CHAPTER 2

THEORY OF CONSUMER BEHAVIOUR

❖ Consumer's Budget

The availability of consumption bundle depends on three factors:

1) Price of good 1 (P_1)
2) Price of good 2 (P_2)
3) Income of consumer (M)

❖ Budget Set

It represents the sets of consumption bundles that are available to a consumer given his/her income level (M) and the existing prices of the goods.

Let x_1 be the amount of good 1

x_2 be the amount of good 2

P_1 be the price of good 1

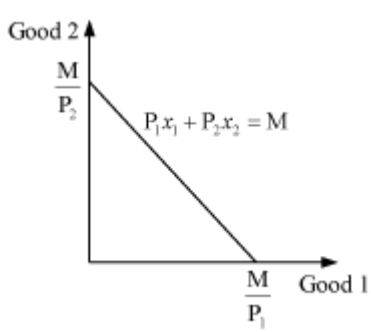
P_2 be the price of good 2

$$\begin{cases} P_1x_1 \Rightarrow \text{ The amount of money spent on good 1} \\ P_2x_2 \Rightarrow \text{ The amount of money spent on good 2} \end{cases}$$

$P_1x_1 + P_2x_2 \leq M \quad \Rightarrow \quad$ Budget constraint

❖ Budget Line

It represents the different combinations of two goods that are affordable and are available to a consumer provided his/her level of income and the market prices (P_1, P_2) of both the goods are given.



The equation of the budget line is as follows:

$P_1x_1 + P_2x_2 = M$ (1)

The equation (1) can be represented in two ways

$$x_2 = \frac{M}{P_2} - \frac{P_1}{P_2}x_1$$

where,

$\frac{M}{P_2}$ is the vertical intercept and it represents the amount of x_2 if the entire amount is spent on good 2.

$-\frac{P_1}{P_2}$ represents the slope of budget line. This is also called the price ratio.

and

$$x_1 = \frac{M}{P_1} - \frac{P_2}{P_1}x_2$$

where,

$\frac{M}{P_1}$ is the horizontal intercept and it represents the amount of x_1 if the entire amount is spent on good 1.

The negative sign depicts the negative slope of the budget line from left to right down the slope.

- Slope of Budget Line and its Derivation

The slope of the budget line measures the amount of good 1 that must be foregone in order to obtain an additional unit of good 2.

$$\frac{\Delta x_2}{\Delta x_1} = \frac{-P_1}{P_2}$$

The price ratio implies the rate of exchange or the rate at which good 1 can be substituted for good 2.

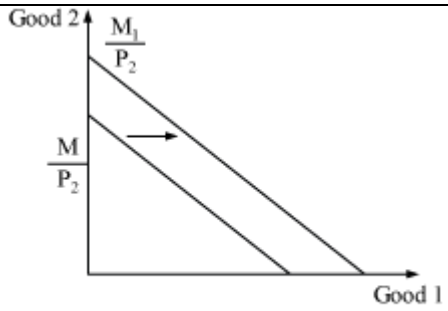
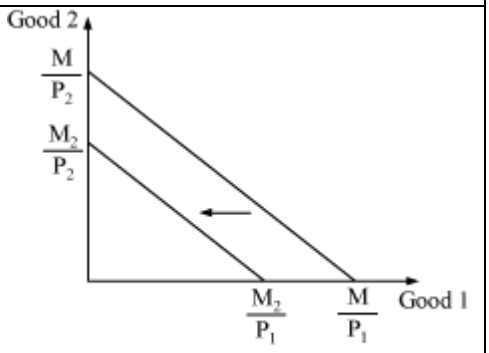
- Points below the Budget Line

