CHAPTER - 2

THEORY OF CONSUMER DEMAND

Ordinal Approach (Indifference Curve Analysis):

Modem economists, particularly Hicks gave ordinal utility concept to analyze consumer behavior. He has used a tool, called indifference curve, for consumer behavior analysis. The ordinal utility approach is based on the following assumptions:

1. **Rationality:**

Implies that a consumer is a rational being and aims at maximizing the total satisfaction given the income and prices of goods and services.

2. **Ordinal Utility:**

Assumes that utility is expressible only in ordinal terms. This implies that a consumer is only able to express his/her preference for goods.

3. **Transitivity and Consistency of Choice:**

Implies that consumer choices are assumed to be transitive and consistent. The transitivity of choice means that if a consumer prefers A to B and B to C, he/she would prefer A to C. On the other hand, the consistency of choice means that if a consumer prefers A to B in one period, he or she cannot prefer B to A in another period.

4. **Non-satiety:**

Implies that a consumer is assumed to be non-satisfied. In other words, it is assumed that consumer does not reach the level of satisfaction by consuming a good and always prefers a large quantity of goods.

5. **Diminishing Marginal Rate of Substitution:**

Acts as an important concept in indifference curve analysis. Marginal rate of substitution implies the rate at which a consumer is willing to substitute one good (X) for another good (Y), so that the total satisfaction remains the same.

Meaning of Indifference Curve:

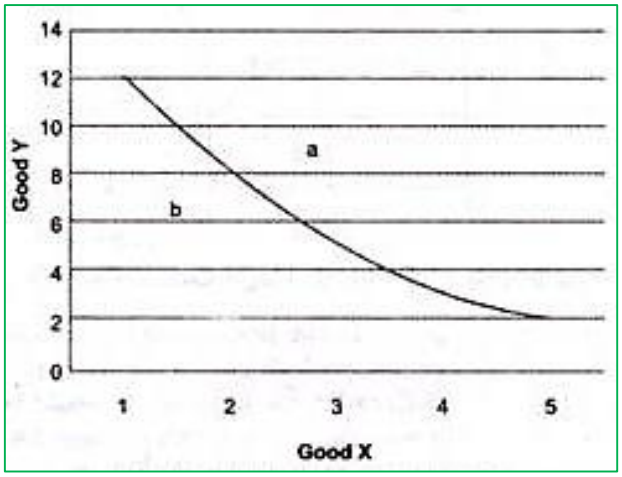
Indifference curve is defined as the locus of points on the graph each representing a different combination of two substitute goods, which yield the same utility or level of satisfaction to a consumer. The combinations of goods give equal satisfaction to a consumer.

Therefore, a consumer is indifferent between any combinations of two goods when it comes to make a choice between them. When these combinations are plotted on the graph, the resulting curve is called indifference curve. This curve is also called as equal utility curve.

Let us learn the indifference curve through a schedule.

Combination	Good X	Good Y	MRSxy = $(\frac{\Delta Y}{\Delta X})$
A	1	12	-
B	2	8	4
C	3	5	3
D	4	3	2
E	5	2	1

Above table depicts that a consumer starts with one unit of good X and 12 units of good Y, which point combination A. For gaining an additional unit of X, he/she sacrifices 4 units of good Y, so that the level of satisfaction remains the same and get combination B. Similarly, we get the consumption level of 3X+ 5Y, 4X+ 3Y, 5X+2Y with combination level respectively C, D, And E. The consumer's satisfaction remain same whichever the combination of goods. This schedule of combinations can be show graphically on indifference curve. The quantity of good X is measured on X-axis and quantity of good Y is shown on Y- axis.

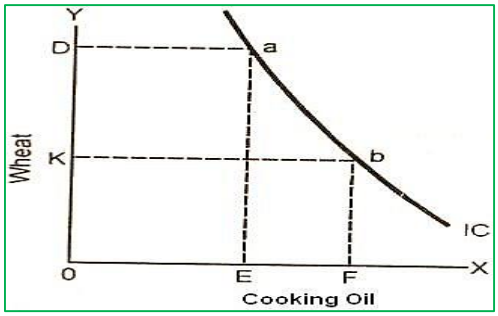


In above figure, point b shown below and left of the indifference curve would give less satisfaction and point a above the indifference curve would be more preferred than combinations. A description of consumer's preferences is represented on indifference map that consists of a set of indifference curves. Indifference map shows the indifference curves ranked in order of preferences of consumers.

PROPERTIES OF INDIFFERENCE CURVE:

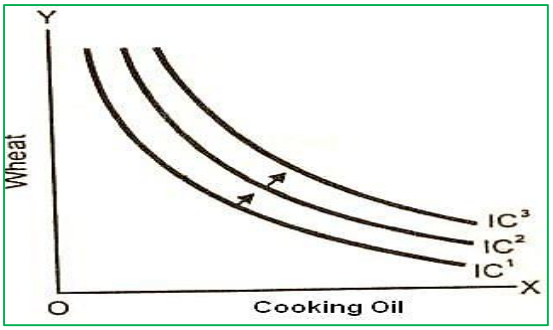
1. Indifference Curves are Negatively Sloped:

The indifference curves must slope down from left to right. This means that an indifference curve is negatively sloped. It slopes downward because as the consumer increases the consumption of X commodity, he has to give up certain units of Y commodity in order to maintain the same level of satisfaction.



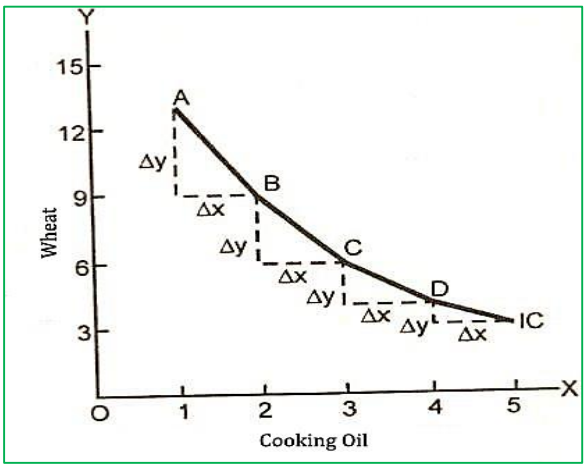
2. Higher Indifference Curve Represents Higher Level of Satisfaction:

A higher indifference curve that lies above and to the right of another indifference curve represents a higher level of satisfaction and combination on a lower indifference curve yields a lower satisfaction. In other words, we can say that the combination of goods which lies on a higher indifference curve will be preferred by a consumer to the combination which lies on a lower indifference curve.



