MODULE II DEMAND & SUPPLY ANALYSIS

MARKET

- TYEPS OF MARKET

DEMAND

- TYPES OF DEMAND
- DETERMINANTS OF DEMAND
- DEMAND FUNCTION
- LAW OF DEMAND & DEMAND THEORY
- DEMAND SCHEDULE & DEMAND CURVE
- MARKET DEMAND

SUPPLY

- STOCK & SUPPLY
- DETERMINANTS OF SUPPLY
- SUPPLY FUNCTION
- LAW OF SUPPLY
- SUPPLY CURVE & SUPPLY SCHEDULE
- MARKET SUPPLY
- CHANGES IN SUPPLY CURVE
- CHANGES IN DEMAND CURVE
- MARKET EQUILIBRIUM

ELASTICITY OF DEMAND & SUPPLY

- PRICE ELASTICITY OF DEMAND
- TYPES OF ELASTICITY
- CROSS-PRICE ELASTICITY OF DEMAND
- INCOME ELASTICITY OF DEMAND
- PRICE ELASTICITY OF SUPPLY
- FACTORS DETERMINING ELASTICITY OF DEMAND & THEIR PRACTICAL APPLICATIONS
- AVERAGE REVENUE, MARGINAL REVENUE & ELASTICITY OF DEMAND

MARKET

In economics, the concept of market is any structure that allows the buyers and sellers to exchange any type of goods, services and information. The exchange of goods or services, with or without money is a transaction.

There are 7 major types of markets. They are:-

1. Perfect competition.

* A perfectly competitive market has a large number of buyers and sellers.
* The buyers mainly focus on homogenous products.
* There is no restrictions on entry or exist to and from the market.
* Government interference is absent or very little in this kind of a market.

2. Monopolistic Market

A monopolistic market has only a single seller. The entire supply to the market is controlled by a single seller or a firm.

3. Oligopoly

Supply to an oligopolistic market is controlled by a few sellers or firms. The exact number of firms is not defined.

* firms under oligopoly are interdependent. A change in output or price by one firm evokes reactions from other firms in the market.
* Under oligopoly, firms are in a position to influence the prices. However, they try to avoid price competition for the fear of price war. They follow the policy of price rigidity.

Barriers to entry of firms.

* The main reason for few firms under the oligopoly is barriers, which prevent entry of new firms to the market. Patents, requirement of large capital, control over crucial raw materials etc. are some of the reasons.

* Due to severe competition and interdependence of the firms, various sales promotion techniques are used to promote the product. firms under oligopoly relies more on non-price competition. Selling costs are more important under oligopoly

* Under oligopoly, price & output decisions of a particular firm directly influence the competing firms. Instead of independent price and output strategy, Oligopoly firms prefer group decisions that will protect the interest of all the firms.

* The firms under oligopoly may produce homogenous or differentiated products.

* If the firms produces homogenous product, the industry is called pure or perfect oligopoly.

* If firms produce differentiated products, the industry is called differentiated or imperfect oligopoly.

* Demand curve faced by an oligopolist is uncertain/ indeterminate.

4. Monopolistic Competition.

Monopolistic competition refers to a market situation in which there are large number of firms which sell closely

related but differentiated products.

* There are large number of sellers in monopolistic competition.
* Each firm is in a position to exercise some degree of monopoly through product differentiation.
* Selling costs contribute a substantial part of the total cost under monopolistic competition.
* Firms are free to enter into or exit from the industry at any time they wish.
* Buyers and sellers do not have perfect knowledge about the market conditions.
* Every firm has partial control over the price. The extent of power of control over price depends upon how strongly buyers are attached to the brand.
* The demand curve is downward sloping.

5. Monopsony

A monopsony is a market condition in which there is only one buyer, the monopolist.

* monopsony has imperfect market conditions.
* These are common to areas where they supply most of or all of the region's jobs.
* The buyer is the controlling entity in such a market.

6. Duopoly

This is a type of oligopoly where two firms have control over the market.

* There exists only two sellers in duopoly
* The firms are interdependent.
* Cournot's Model & Bertland's Model are 2 popular models of duopoly.

7. Bilateral Monopoly

A bilateral monopoly exists when a market has only one supplier and one buyer. The supplier will tend to act as a monopoly power look to charge high prices to the buyer. The done buyer will look towards paying a price as low as possible.

DEMAND

Demand is an economic principle referring to a consumer's desire to purchase goods and services and willingness to pay.

Types of Demand :-

1. Joint Demand

This is when a person needs multiple goods or services to fulfill his want

eg:- Pen, paper, ink to write.

2. Direct and Derived Demand.

Direct demand is when the goods and services are demanded by the consumers to satisfy their wants directly.

Indirect demand refers to the demand for a commodity to be used in the ~~production~~ production of some other commodities.

3. Composite demand

Composite demand is where goods have more than one use.

4. Price Demand

Price demand is the change in demand for a product due to the change in its price.

5. Income Demand.

The change in demand due to the change in income of the consumer is called income demand.