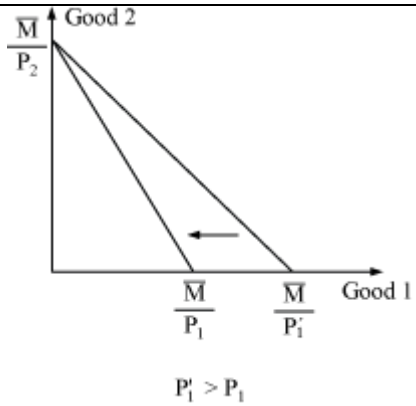
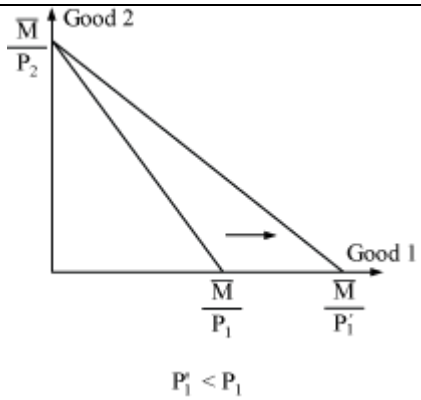
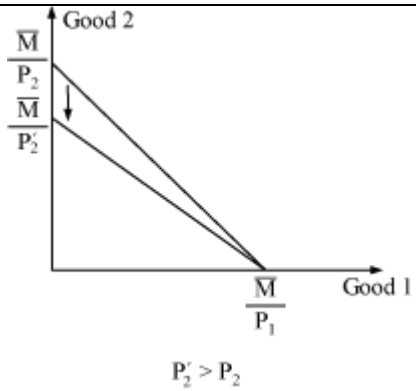
The consumption bundles that are below the budget line represents those bundles that leaves the consumer with some unspent amount of money.

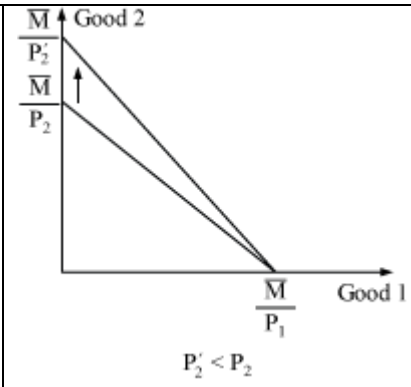
- Changes in the Budget Line

The budget line changes if:

1) Money income changes
2) P_1 changes
3) P_2 changes

Changes	Vertical Intercept	Horizontal Intercept	Slope of Budget Line	Shift/Pivot	Figure
Change in Money (M)					
Increase in Money	Increase	Increase	Slope unchanged	Parallel outward shift	 $M_1 > M$
Decrease in Money	Decrease	Decrease	Slope unchanged	Parallel inward shift	 $M_1 < M$
Change in Price of Good 1 (P_1)					

Increase in P_1	Unchanged	Decrease	Budget line will be steeper	Pivot inwards around the same vertical intercept	
Decrease in P_1	Unchanged	Increases	Budget line will be flatter	Pivot outwards around the same vertical intercept	
Change in Price of Good 2 (P_2)					
Increase in P_2	Decreases	Unchanged	Budget line will be flatter	Pivot inwards around the same horizontal intercept	

Decrease in P_2	Increases	Unchanged	Budget line will be steeper	Pivot outwards around the same horizontal intercept	

❖ Preferences of Consumer: Assumptions

The general assumptions made about the preferences of a consumer are as follows:

1) Tastes and preferences- consumer's choices depends on his/her tastes and preferences

2) Rationality- A consumer is assumed to be a rational consumer.

3) Well-defined preferences

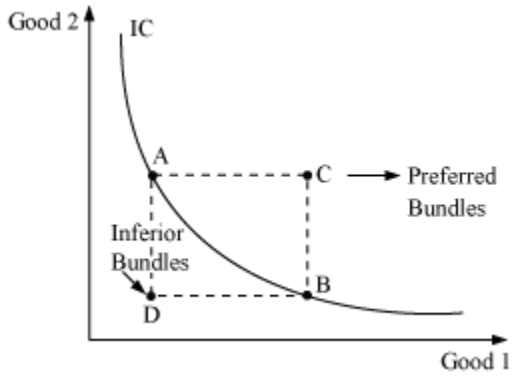
4) Comparison- A consumer can compare among different available bundles

5) Ranking- A consumer can rank different bundles according to his/her preferences.