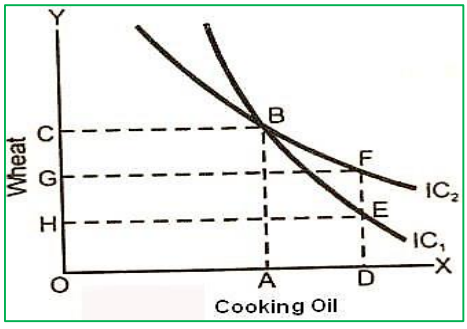
3. Indifference Curve are Convex to the Origin:

This is an important property of indifference curves. They are convex to the origin (bowed inward). This is equivalent to saying that as the consumer substitute's commodity X for commodity Y, the marginal rate of substitution diminishes of X for Y along an indifference curve.



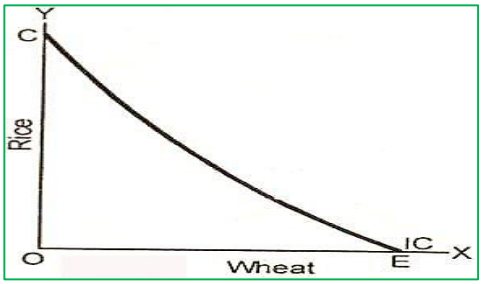
4. Indifference Curve Cannot Intersect Each Other:

Given the definition of indifference curve and the assumptions behind it, the indifference curves cannot intersect each other. It is because at the point of tangency, the higher curve will give as much as of the two commodities as is given by the lower indifference curve. This is absurd and impossible.



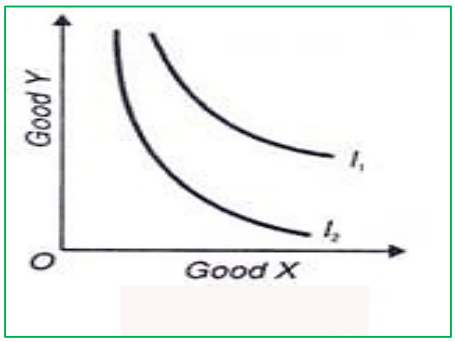
5. Indifference Curves do no touch X-axis and Y-axis:

One of the basic assumptions of indifference curves is that the consumer purchases combinations of different commodities. He is not supposed to purchase only one commodity. In that case indifference curve will touch one axis. This violates the basic assumption of indifference curves.



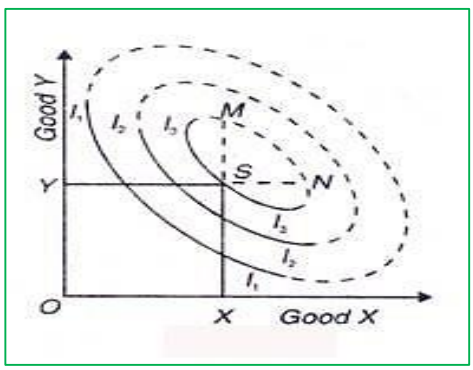
6. Indifference Curve need not to be Parallel:

Indifference curves are not necessarily parallel to each other. Though they are falling, negatively inclined to the right, yet the rate of fall will not be the same for all indifference curves. In other words, the diminishing marginal rate of substitution between the two goods is essentially not the same in the case of all indifference schedules. The two curves I1and I2 shown in figure below are not parallel to each other.



7. Indifference Curve are like Bangles:

In reality indifference curves are like bangles. But as a matter of principle their 'effective region' in the form of segments is shown in figure below. This is so because indifference curves are assumed to be negatively sloping and convex to the origin. An individual can move to higher indifference curves I1and I2 until he reaches the saturation point 5 where his total utility is the maximum.



Consumers Equilibrium:

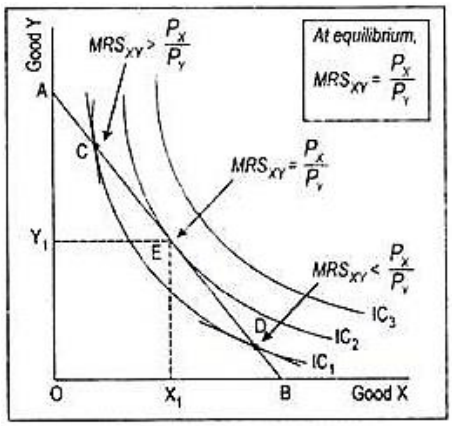
A consumer is said to be in equilibrium when he feels that he **"cannot change his condition either by earning more or by spending more or by changing the quantities of thing he buys"**. A rational consumer will purchase a commodity up to the point where price of the commodity is equal to the marginal utility obtained from the thing.

Assumption:

1. Consumer must be rational.
2. Consumer must have budget line and indifference map.
3. Prices of two goods remain unchanged
4. Producer has to maximize utility by spending fixed budged on two goods.

Conditions:

1. **Necessary or 1st order Condition:** Budget line should be tangent to the indifference curve (or the slope of indifference curve should be equal to the slope of budget line i.e. MRSxy = Px/Py).
2. **Sufficient or 2nd order Condition:** Indifference curve should be convex to the origin.



According to above figure, point E is the consumer's equilibrium where two conditions for equilibrium (i.e. AB budget line is tangent to the IC_2 and IC_2 is convex to the origin) are satisfied. Hence, consumer gets maximum satisfaction by spending total budget on combination E which contains OY_1 units of Good Y and OX_1 units of Good X.