6. Cross Demand.

Cross demand is the change in demand for a product due to a change in the price of another product.

DETERMINANTS OF DEMAND

Demand for a product is determined by various factors. Major among them are:-

1. Price of a commodity

Law of Demand :— there is an inverse relationship between price of commodity and quantity demanded, Ceteris paribus.

2. Income

There is a direct relation between income and quantity demanded for a product. But the policy

may vary according to the nature of the commodity as normal, inferior or luxury goods.

3. Price of Related Goods.

Price of a related good, i.e, substitute and compliments, has effect on the demanded quantity of a commodity.

~~def~~ The relation between change in quantity demanded of a commodity in pair with change in price of a substitute good is direct.

There is an inverse relationship between change in quantity demanded for a commodity and change in the price of its complementary good.

4. Tastes and Preferences

Tastes and preferences of a consumers affect the demand for a commodity directly. ~~Current~~ contemporary trends have thus a great influence over demand for products.

5. Business Conditions.

The demand for overall goods and services are highly influenced by the condition of economy as boom, recession etc.

6. Income of consumers

The level of income of individuals determines their purchasing power. Generally, income and demand are directly proportionate to each other.

7. Government Policies

This includes the actions taken by the government to determine the fiscal policy and monetary policy.

8. Supply of money

Supply of money and instances like inflation and deflation has a heavy effect on market.

Demand Function

Demand function shows the functional relationship between quantity demanded and various determinants of demand.

According to the Law of Demand, $Q_x = f(P_x)$.

Q_x = Quantity demanded of x

P_x = Price of x

Linear equation for this is $Q_x = a - bP_x$, assuming -

* Inverse relation between Q_x and P_x
* Other things are constant
* a & b are the parameters

Demand Schedule

Demand schedule is the tabular representation of quantity demand of a commodity.

eg:-

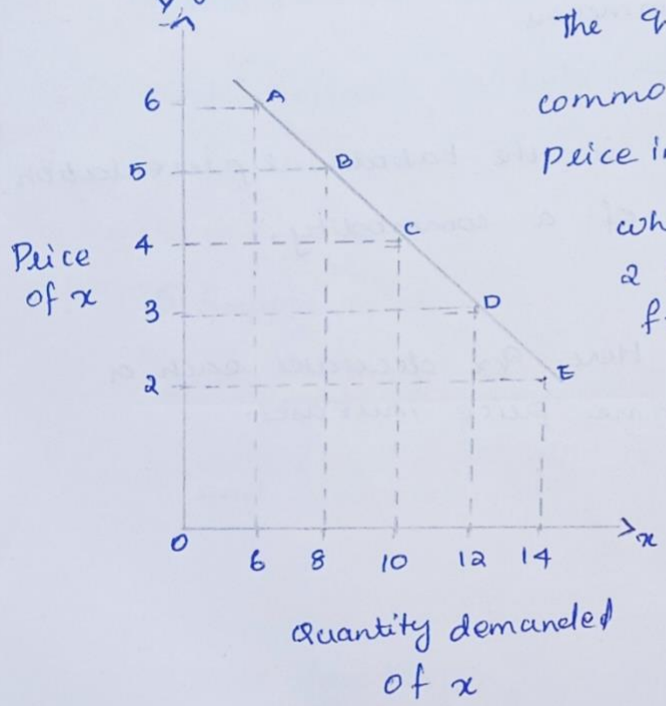
Q_x	P_x
14	2
12	3
10	4
8	5
6	6

Here, Q_x decreases each a time price increases.

Demand Curve

Demand curve is the graphical representation of Law of Demand.

eg :—



The quantity demanded for the commodity decreases when the price increases.

when price increased from 2 to 3, quantity decreased from 14 to 12.

Market Demand

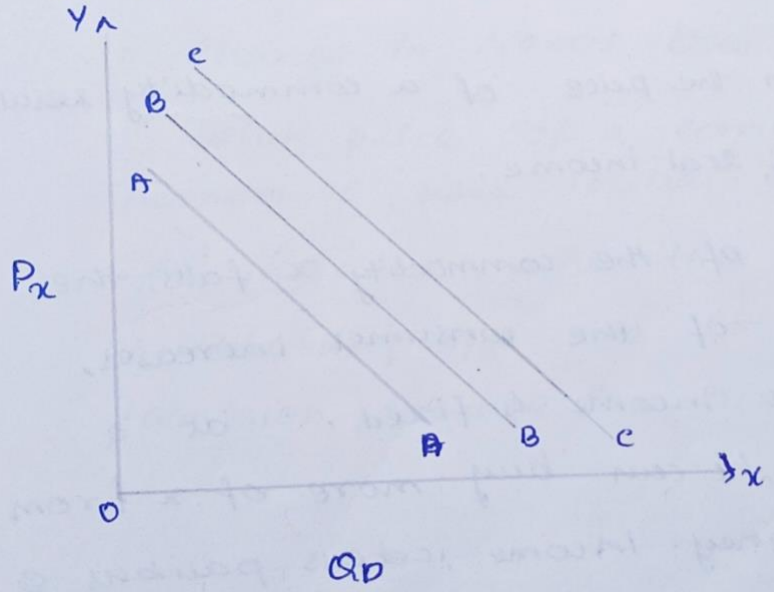
Market demand is the aggregate demand as the sum total of quantities demanded by all buyers.

