P2 causes only a small extension in supply from Q1 to Q2.

In the long run, firms can obtain more labour, land and capital to expand their scale of production, so in the long run supply becomes more price elastic.

Supply is **price elastic** in the **long run** - a rise in price from P1 to P2 causes a large extension in supply from Q1 to Q2.