6) Monotonic preferences: This implies more is better, i.e., a consumer will always prefer a bundle over the other bundle, if the former consists of at least more of one good and no less of the other good. For example, let there be two bundles i.e., A (x_1, x_2) and B ($x_1 + \Delta x_1$, $x_2 + \Delta x_2$). In this case, the monotonicity of preferences implies

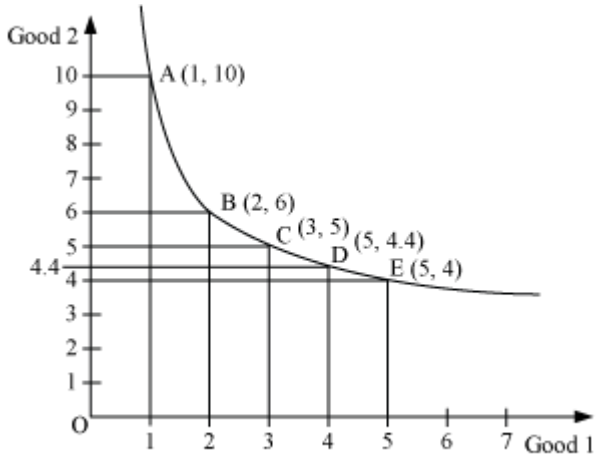
If $\Delta x_1 > 0$,	If $\Delta x_1 < 0$,
then $\Delta x_2 < 0$	then $\Delta x_2 > 0$

7) Substitution between goods: The rate of substitution between good 2 and good 1 is given by $\left|\frac{\Delta x_2}{\Delta x_1}\right|$.This rate of substitution can be defined as the amount of good 2 that the consumer is ready to forego or the substitute for an additional unit of good 1.In other words, it represents the cost of good 1 that the consumer is ready to pay in terms of good 2.



❖ Diminishing Rate of Substitution

If a consumer prefers a bundle that has more of good 1 and less of good 2, then, according to the diminishing rate of substitution, the amount of good 2 that the consumer is ready to give up for an additional unit of good 1 declines or diminishes with successive increase in the amount of good 1. The diminishing rate of substitution ensures the convexity of IC.



Diminishing Marginal Rate of Substitution

❖ Indifference Curve

Indifference curve is a curve that consists of various combinations of two goods that provide a consumer with the same level of satisfaction. In other words, a consumer is indifferent between any two bundles that are on the same IC.

❖ Shape of the Indifference Curve

The shape of IC is convex to the origin because of the diminishing MRS and monotonic preferences. The monotonic preferences ensure negative slope of IC, as an increase in the amount of good 1 can only be brought with a simultaneous decrease in the amount of good 2.

- Indifference Map

  Indifference map is a family or collection of indifference curves that depicts different levels of satisfaction and preferences of a consumer.

  Note: Higher IC denotes higher level of satisfaction and lower IC denotes lower level of satisfaction.

- **Utility** refers to the satisfaction that a consumer expects to derive from the consumption of a particular good. It is a subjective concept. Utility can be cardinally (or numerically) expressed in terms of utils

- **Total Utility** refers to the aggregate utility or summation of utility derived from the consumption of all the units of a commodity. Algebraically,

  $TU = TU_1 + TU_2 + TU_3 + \ldots\ldots\ldots\ldots\ldots + TU_n$

- **Marginal Utility** refers to the addition to the total utility due to the consumption of an additional unit of a commodity. Algebraically,