The tabular representation of market demand is called market demand schedule.

eg:-

P_x	Q_A	Q_B	Q_C	MD $(Q_A + Q_B + Q_C)$
10	3	4	5	12
8	4	5	6	15
6	5	6	7	18
4	6	8	8	22
12	8	9	10	27

The graphical representation of market demand is called market demand curve.



Slope of Demand Curve

There are five major reasons behind the downward or negative slope of demand curve.

1. Diminishing Marginal Utility

This theory was proposed by Alfred Marshall.

Law of Diminishing Marginal utility states that the satisfaction we gain from buying a product lessens as we buy more of the same product. As we use more of a product, we are not willing to pay as much for it. Therefore, the demand curve is downward slopping.

2. Income Effect.

The change in the price of a commodity results in a change in real income.

* When price of the commodity x falls, the real income of the consumer increases, assuming his income is fixed, ∴ at a lower price, he can buy more of x from same money income, ceteris paribus & demand will rise and vice versa.

3. Substitution Effect

This occures due to change in price of substitute good of a commodity.

There is a positive relationship between change in price of a commodity and the change in quantity demanded for its substitute good.

4. Change in No. of consumers

There is an inverse relationship between change in price of a commodity and no. of consumers willing to buy it.

* when price of x goes up, the quantity demanded will fall and vice versa.

5. Change in No. of Uses.

When price of a commodity changes, number of uses it has also changes.

for instance, when the price of electricity is reduced, people use it for cooking, running television, operate fans, air conditioners etc.

SUPPLY

The total amount of a commodity offered to be sold by the sellers at a particular point of time at a particular price is called supply.

The total amount of commodity brought to the market is the stock. A fraction of this stock is put for sale at different periods of time with different prices. The presence of price differentiates supply from stock.

Determinants of Supply

There are various elements that determine supply. Some of them are:-

* Price of commodity
* technology
* Price of factors of production
* price of other commodities
* objectives of the firm
* Governmental policies
* Number of firms
* future price expectation
* Natural factors
* Discovery of new raw materials.

1. Price of commodity

There is a positive relationship between price and quantity supplied.

Law of Supply states that, other things remaining the same, an increase in price results in an increase in quantity supplied.

2. Technology

This is related to the technological assistance in the firm.

* A firm can only meet the demands of the market with adequate level of technology.
* Inadequate level of technology can also result in relatively less output and more time consumed increasing cost of production.

3. Prices of factors of production.

An increase in the price of factors of production affects cost of production, may result in reduced output and this naturally decreases supplied quantity.

4. Prices of related commodities.

This applies to substitutes and complements.

* when the price of substitute increases, its supply also increases, as per the law of Supply, outnumbering the related good.

In case of the complementary goods, when the price of one good increases and so does the supply, the quantity supplied of the related good goes up too.

5. Objectives of the firms.

Firms usually have two aims or motives :-

* profit maximization
* sales maximization

Depending on the aim of the firm, the quantity supplied varies. Aiming to maximise sales, a firm will increase its supply and if its profit maximization, it's vice versa.

6. Government Policy

Government policies can affect the cost of production and supply curve through taxes, regulations & subsidies.

* Taxes are treated as cost by producers. Higher costs decreases production and supply
* Government subsidies reduce the cost of production and increase supply at every given price, shifting

supply curve to the right.

7. No. of Firms

In terms of total supply to the market, the no. of firms in the market will affect it. New firms in a market will increase market supply & firms leaving will reduce supply.

8. Future Price Prediction

Sellers look forward to get maximum profit from their products. If they expect the price of a product to go up in the future, they will supply less quantity and keep the rest as stock to supply when price goes up. The current supply will be less.

Supply will be more if the anticipated price in the future is low.

9. Natural Conditions

If rainfall is plentiful, timely and well-distributed, there will be bumper crops. Whereas floods, droughts or earthquakes and other natural calamities affect production adversely.

10. Discovery of New Raw Materials

When new raw materials for a producing a commodity are discovered, it usually speeds up the production, increasing supply.