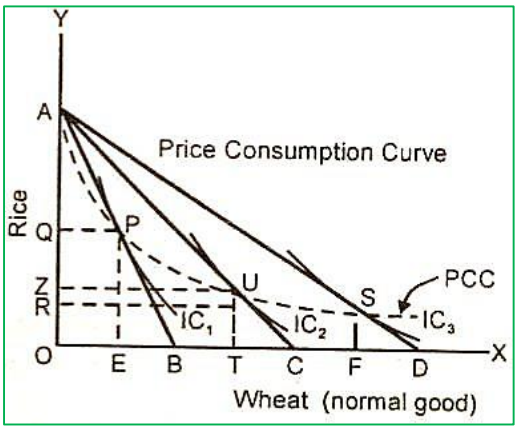
Changes in Consumer's Equilibrium:

1. Price Effect:

Price effect shows total effect on consumer's demand for a commodity due to change in price of same commodity, other things being equal. When price of the good changes, a consumer will be wither better off or worse off than before, depending upon whether the price falls or rises. In other words, as a result of change in price of the good, his equilibrium position will be at a higher indifference curve in case of the fall in price and at a lower indifference curve in case of the raise in price.

Price Effect on the Consumption of a Normal Good:

A normal good is a product or service whose quantity demanded increases as consumer income increases. The elasticity of demand for a normal good is always positive but less than 1.

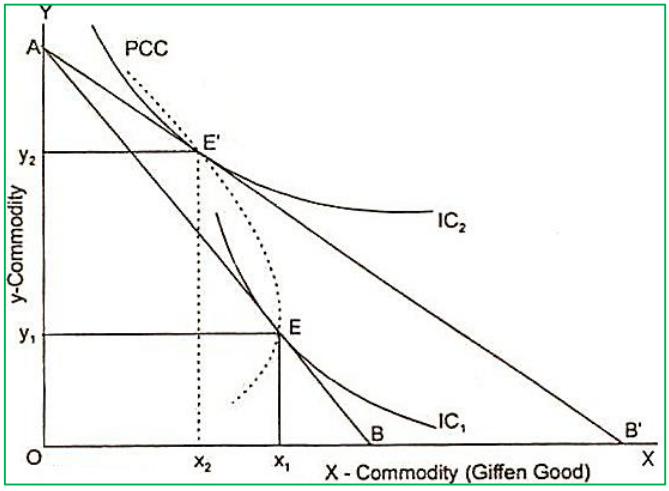


For example in above figure, AB is the initial budget line. It is assumed that the price of wheat has fallen and the price of rice and the income of the consumer remains unchanged. The price line takes a new position AC and the equilibrium point shifts from P to U. The consumer buys now OT quantity of wheat, the amount demanded rises from OE to OT and OZ quantity of rice. With further fall in the price of wheat, the consumer is in equilibrium at point S, where the budget line AD is tangent to a higher indifference curve AC3. He buys now OF quantity of wheat and OR quantity of rice.

The rise in amount purchased of wheat (OE to OF) as a result of a fall in its price is called price effect. The price effect on the consumption of a normal good is negative. If we join the equilibrium points PUS, we get price consumption curve (PCC) of the consumer for the commodity wheat.

Price Effect on the consumption of a Giffen Good:

A Giffen good is a good for which demand increases as the price increases, and falls when the price decreases. A Giffen good is typically an inferior product that does not have easily available substitutes, as a result of which the income effect dominates the substitution effect. Giffen goods are quite rare, to the extent that there is some debate about their actual existence. The term is named after the economist Robert Giffen.



In figure above, the consumer is in equilibrium at point E where the budget line AB is tangent to the indifference curve IC1. The consumer purchases OX1 quantity of Giffen good X and OY1 quantity of good Y. When there is a reduction in the price of good X but no change in the price of good Y, the budget line AB' will showing upward. The consumer is in equilibrium at point E' where the budget line AB' is a tangent to the indifference curve IC2. In the new equilibrium position, the consumer purchases only OX2 units of Giffen good X and OY2 units of good Y.

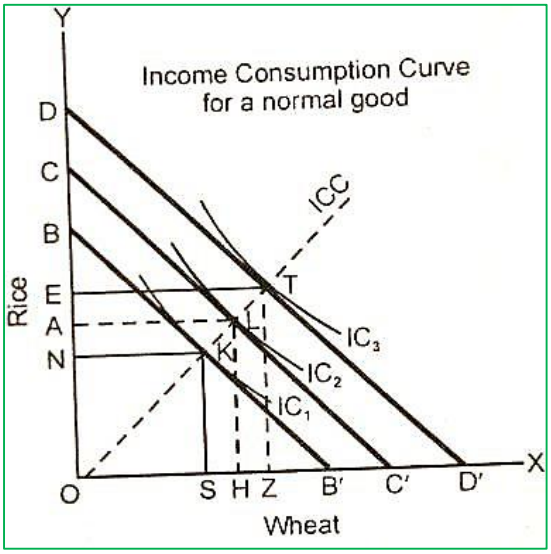
We find that the decrease in the price of Giffen good X, its quantity purchased has fallen from OX1 to OX2 and the quantity demanded of Y commodity goes up from OY1 to OY2. The price effect on the consumption of Giffen good is positive. It is indicated by the backward bending PCC in the case of X as a Giffen good.

2. Income Effect:

If the prices of goods, tastes and preferences of the consumer remains constant and there a change in his income, it will directly affect consumer's demand. This effect on the purchase due to change in income is called the income effect. A rise in consumer's income will shift the price line or budget line upward to the right and he goes on to higher point of equilibrium. A fall in the income, will shift the price line downward to the left and the consumer attains lower (tangency) points of equilibrium. The shift of the price line is parallel as the prices of the goods are assumed to remain the same.

Positive Income Effect:

Income effect for a good is supposed to be positive when with an increase in consumer's income, consumer increases his/her consumption of the good. Such goods for which income effect is positive are called superior goods.



In above figure wheat is measured along OX and rice along OY. When the price line or budget line is BB' the consumer gets maximum satisfaction or is in equilibrium position at point K where it touches the indifference curve IC1. The consumer buys OS quantity of wheat and ON quantity of rice. We suppose now that the income of the consumer has increased and the price line is now CC'. Which shifts in a parallel fashion to the right.