  $MU_n = TU_n - TU_{n-1}$

  $TU_n = MU_1 + MU_2 + MU_3 + \ldots\ldots\ldots\ldots\ldots + MU_n = \sum MU$

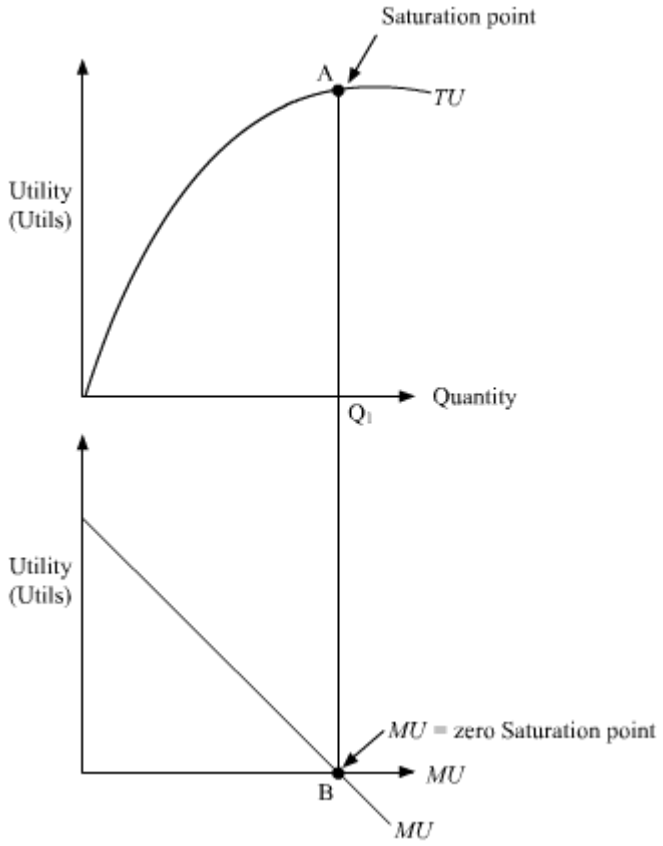
- **Relationship between Total Utility and Marginal Utility**

  1. With the consumption of the successive units, the Marginal Utility falls, subsequently becomes zero and finally, becomes negative

  2. As long as MU derived from the consumption of additional units of the commodity is positive, TU continues to rise

  3. When TU becomes maximum (also known as Saturation Point), MU becomes zero.

4. When TU starts falling, MU becomes negative.



❖ Law of Diminishing Marginal Utility

Law of Diminishing Marginal Utility states that as a consumer consumes more and more units of a commodity at succession, then Marginal Utility derived from the consumption of each additional unit of the commodity

❖ **Consumer Equilibrium in Case of a Single Commodity**

In case of a single commodity, a consumer attains equilibrium when the utility derived from each additional unit of the rupee spent on the commodity becomes equal to the Marginal Utility of Money. In other words the consumer attains equilibrium when,

Marginal Utility of a Rupee spent on the commodity = Marginal Utility of Money

❖ Consumer Equilibrium in Case of a Single Commodity

In case of a single commodity, a consumer attains equilibrium when the utility derived from each additional unit of the rupee spent on the commodity becomes equal to the Marginal Utility of Money. In other words the consumer attains equilibrium when,

Marginal Utility of a Rupee spent on the commodity = Marginal Utility of Money

$$\frac{MU_x}{P_x} = MU_m$$

If, $\frac{MU_x}{P_x} > MU_m$

Then, the consumer would consume additional units of the commodity x,

If, $\frac{MU_x}{P_x} < MU_m$

Then, the consumer would reduce consumption of the commodity x,

❖ Consumer's Equilibrium in Case of Many Commodities- Two Goods Case

In case of many commodities, the Consumer's Equilibrium is given in accordance with the Law of Equi-Marginal Utility.

Law of Equi-Marginal Utility states that a consumer allocates his expenditure on various commodities in such a manner that the utility derived from each additional unit of the rupee spent on each of the commodities is equal. Algebraically, this is represented the following equality.

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \ldots \frac{MU_m}{P_n} = MU_m$$

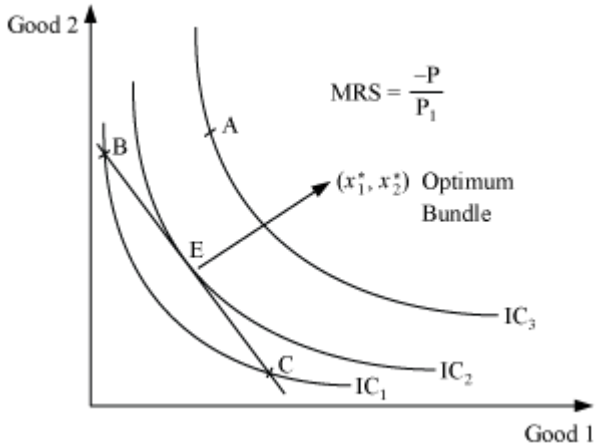
❖ Optimal Choice of Consumer and Equilibrium

This optimal choice is denoted by the tangency between the highest possible IC and his/her budget line. This optimum point is characterised by:

Slope of the IC = Slope of the budget line

$$\left|\frac{-dy}{dx}\right| = \left|MRS_{x,y}\right| = \left|\frac{-P_x}{P_y}\right| = \frac{MU_x}{MU_y}$$

i.e. Absolute value of the slope of the IC = Absolute value of the slope of the budget line



❖ Demand Function

It represents the relationship between the quantity demanded of a good and its own price for a given consumer's income, his/her tastes and preferences. It is represented as:

$$D_x = f(P_x, \overline{P}_y, \overline{Y}, \overline{T})$$

where,

P_x = Price of good x

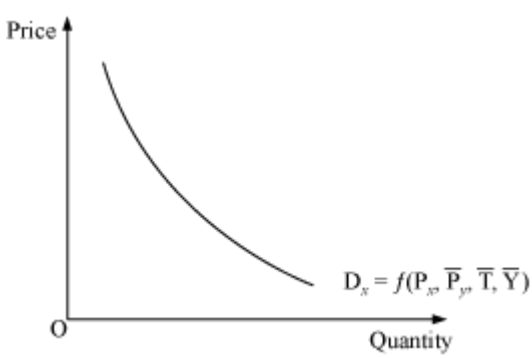
D_x = Demand for good x

P_y = Price of good y

Y = Income of consumer

T = Tastes and preferences

This function depicts the relationship between the demand for a good and its price, holding Y, T and P_y as constant.



- Demand Curve

It is a graphical representation of demand function i.e., the graphical representation of the relationship between the demand for a good and its price for a given his/her income, tastes and preferences, price of related goods.

- Law of Demand

According to the law of demand, a consumer's demand shares an inverse relationship with the price of a good and vice-versa, ceteris paribus (other things being constant). In other words, if the income, price of related goods and the consumer's tastes and preferences remain unchanged, then the demand of goods moves opposite to the movement in the price of those goods.

- Linear Demand Curve

A linear demand curve is a straight line that negatively slopes downwards from left to right. A linear demand curve is algebraically represented as:

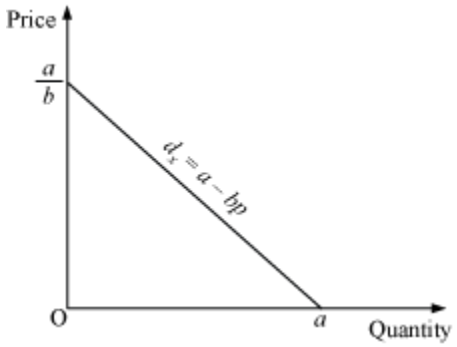
$$dx = \begin{cases} = a - bp & \text{If } p \geq 0 \\ = \quad 0 & \text{If } p > \dfrac{a}{b} \end{cases}$$

where,

a = Vertical intercept of the demand curve

–b = Slope of the demand curve

The slope of the demand curve measures the responsiveness of change in the demand of a good with respect to the change in the price of the good.



- Normal and Inferior Goods
  - Normal goods

    Those goods that share a positive relationship with income but a negative relationship with its price are called normal goods.
  - Inferior goods

    Those goods that share a negative relationship with price as well as the income of a consumer are called inferior goods. For example, coarse cereals, etc.
- Substitute goods

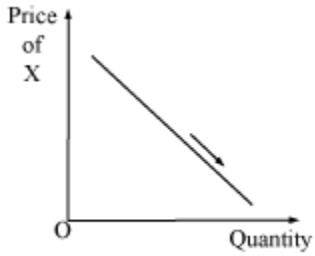
  Those goods that can be consumed in place of other goods are called substitute goods. For examples, tea and coffee, etc.

  P_T increases $\rightarrow$ D_T decreases $\rightarrow$ D_C increases $\rightarrow$ Tea and coffee are substituted goods
- Complementary goods

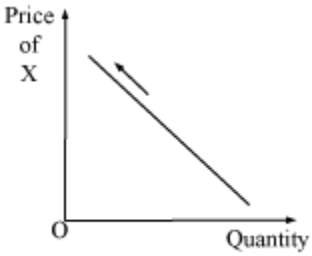
  Those goods that are consumed together are called complementary goods. Examples: Tea and sugar.