Supply Function

The functional association between supply of a good/service to its determinants is called Supply Function.

$$Q_S = f(P, T, F_0, G \ldots\ldots)$$

Law of Supply

Law of supply states that, ceteris paribus, an increase in price results in an increase in the quantity supplied.

$$(p - p')(y - y') \geq 0$$

p = price of product in market if supply is y

p' = price of product in market if supply is y'

y = qty. of supply is price is p

y' = qty of supply is price is p'

$$Q_x^S = \Phi(P_x, \overline{Tech}, \overline{S_i}, \overline{F_n}, \overline{X_i}, \ldots)$$

Q_x^S = Qty. supplied of x

Φ = function of

P_x = Price of x

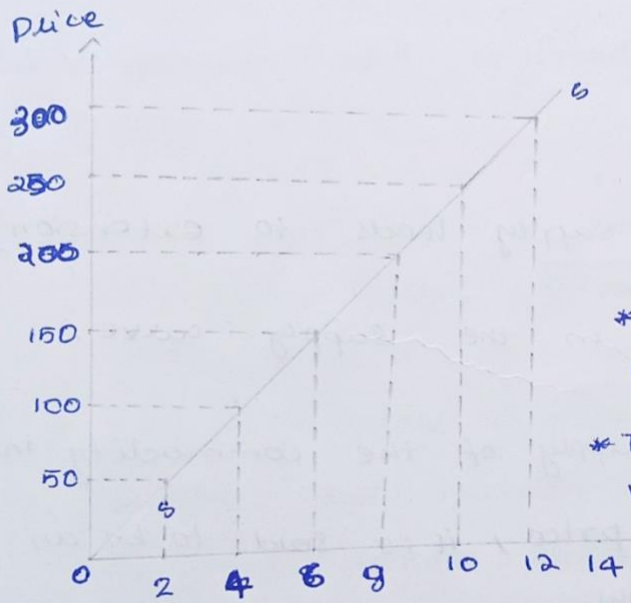
Tech = Technology

S = Supply of inputs

F = Features of nature (Natural factors)

X = Taxes / Subsidies

Supply curve



*when P_x goes up from 50 to 100, q_x also increases from 2 to 4. As the price increases, so does the q_s.

*Supply curve has an upward sloping curve.

*The relation between two variables are positive

The graphical representation of supply is called supply curve. Whereas the tabular representation of supply is supply schedule.

Market Supply

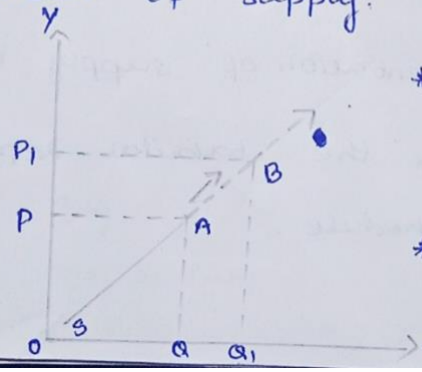
The aggregate supply or the sum total of all the quantities supplied of a product by each seller is the market supply.

Market supply showed in tabular method is market supply schedule and market supply curve is represented in graphical form.

Changes in Supply

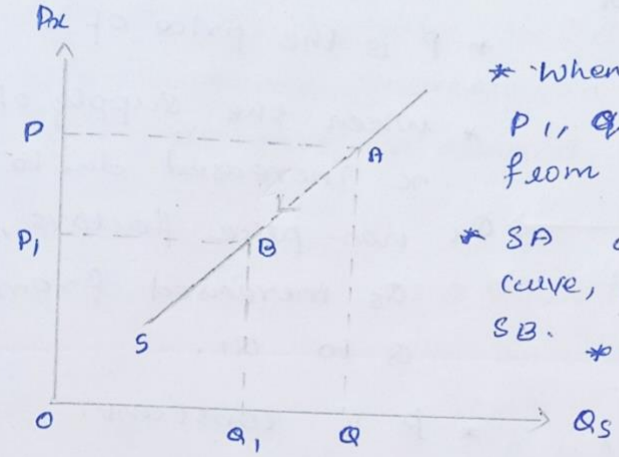
A change in supply leads to extension, contraction or shift in the supply curve.

(a) when the supply of the commodity increase due to rise in price, it is said to be an extension of supply.



* when Px increased from P to P1, Qx also raised from Q to Q1.
* The supply curve extended from SA to SB. $\overline{AB}$ is the new extension

(b) When the supply of a commodity decreases as a result of decrease in its price, it is called contraction of supply.



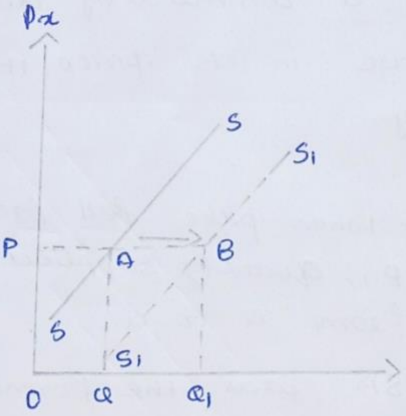
* When price fell from P to P1, quantity supplied decreased from Q to Q1.
* SA was the former supply curve, which contracted to SB.
* BA shows the contraction of supply

→ Expansion and contraction happen along the supply curve

(ii) When there is a change in supply due to non-price factors, it causes a shift in supply curve.

* The right ward movement of supply curve denotes and increase in supply and a leftward movement denotes decrease in supply.

→ Change in supply and change in quantity supplied are not the same.



* SS is the original supply curve.
* P is the price of x.
* When the supply of x increased due to non-price factors, Qs increased from Q to Q1.
* P is constant.