The consumer is in equilibrium at a level at point L which is its equilibrium point. If there is further increase in income: shift of the price line now will be DD', and the consumer is in

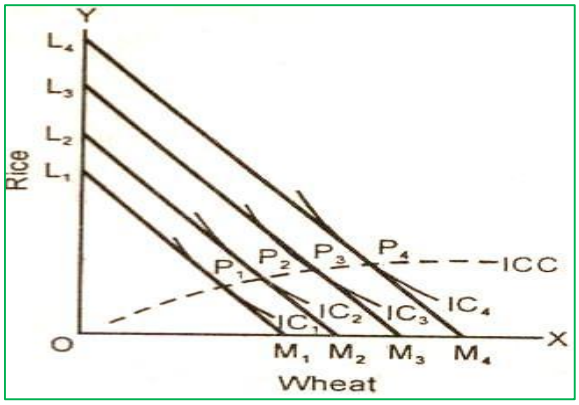
equilibrium at point T and will be purchasing OZ quantity of wheat and OE quantity of rice. If these, equilibrium points K, L, T are joined together by a dotted line passing through the origin, we get income consumption curve ICC.

This shows that with the rise in income, the consumer generally buys more quantities of the two commodities rice and wheat. The income consumer is now better off at T on indifference curve IC3 as compared to L at a lower indifference curve IC2 . The income effect is positive in case of both the goods rice and wheat as these are normal goods. The income consumption curve ICC which is derived by joining the successive equilibrium positions has a positive slope.

Negative Income Effect:

Income effect for a good is supposed to be negative when with an increase in consumer's income, consumer reduces his/her consumption of the good. Such goods for which income effect is negative are called inferior goods.

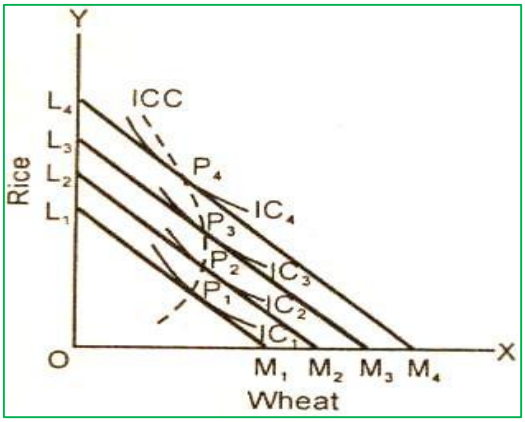
Income Effect When Rice is an Inferior Good:



In the figure above, it is shown that with the rise in income, the purchase of wheat has increased from M1 to M4 indicating positive income effect on the purchase of normal good wheat. The income effect on inferior good is negative. The income consumption curve ICC is starts bending towards the horizontal axis which shows that wheat is a normal good and rice is inferior good.

Income Effect When Wheat is an Inferior Good:

Sometimes it also happens that with the rise in income, the consumer buys more of one commodity and less of another. For instance, he may buy less of wheat and more of rice as is, illustrated in figures below.

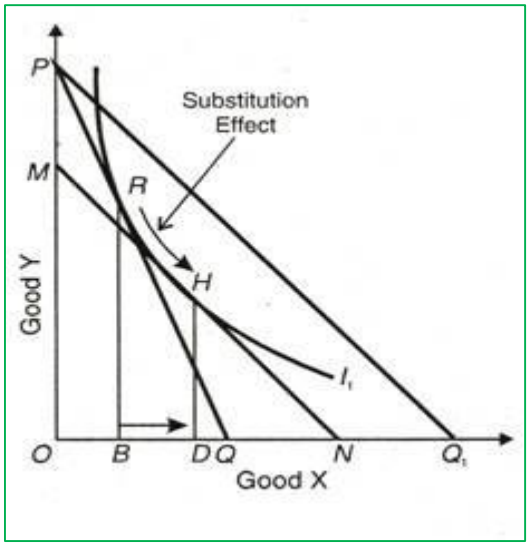


In diagram above, the income consumption curve bends back on itself. With the rise in income, the consumer buys more of rice and less of wheat. The price effect for rice is positive and for wheat is negative. The good which is purchased less with the increase in income is called inferior good.

3. Substitution Effect:

Prof. Hicks has explained the substitution effect independent of the income effect through compensating variation in income. "The substitution effect is the increase in the quantity bought as the price of the commodity falls, after adjusting income so as to keep the real purchasing power of the consumer the same as before. This adjustment in income is called compensating variations and is shown graphically by a parallel shift of the new budget line until it become tangent to the initial indifference curve."

Thus on the basis of the methods of compensating variation, the substitution effect measure the effect of change in the relative price of a good with real income constant. The increase in the real income of the consumer as a result of fall in the price of, say good X, is so withdrawn that he is neither better off nor worse off than before.



The substitution effect is explained in Figure above where the original budget line is PQ with equilibrium at point R on the indifference curve I1. At R, the consumer is buying OB of X and BR of Y. Suppose the price of good X falls so that his new budget line is PQ1. With the fall in the price of X, the real income of the consumer increases. To make the compensating variation in income or to keep the consumer's real income constant, take away the increase in his income equal to PM of good Y or Q1N of good X so that his budget line PQ1 shifts to the left as MN and is parallel to it.

At the same time, MN is tangent to the original indifference curve l1 but at point H where the consumer buys OD of X and DH of Y. Thus PM of Y or Q1N of X represents the compensating variation in income, as shown by the line MN being tangent to the curve I1 at point H. Now the consumer substitutes X for Y and moves from point R to H or the horizontal distance from B to D. This movement is called the substitution effect. The substitution affect is always negative because when the price of a good falls (or rises), more (or less) of it would be purchased, the real income of the consumer and price of the other good remaining constant. In other words, the relation between price and quantity demanded being inverse, the substitution effect is negative.

Decomposition of Price Effect into Income and Substitution Effect:

A change in demand for a commodity, say X, due to change in the price of the same commodity (i.e. X) is called price effect. The price effect describes the phenomenon on the consumer's purchases for a commodity (say X good) when its price changes, given consumer's tastes & preferences, his income and the price of good Y remains constant. It shows the total effect on consumer's demand for a commodity due to the change in the price of the same commodity, other things being equal. The total price effect consists of two direct effects of price change on consumer's choice i.e. (i) Income effect and (ii) Substitution effect.

Substitution effect arises due to the change in the relative price of a commodity. It happens due to the absolute change in the price of the same commodity. When the price of one commodity increases (or decreases), it becomes relatively dearer (or cheaper) than the other. The consumers have an inherent tendency to substitute cheaper goods for relatively dearer ones. This is called substitution effect.