  P_S increases $\rightarrow$ D_T decreases $\rightarrow$Tea and sugar are complementary goods
- Movements along the demand curve

  If demand changes due to a change in the price of that particular good, then it is known as a movement along the demand curve. A movement along the demand curve can be an expansion or a contraction of demand.



Expansion of demand d_x

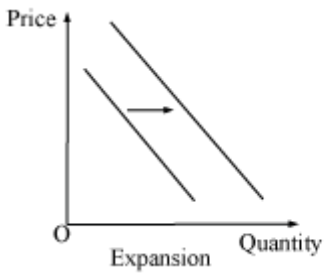


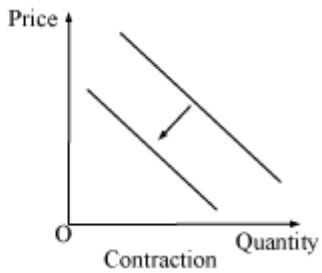
Contraction of demand d_x

- Shifts in the demand curve

  If demand changes due to a change in the price of related goods, income of a consumer, tastes and preferences, it is known as a shift in the demand curve.

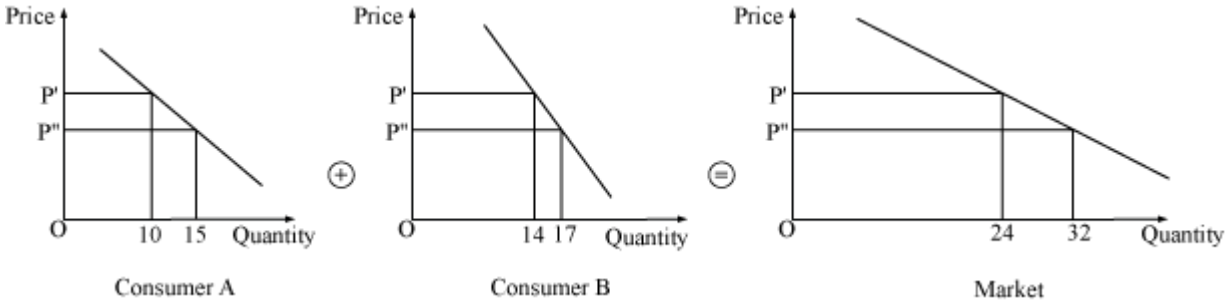
If there is an increase in the price of related goods or in the income of a consumer or if his/her tastes and preferences shift in favour of that good, then the demand curve will shift outwards, parallely. On the other hand, if there is a decrease in the price of related goods or in the income of a consumer or shift in the tastes and preferences away from the good, then the demand curve will shift inwards, parallely.





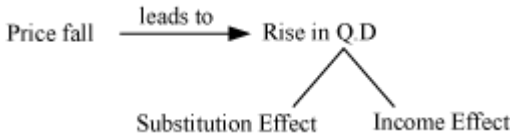
❖ Market Demand

The market demand for a good at a particular price is the sum total of the demands of all the consumers in a market. Graphically, it is the horizontal summation of two demand curves of different consumers at different prices.



❖ Price Effect on Quantity Demanded

The increase in quantity demanded of a good because of fall in its price consists of two components, namely, substitution effect and income effect.



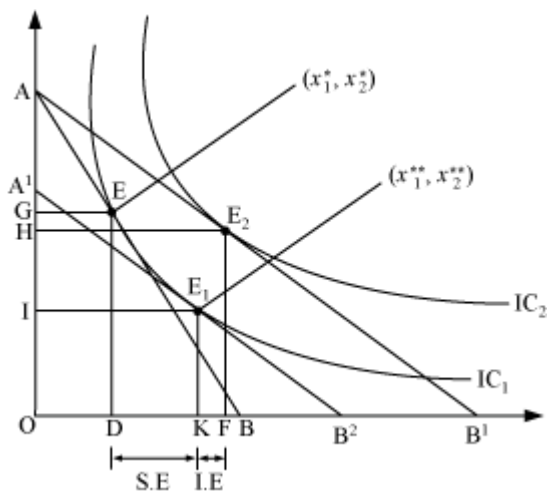
- Substitution effect

  The fall in the price of one good makes it relatively cheaper than the other good, as compared to what it was before the price fall. It can be observed by the movement along the budget line.