* AQ ∥ BQ1

∴ AB = QQ1

AB is the change / shift happened in the supply of x.

Changes in Demand Curve

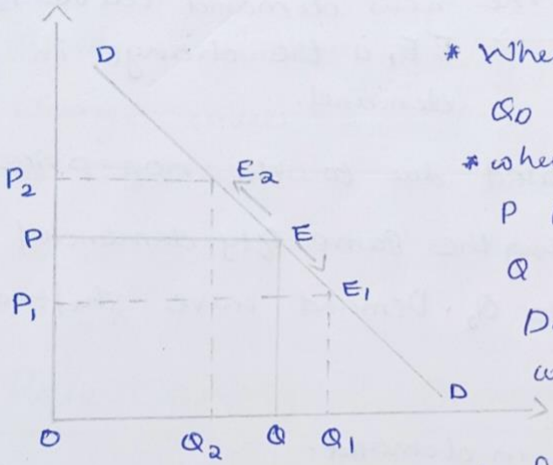
A change in demand leads to change in demand curve. It can be contraction, expansion or shift in demand.

(a) when demand for a commodity increases due to a fall in its price, it is called extension of demand.

(b) when there is a decrease in demand due

to rise in price, it is said to be a contraction in demand.

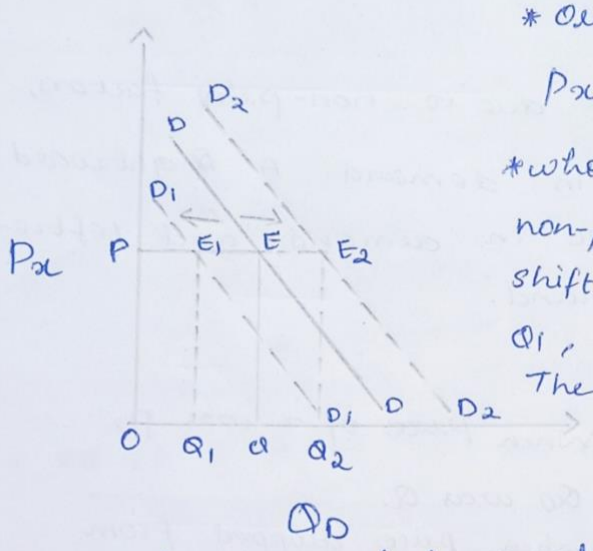
* Change in demand due to non-price factors, it causes a shift in demand. A Rightward shift means increase in demand and leftward decrease in demand.



* When Price of x was P, Q_0 was Q.
* when price dropped from P to P_1, Qd rose from Q to Q_1, EE_1 ~~in the ext~~ Demand curve move downward to E_1 from E. DE became DE_1.

* when P_x increased from P to P_2, Qd was reduced to Q_2 from Q_1. Demand curve DE contracted to DE_2. E_2E is the contraction occured in this case. Movement along the curve is upwards.

(c) The change in demand due to non-price factors is the shift in demand. A rightward shift of demand curve means increase in demand and a leftward shift denotes decrease in demand.



* Originally, Q was the Q_D when P_x was p. Dd curve is DD

* when demand decreased due to non-price factors, demand curve shifted leftwards, Q moved to Q_1, with p remaining the same. The new demand curve is D_1D_1. EE_1 is the change in demand.

* when demand increased due to the non-price factors, price remaining the same, Qty. demanded increased from Q to Q_2. Demand curve shifted from DD to D_2D_2.

EE_2 is the change in demand.

Market Equilibrium

The market condition where quantity demanded and quantity supplied is equal is called market demand. The market will be stagnant / constant at this point.

$$Q_D = Q_S$$

* when demand exeeds supply, there will be an exiess dimanel. ($Q_D > Q_S$)

* If demand is loss than supply, it is called exiess supply. ($Q_D < Q_S$)

The peice at equilibeicum is called competitive peice or market clearing peice and it tends not to change cinless demand or supply changes. The qty. at equilibeicum is called competitive quantity or market clearing quantity.

Peice Elasticity of Demand

Price elasticity of Demand of a commodity is the degree of responsiveness of the quantity demanded to its price. It measures the change in consumption of a good in relation to the change in price.

→ η (ETA) represents price elasticity of a commodity

$$\eta = \frac{\%\text{ change in } Q_D}{\%\text{ change in } P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Types of Elasticity

There are 5 types of elasticity.

(1) Perfectly elastic
(2) perfectly inelastic
(3) Relatively elastic
(4) Relatively inelastic
(5) Unitary elastic

(1) Perfectly elastic

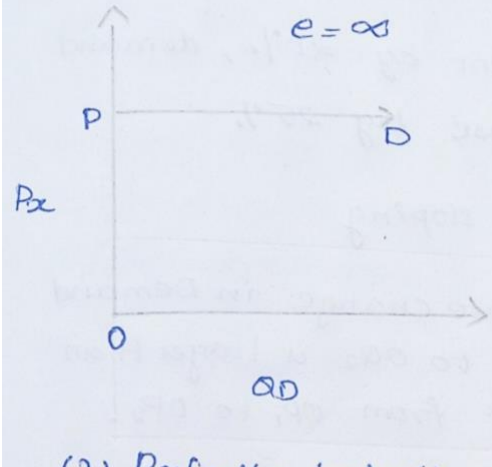
Perfectly elastic price demand is when a small change in price of the commodity causes huge change in demand.