A change in the relative prices of goods makes a rational consumer substitute a relatively cheaper commodity for the dearer one. Such effect of the change in relative prices of goods is described as the substitution effect. Under this effect, the consumer will tend to buy more of a good, the price of which has fallen and less of the good price of which has remained unchanged or has increased as he would reallocate his expenditure in favor of the relatively cheaper good and substitute for the dearer one.

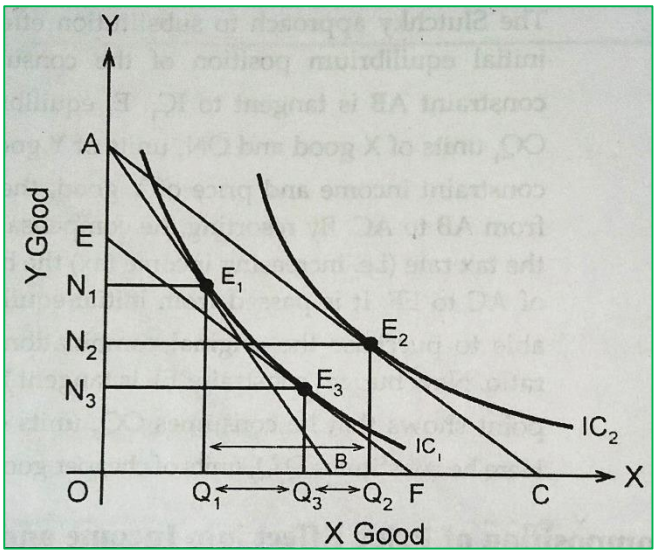
It was assumed that the income level of the consumer remains constant or unchanged in the consumer's equilibrium analysis, given the prices of two goods X and Y. If the income level of the consumer changes (i.e. either increases or decreases), then there is the effect in the purchase decision, given the prices of the two goods, and tastes & preferences of the consumer. This effect on the demand or purchasing decision is known as income effect. Income effect shows the total effect on demand for goods due to the change in income of the consumer, other things being equal.

Thus, total price effect is composed of income and substitution effect. There are two methods of decomposing total price effect into income and substitution effects. They are as:

i. Hicksian approach
ii. Slutchky approach

Decomposition of price effect into income and substitution effects with a fall in price of normal goods under Hicksian approach

In the figure, suppose that consumer is initially in equilibrium position at E_1 on the indifference curve IC_1 where initial budget line AB is tangent to indifference curve IC_1. Here, the consumer buys (or purchase) OQ_1 units of X good and ON_1 units of Y good. Now, suppose the price of X falls or decline other things being equal (i.e. the price of Y and level of income of the consumer remains unchanged or constant), the initial budget line AB shifts rightward to AC due to the increase in purchasing power of consumer for X good. The new budget line (AC) is tangent to IC_2 at the point E_2 and the consumer reaches a new equilibrium. The new equilibrium shows that the consumers purchase (or buys) OQ_2 units of X good and reduces N_1N_2 units of Y good. This process of adjustment on the consumption X and Y is called total price effect.



Now the problem is how to split the price effect of X good (i.e. Q_1Q_2) into the income and substitution effects since price effect (PE) is composed of income effect (IE) and substitution effect (SE) i.e. PE = IE + SE. If we measure any of these effects (IE or SE), we can easily find the others. Hicks suggested a convenient and direct way measure first the income effect.

According to Hicks, the consumer can be bought to the initial indifference curve IC_1, by imposing taxes (such as an increase in income tax), in according with the new budget line. In other words, when the government increases income tax, the consumer's real disposable income decreases and budget line shifts leftwards as a parallel of AC to EF. The new budget line EF is tangent to the initial indifference curve IC_1 at the point E_3. The point E_3 represents the consumer's equilibrium at new price budget line (or price ratio) of X and Y, after the elimination of the real income effect. The equilibrium point E_3 shows that the consumers purchase OQ_3 units of X good and ON_3 units of Y good. Here, he reduces his demand for X good by Q_2Q_3 units. The change in quantity demanded of X results from a decrease in consumer's real income due to increase in income tax. Hence, Q_2Q_3 is the income effect.

When the consumer is in initial purchasing power from the cutting down of increased purchasing power or real income due to fall in the price of X, he compares the relative price of X with Y. It results that X good is relatively cheaper than Y good. The change in relative prices will induce the consumer to rearrange the purchases of X and Y. Here, he substitutes Q_1Q_3 units of X for N_1N_3 units of Y. It is shown by the equilibrium point E_3. This process in substitution effect. In short,

PE = SE + IE

Or, $E_1E_2=E_1E_3 + E_2E_3$

Or, $Q_1Q_2=Q_1Q_3 + Q_2Q_3$

Or, $Q_1Q_2 = Q_1Q_3 + Q_2Q_3$

Demand and Demand Function:

Demand is the quantity of a good or service that consumers are willing and able to buy at a given price in a given time period. According to **Milton H. Spencer,** *"Demand is the quantity that will be purchased of particular commodity at various prices, at a given time and place".*

Demand function shows the functional relationship between demand for a commodity and price of same commodity. It may be defined as the mathematical relationship between determinants of demand and demand for a commodity. It is expressed as Qx = f(Px, Y, Py, A, T, C, W, Sp, Ms, Tr, Ep) where,

Qx	=	Quantity Demand for X Good
F	=	Function
Px	=	Price of X Good
Y	=	Income
Py	=	Price of Y Good
A	=	Advertisement
T	=	Taste and Preferences
C	=	Customs
W	=	Weather
Sp	=	Size of Population
Ms	=	Money Supply
Tr	=	Tax Rate
Ep	=	Expectation about Change in Price

According to **Edwin Masfield,** *"Demand function is the relationship between the quantity demanded of the product and the various factors that influence this quantity".*

Price Elasticity of Demand (Ep):

Price elasticity of demand, is a measure used in economics to show the responsiveness of the quantity demand of a good or services to a change in its price. More precisely, it gives the percentage change in quantity demanded in response to a one percent change in price, holding constant all the other determinants of demand.

Price elasticity of demand is defined as percentage change in demand due to percentage change in price of commodity.