- Income effect

  It is associated with the increase in the purchasing power of a consumer due to the fall in the price of a good. The price-fall leaves the consumer with a higher purchasing power, which enables him/her to buy more of the good with the same amount of money income. It can be observed by the shift in the budget line.

  TOTAL PRICE EFFECT = SUBSTITUTION EFFECT + INCOME EFFECT



Types of Goods	Total Price Effect	Substitution Effect	Income Effect
Normal Goods	Negative	Negative	Negative
Inferior Goods	Negative	Negative	Positive
Giffen Goods	Positive	Negative	Positive

❖ Elasticity of Demand or Price Elasticity of Demand (e_d)

The elasticity of demand measures the degree of responsiveness of the demand for a good to the changes in its price.

$$e_d = \frac{\text{Percentage change in the demand for a good}}{\text{Percentage change in the price of the good}}$$

$$= \frac{(\Delta q/q)\times 100}{(\Delta p/p)\times 100}$$

$$= \frac{\Delta q}{q} \times \frac{p}{\Delta p}$$

$$e_d = \frac{\Delta q}{\Delta p} \times \frac{\mathrm{P}}{\mathrm{Q}}$$

Where,

P = Initial price

Q = Initial quantity

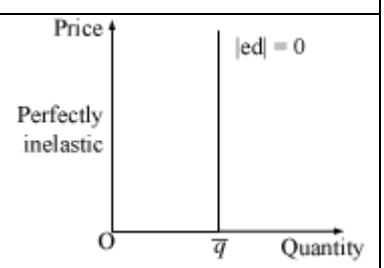
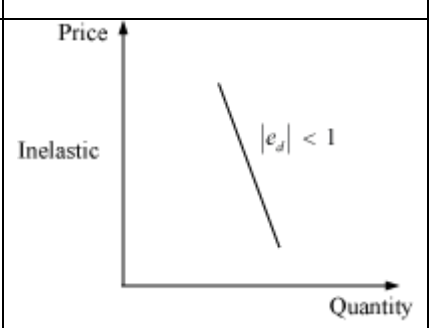
P_1 = Final price

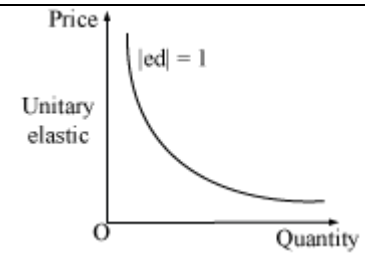
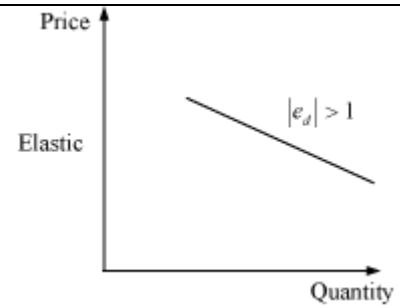
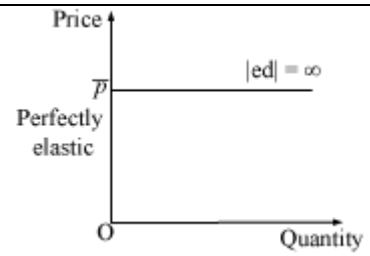
Q_1 = Final quantity

$\Delta q = Q - Q_1$ = Change in demand

$\Delta p = P - P_1$ = Change in price

e_d is a negative number as demand is inversely related to the price of the good and $0 \leq |e_d| \leq \infty$

Conditions	Elasticity	Demand	Figure
When change in quantity demanded is independent of change in price	$\lvert e_d \rvert = 0$	Perfectly Inelastic	
Percentage Δ in demand (<) Percentage Δ in price	$\lvert e_d \rvert < 1$	Inelastic	

Percentage Δ in demand (=) Percentage Δ in price	$\lvert e_d \rvert = 1$	Unit elastic	
Percentage Δ in demand (>) Percentage Δ in price	$\lvert e_d \rvert > 1$	Elastic	
When change in price is independent of change in demand	$\lvert e_d \rvert = \infty$	Perfectly Elastic	

❖ Elasticity along a Linear Demand Curve

For the linear demand curve, q = a – bp.