* a small rise in price may make demand fall to 0.
* a small fall in price may make demand to ∞

$e(p) = \infty$

⟶ Degree of elasticity of a demand defines the shape and slope of demand curve. Flatter the slope of Demand curve, higher the elasticity of Demand.

* In perfectly inelastic demand, demand curve is a straight line.

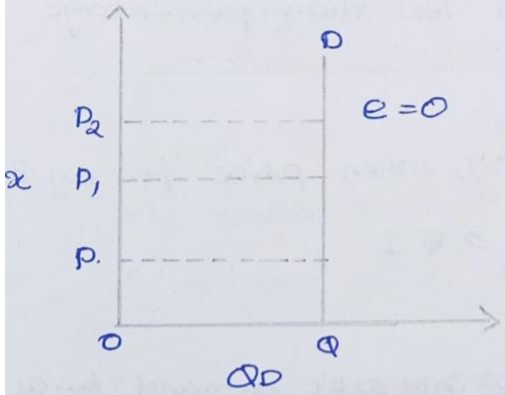


* this is a theoretical concept & can't be applied in real life.
* this can be applied, however, to perfectly competitive market & homogenous products where demand is assumed to be perfectly elastic.

(2) Perfectly Inelastic

In a perfectly inelastic condition, change in price has no effect on demand.

* $ep = 0$
* Demand curve is a vertical straight line.



* There is change in quantity when price moved from p to p_1 and then p_1 to p_2. QD is constant.
* This is also a theoretical concept and can be applied only to essential goods like salt.

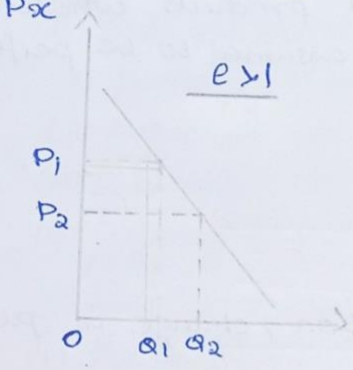
(3) Relatively Elastic

In case of relatively elastic demand, proportionate change in demand will be greater than proportionate change in price of the commodity.

* numerical value ranges between 1 to ∞
* Mathematically, this is known as 'more than unit elastic demand'.

$e_p > 1$. eg :— If p_x went by 20%, demand may increase by 25%.

* Demand curve is gradually sloping



* Proportionate change in Demand from OQ_1 to OQ_2 is larger than that in p_x from OP_1 to OP_2.

* This has practical applications as demand for many products respond the same way to change in prices.

(4) Relatively Inelastic

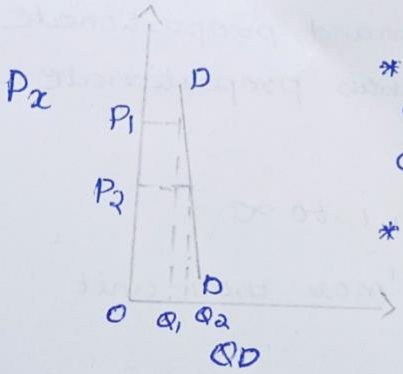
Percentage change in demand is less than percentage change in price.

eg :- If demand went up by 10%, when price fell by 3%.

* numerical value is between 0 & 1.

$e_p < 1$

* Marshall has termed relatively inelastic demand as 'elasticity being less than unity'.



* change in demand from OQ_1 to OQ_2 is smaller than change in price from OP_1 to OP_2 in proportion.

* This has practical applications.

eg:- Price of milk Q_D

15 100

20 90

Sol. $P = 15$ $\Delta P = P_1 - P = 20 - 15 = 5$

$Q = 100$ $\Delta Q = Q_1 - Q = 90 - 100 = +10 = 10$

$P_1 = 20$

$Q_1 = 90$

$$e(p) = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \frac{10}{5} \times \frac{15}{100} = 2 \times 0.15 = 0.3$$

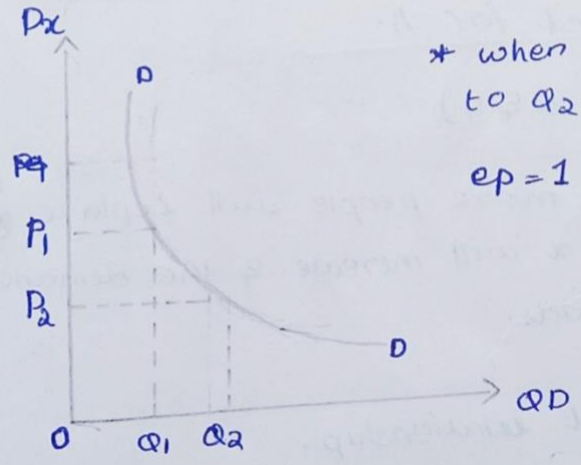
$0.3 < 1$

(5) Unitary Elastic

Unitary elastic demand is when proportionate change in demand is equal to proportionate change in price.