Mathematically,

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

$$Ep = \frac{\frac{\Delta Q}{Q} * 100\%}{\frac{\Delta P}{P} * 100\%}$$

$$\therefore Ep = \frac{P}{Q} * \frac{\Delta Q}{\Delta P}$$

Where,

Ep = Coefficient of price elasticity of demand
Q = Initial quantity demanded
P = Initial price
ΔQ = Change in quantity demanded
ΔP = Change in price

According to **K. E. Boulding,** *"The price elasticity of demand may be defined as the percentage change in the quantity demanded which would result from one percent change in price".*

For example, when quantity demanded increase from 100 units to 150 units due to change in price of the commodity from Rs 12 to Rs 10. Find the price elasticity of demand.

Solution,

Initial Price (P) = Rs 12
New Price (P1) = Rs 10
Change in Price (ΔP) = P1 - P = Rs (10 - 12) = - Rs 2
Initial Quantity Demanded (Q) = 100 units
New Quantity Demanded (Q1) = 150 units
Change in Quantity demanded(ΔQ) = Q1 - Q = (150 - 100) units = 50 units

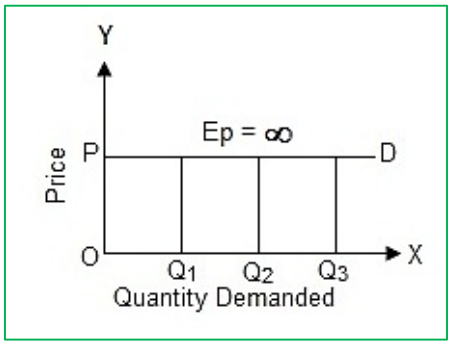
$$\therefore Price\ Elasticity\ of\ Demand\ (Ep) = \frac{P}{Q} * \frac{\Delta Q}{\Delta P} = \frac{10}{100} * \frac{50}{-2} = -2.5$$

Interpretation: Ep = -2.5 indicates that one percent increase in price of the commodity leads to 2.5 percentage decrease in quantity demanded.

Types (Degree) of Price Elasticity of Demand:

1. Perfectly Elastic Demand (Ep = ∞):

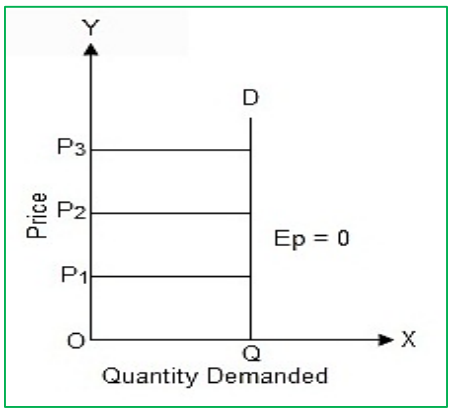
If small change in price of a commodity make infinite change in demand of commodity then it is called perfectly elastic demand. It is unrealistic because one percent increase in the price of product X causes its sales to drop to zero or one percent decrease cause its sales to increase to infinity. It is denoted by Ep = ∞**.**



In above figure, quantity demanded and price of commodity is measured along X-axis and Y-axis respectively. Small change in price OP (i.e. rise or fall) make infinite change in quantity demand (i.e. demand rises from OQ2 to OQ3 or demand fall from OQ2 to OQ1). Thus, the demand curve PD, which is horizontal straight line parallel to X-axis shows perfectly elastic demand.

2. Perfectly Inelastic Demand (Ep = 0):

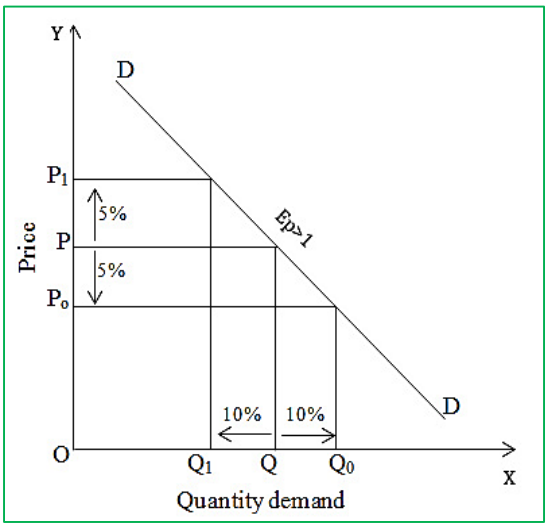
Perfectly inelastic demand refers to a situation when any change in price will not affect the demand for good i.e. quantity demanded will remain unchanged as a result of change in its price, it is called perfectly inelastic demand. It is denoted as Ep = 0. Its example is salt.



In above figure, quantity demanded and price of commodity is measured along X-axis and Y-axis respectively. Change in price OP2 (i.e. rise from OP2 to OP3 or fall from OP2 to OP1) does not make any change in quantity demand. Thus, the demand curve QD, which is vertical straight line parallel to Y-axis shows perfectly inelastic demand.

3. Relatively Elastic Demand (Ep > 1):

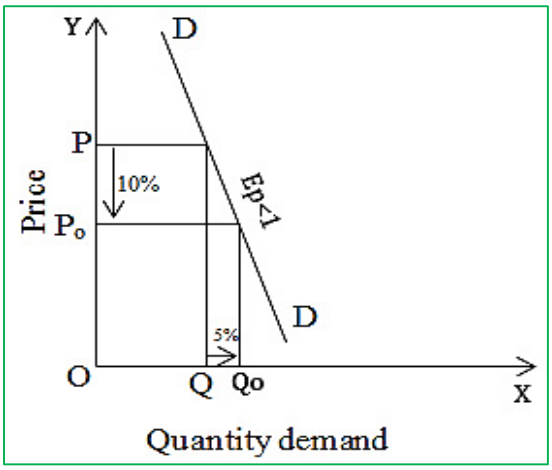
If there is great change in demand with a small change in price, it is called relatively elastic demand, i.e. percentage change in quantity demand is greater than the percentage change in price. It is denoted by Ep>1.



In above figure, quantity demanded and price of commodity is measured along X-axis and Y-axis respectively. Small percentage rise in price from OP to OP_1 i.e. 5% makes greater percentage fall in quantity demand from OQ to OQ_1 i.e. 10% and vice versa then such, the demand curve DD, shows relatively elastic demand.