The elasticity of demand, $e_d = \dfrac{-bp}{a-bp}$

Elasticity at different price levels are

When P = 0	$\lvert e_d \rvert = 0$	Perfectly Inelastic
$0 < P < \dfrac{a}{2b}$	$\lvert e_d \rvert < 1$	Inelastic
$P = \dfrac{a}{2b}$	$\lvert e_d \rvert = 1$	Unitary elastic
$\dfrac{a}{2b} < P < \dfrac{a}{b}$	$\lvert e_d \rvert > 1$	Elastic

P = a/b	$\lvert e_d \rvert > \infty$	Perfectly elastic

- Geometric Measure of Elasticity along a Linear Demand Curve

The elasticity of demand at any point on a straight line (linear) demand curve is given by the ratio of the lower segment and the upper segment of the demand curve at that particular point.

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

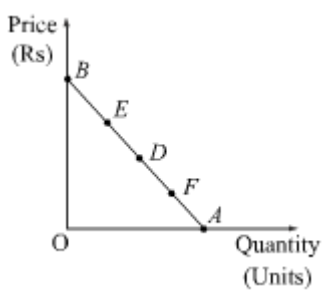
$$e_d \text{ at point D} = \frac{\text{DA}}{\text{DB}} = \frac{1}{1}$$

$$e_d \text{ at point E} = \frac{\text{EA}}{\text{EB}} > 1$$

$$e_d \text{ at point B} = \frac{\text{BA}}{\text{Zero}} = \infty$$

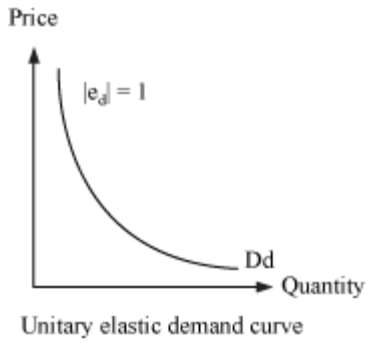
$$e_d \text{ at point A} = \frac{\text{Zero}}{\text{AB}} = \text{Zero}$$

$$e_d \text{ at point F} = \frac{\text{FA}}{\text{FB}} < 1$$



- Rectangular Hyperbola Demand Curve

If the demand curve is a rectangular hyperbola, then elasticity at every point along this demand curve will be equal to 1. This curve is called the unitary elastic demand curve.



❖ Factors Determining Price Elasticity of Demand for a Good

1) Nature of commodity: The price elasticity of demand depends on the nature of a good. Based on the nature, goods can be classified as:

(a) Necessity goods: They have inelastic demand.

(b) Luxury goods: They have elastic demand.

(c) Jointly-demanded goods: The demand for such goods that are demanded together (complementary goods) is inelastic.

2) Substitutes: More the number of substitutes will be available; more will be the elasticity of demand and vice-versa

3) Several uses: Multiple uses of a good leads to elasticity of demand and vice-versa.

4) Consumer's income: Very high or very low income group people have inelastic demand and the middle-income earners have an elastic demand

5) Consumer's habits: The goods with which a consumer are habituated to, will have an inelastic demand.

6) Period of time: In short run, the demand is inelastic and in long run, the demand becomes elastic.

7) Income spent on goods: The goods that account for a very small proportion of a consumer's income such as newspaper, etc. will have an inelastic demand.

- Relationship between Elasticity and Expenditure

The expenditure on a good is equal to the demand for the good times its price.

Expenditure = P Q

1) If the percentage decline in the quantity is more than the percentage increase in the price, the expenditure on a good goes down and the good becomes price-elastic, i.e., $|e_d| > 1$.
2) If the percentage decline in the quantity is equal to the percentage increase in the price, the expenditure remains unchanged and the good becomes unit elastic, i.e., $|e_d| = 1$.
3) If the percentage decline in the quantity is less than the percentage increase in the price, the expenditure on a good goes up and the good becomes price-inelastic, i.e., $|e_d| < 1$.