* numerical value is 1 [ep=1]

* Demand curve is a rectangular hyperbola.



* when P_1 moved to P_2, Q_1 increased to Q_2. $P_1 P_2 = Q_1 Q_2$

ep = 1

Cross Elasticity of Demand

Cross-price elasticity of demand measures percentage change in qty. demanded for a good to percentage change in price of another good, ceteris paribus. This is applied specifically to related goods, i.e, substitutes and compliments.

$$CED = \frac{\%\text{ change in } Q_D \text{ of product A}}{\%\text{ change in Price of product B}}$$

*In complementary goods, there will be a negative CED.
*In supplementary goods, there will be a positive CED.

→ Complements :- (goods A & B)

*If price of B goes up, qty. demanded for A is reduced. This causes a leftward shifting demand curve of A.
*There is an inverse relationship between price of B and qty. demanded for A.

→ Supplements :- (goods x & y)

*If price of y goes up, more people will replace y with x, the demand for x will increase. & the demand curve shifts rightwards.

*Here exists a direct relationship.

$$E_c = \frac{\frac{\Delta Q_x}{Q_x}}{\frac{\Delta P_y}{P_y}} = \frac{\Delta Q_x}{Q_x} \times \frac{P_y}{\Delta P_y}$$

$$EC = \frac{P_y}{Q_x} \times \frac{\Delta Q_x}{\Delta P_y}$$

→ If elasticity is 0, that means the goods are unrelated.

CED ≥ 1 - elastic
CED ≤ 1 - Inelastic
CED $= 1$ - unitary

Income Elasticity

Income elasticity is the degree of responsiveness of qty. demanded for a commodity to a change in the income of the consumer.

* It is measured as ratio of % change in qty. demanded to % change in Income.

$$Ed = \frac{\Delta D/D}{\Delta I/I} = \frac{\Delta D}{D} \times \frac{\Delta I}{\Delta I} = \frac{\Delta D}{\Delta I} \times \frac{I}{D}$$

$$Ed = \frac{\Delta D}{\Delta I} \times \frac{I}{D}$$

* $-Ed$ = inferior goods
* $+Ed$ = normal goods
* $Ed \leq 1$ = necessary good
* $Ed \geq 1$ = luxury good
* $Ed = 0$ = Change in income and change in demand for the commodity is unrelated.

→ High elasticity = change in income produces large change in demand

→ Unitary elasticity = change in income produces same proportionate change in demand

→ Low elasticity = change in income produces less than proportionate change in demand

→ 0 elasticity = change in income has no effect on demand

→ Negative elasticity = inverse relation between income of the consumer and demand.

Price Elasticity of ~~Demand~~ Supply

Price elasticity of supply measures the degree of responsiveness of supplied quantity of a product to change in its price.

There are 2 methods to calculate ES.

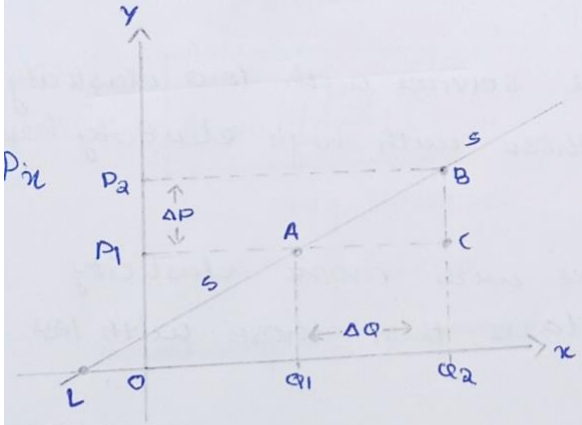
(1) Percentage method:-

$$ES = \frac{\text{\% change in S}}{\text{\% change in P}}$$

$$ES = \frac{P}{q} \times \frac{\Delta q}{\Delta P}$$

(2) Geometric method

Geometric method is the technique of measuring price elasticity of supply at any given point on the supply curve. This method is also known as 'arc method' or point method.



According to percentage method,

$$ES = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \quad \ldots (i)$$

$$= \frac{Q_1Q_2}{P_1P_2} \times \frac{OP_1}{OQ_1}$$

Qs

$$\frac{Q_1Q_2}{P_1P_2} \times \frac{OP_1}{OQ_1} = \frac{AC}{BC} \times \frac{AQ_1}{OQ_1}$$

ΔBAC and ΔALQ_1 are similar triangles. So the ratio of their sides are equal.

$$\therefore \frac{AC}{BC} = \frac{LQ_1}{AQ_1}, \text{ so } \frac{AC}{BC} \times \frac{AQ_1}{OQ_1} = \frac{LQ_1}{AQ_1} \times \frac{AQ_1}{OQ_1}$$

$$= \frac{LQ_1}{OQ_1}.$$

LQ_1 is larger than OQ_1. Hence $\frac{LQ_1}{OQ_1} > 1$.