4. Relatively Inelastic Demand (Ep < 1):

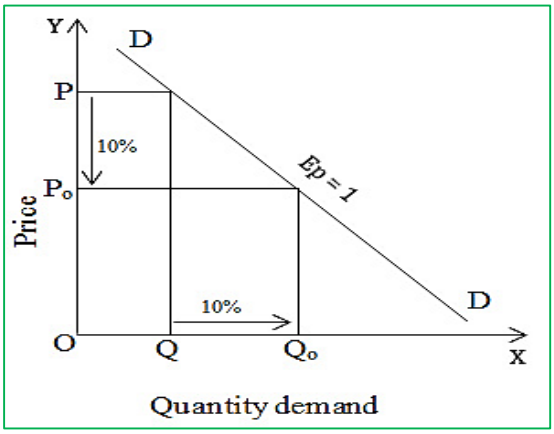
If there is small change in demand with greater change in price i.e. percentage change in demand is less than percentage change in price, is said to be relatively inelastic demand. It is denoted by Ep < 1.



In above figure, quantity demanded and price of commodity is measured along X-axis and Y-axis respectively. Percentage fall in price from OP to OP_0 i.e. 10% makes smaller percentage rise in quantity demand from OQ to OQ_0 i.e. 5% and vice versa then such, the demand curve DD, shows relatively inelastic demand.

5. Unitary Elastic Demand (Ep = 1):

If percentage change in price leads to equal percentage change in demand, then the demand for that good is unitary. This kind of elasticity is also an imaginary one. This kind of elasticity is found basically in case of normal goods. It is denoted by Ep = 1.



In above figure, quantity demanded and price of commodity is measured along X-axis and Y-axis respectively. Percentage fall in price from OP to OP_0 i.e. 10% makes same percentage rise in quantity demand from OQ to OQ_0 i.e. 10% and vice versa then such, the demand curve DD, shows unitary elastic demand.

Nature of Price Elasticity of Demand:

Description	Elasticity	Definition	Example
Perfectly Elastic	Infinite (Ep = ∞)	Change in demand with negligible change in price	Imaginary

Perfectly Inelastic	Zero (Ep = 0)	Demand does not change with change in price	Salt
Relatively Elastic	Greater than 1 (Ep > 1)	% change in demand is greater than % change in price	Petrol
Relatively Inelastic	Smaller than 1 (Ep < 1)	% change in demand is less than % change in price	Sugar
Unitary Elastic	One (Ep = 1)	% change in demand is equal to % change in price	Cloth

Determinants of Price Elasticity of Demand:

1. **Availability of Substitute Goods:**

Demand for those commodities which have substitutes is relatively more elastic. The reason begin that when price of commodity falls in relation to its substitute, the consumers will go in for it and so its demand will increase. Commodities having no substitutes like cigarettes, liquor, etc. have inelastic demand.

2. **Income of the Consumer:**

Price elasticity of demand is also determining the income of the consumer. If the consumer's income is high, demand is less elastic i.e. change is price of goods will not affect the demand of that good by a greater proportion. But in low income groups, the demand is elastic i.e. small rise or fall in the price of goods will reduce or increase the demand.

3. **Proportion of Income Spent on a Commodity:**

Goods, on which a consumer spends a very small proportion of his income such as toothpaste, boot-polish, newspaper, etc. will have an inelastic demand. On the other hand, goods on which the consumer spends a large proportion of his income, their demand will be elastic.

4. **Time Period:**

Demand is inelastic in short period but elastic in long period. It is so because in the long-run a consumer can change his habits more conveniently than in the short period. Longer the time taken by consumers to adjust a new price, the greater the elasticity and vice-versa.

5. **Brand Loyalty:**

An attachment to a certain brand, either out of tradition, can override sensitivity to price change, resulting in more elastic demand.

6. **Different Uses of Commodity:**

Commodities that can be put to a variety of uses such as electricity have elastic demand. On the other hands, if a commodity such as paper has only a few uses its demand is likely to be inelastic.

Income Elasticity of Demand (Ey):

Income elasticity of demand is the degree of responsiveness of quantity demanded of a commodity due to change in consumer's income, other things remaining constant. In other

words, it measures by how much the quantity demanded changes with respect to the change in income.

The income elasticity of demand is defined as the percentage change in quantity demanded due to certain percent change in consumer's income.

Mathematically,

$$Ey = \frac{percentage\ change\ in\ quantity\ demanded}{percentage\ change\ in\ income}$$

$$Ey = \frac{\frac{\Delta Q}{Q} * 100\%}{\frac{\Delta Y}{Y} * 100\%}$$

$$\therefore Ey = \frac{Y}{Q} * \frac{\Delta Q}{\Delta Y}$$

Where,

Ey	=	Coefficient of income elasticity of demand
Q	=	Initial quantity demanded
Y	=	Initial income
ΔQ	=	Change in quantity demanded
ΔY	=	Change in income

According to **Watson,** *"Income Elasticity of demand means the ration of the percentage change in the quantity demanded to the percentage change in income."*

For example, suppose that the income is Rs. 100, demand is 25 units. Now suppose that the income increases to Rs. 150, as a result of this, demand increases to 30 units. Find income elasticity of demand.

Solution,

Initial Income (Y) = Rs 100
New Income (Y1) = Rs 150
Change in Income (ΔY) = Y1 - Y = Rs (150 - 100) = Rs 50
Initial Quantity Demanded (Q) = 25 units
New Quantity Demanded (Q1) = 30 units
Change in Quantity demanded(ΔQ) = Q1 - Q = (30 - 25) units = 5 units

$$\therefore Income\ Elasticity\ of\ Demand\ (Ey) = \frac{Y}{Q} * \frac{\Delta Q}{\Delta Y} = \frac{100}{25} * \frac{5}{50} = 0.4$$

Interpretation: Ey = 0.4 indicates that one percent increase in income of the consumer leads to 0.4 percentage increase in quantity demanded.