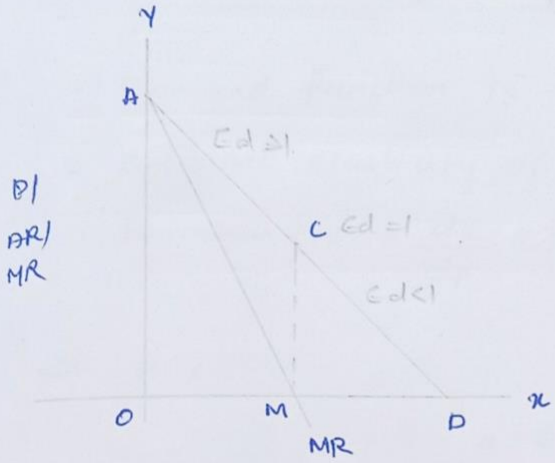
Supply is relatively elastic

Factors Determining Elasticity

* nature of commodity (whether normal, essential, inferior or luxury goods)
* Number of substitutes
* Number of uses
* Share of income spent on the commodity
* level of income
* postponement of consumption
* Habits of the consumers
* Time period.

Applications

* Price fixations. Goods or services with low elasticity have high prices and those with high elasticity have low prices.
* Taxation. Goods or services with more elasticity are imposed with lesser taxes than those with less elasticity
* Output determination. The qty. of output will be higher incase of products with high market elasticity.
* Wages. low wages are given to labor with high elastic demand.
* Foreign trade. Elasticity of demand is taken into consideration when fixing exchang rate.

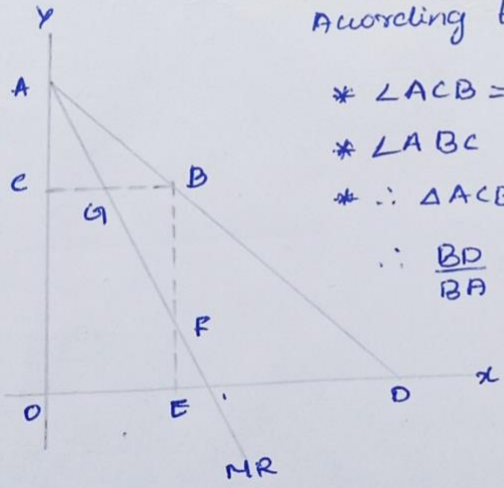


* AD = demand curve, AR curve
* At M, MR = 0
* C is directly above M. It is the centre of AR curve.
Here Ed = 1
* AM is positive. So demand is relatively elastic.
* MMR is negative. Demand here is inelastic.

$$A = M\left[\frac{e}{e-1}\right]$$

A = Avg. Revenue

M = M. Revenue



According to geometric method, $Ed = \frac{BD}{BA}$

* $\angle ACB = \angle BED$ (90°)
* $\angle ABC = \angle BDX$ (corresponding angles)
* $\therefore \Delta ACB$ & ΔBED are equilateral

$\therefore \frac{BD}{BA} = \frac{BE}{AC}$

* $\angle ACG = \angle GBF$ ($90°$)

* $\angle AGC = \angle BGF$ (vertically opposite) (equal)

$\triangle ACG$ & $\triangle GBF$ are identical

$AC = BF$

$\therefore \frac{BE}{AC} = \frac{BE}{BF}$

$BF = BE - EF$

$\therefore Ed = \frac{BE}{BE - EF}$

$BE = AR$ (CA)

$EF = MR$ (MA)

$$e = \frac{A}{A-M}$$

$e(A-M) = A$

$eA - eM = A$

$eA - eM - A = 0$

$eA - A = eM$

$A(e-1) = eM$

$A = \frac{eM}{e-1} = M\left(\frac{e}{e-1}\right)$

$M = A\left(\frac{e-1}{e}\right)$

$M = A\left(\frac{e}{e} - \frac{1}{e}\right) = A\left(1 - \frac{1}{e}\right)$

$e = \frac{A}{A-M}$

$$A = M\left(\frac{e}{e-1}\right)$$

$$M = A\left(1 - \frac{1}{e}\right)$$

Numerical illustration –

$$Ed = \frac{\text{lower segment of demand curve}}{\text{upper segment of demand curve}}$$

•? Demand function is $x = \frac{-3}{4}p + 9$

calculate elasticity of demand if $p(x) = 8$ rs.

formula – $Ed = \frac{dx}{dp} \times \frac{p}{x}$

Sol. $P = 8$.

$$x = \frac{-3}{4} \times 8 + 9 = -0.75 \times 8 + 9 = -6 + 9 = 3$$

$$\frac{dx}{dp} = \frac{-3}{4}$$

$$\therefore Ed = \frac{-3}{4} \times \frac{8}{3} = -2$$

$-2 < 1$ (inelastic demand).