Types of Income Elasticity of demand:

1. Positive Income Elasticity Of Demand ($E_Y > 0$):

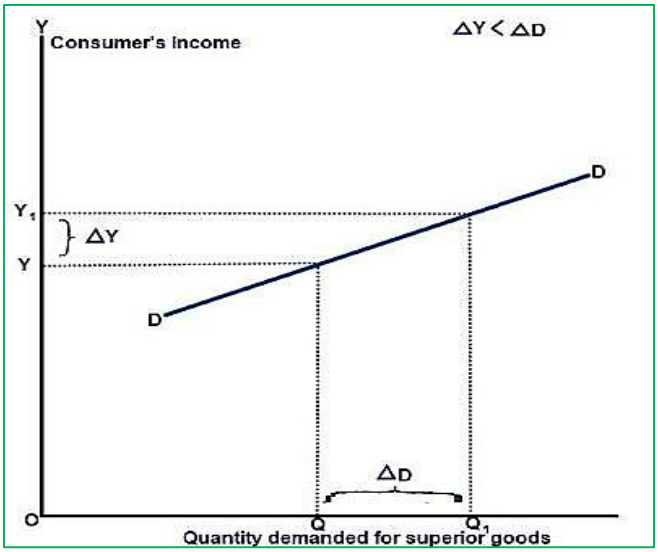
If there is direct relationship between income of the consumer and demand for the commodity, then income elasticity will be positive. That is, if the quantity demanded for a commodity increases with the rise in income of the consumer and vice versa, it is said to be positive income

elasticity of demand. For example: as the income of consumer increases, they consume more of superior (luxurious) goods. On the contrary, as the income of consumer decreases, they consume less of luxurious goods.

Positive income elasticity can be further classified into three types:

a. Income Elasticity Greater Then Unity ($E_Y > 1$):

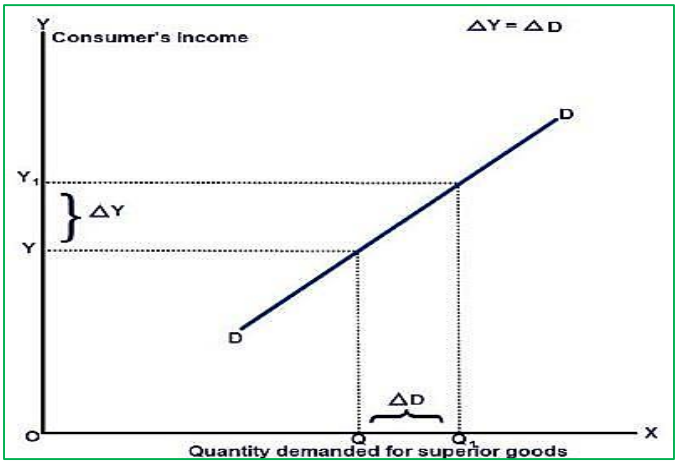
If the percentage change in quantity demanded for a commodity is greater than percentage change in income of the consumer, it is said to be income greater than unity. For example: When the consumer's income rises by 5% and the demand rises by 10%, it is the case of income elasticity greater than unity.



In the given figure, quantity demanded and consumer's income is measured along X-axis and Y-axis respectively. The small rise in income from **OY** to **OY_1** has caused greater rise in the quantity demanded from **OQ** to **OQ_1** and vice versa. Thus, the demand curve **DD** shows income elasticity greater than unity.

b. Income Elasticity Equal to Unity (EY = 1):

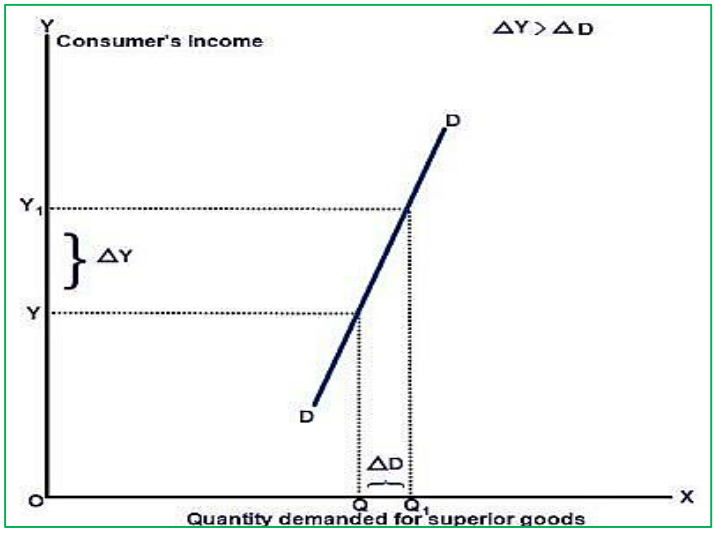
If the percentage change in quantity demanded for a commodity is equal to percentage change in income of the consumer, it is said to be income elasticity equal to unity. For example: When the consumer's income rises by 5% and the demand rises by 5%, it is the case of income elasticity equal to unity.



In the given figure, quantity demanded and consumer's income is measured along X-axis and Y-axis respectively. The small rise in income from **OY** to **OY_1** has caused equal rise in the quantity demanded from **OQ** to **OQ_1** and vice versa. Thus, the demand curve **DD** shows income elasticity equal to unity.

c. Income Elasticity Less Then Unity (EY < 1):

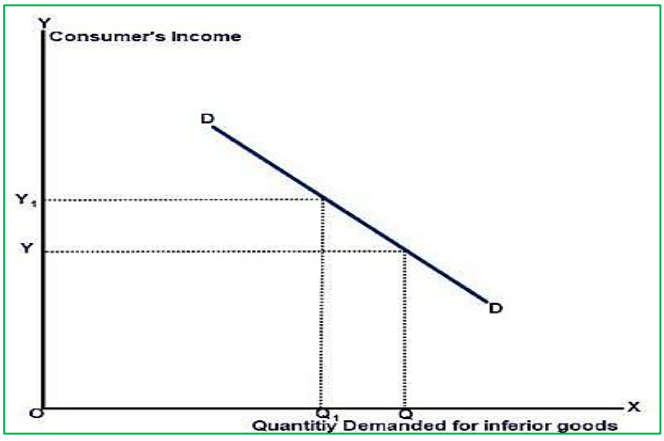
If the percentage change in quantity demanded for a commodity is less than percentage change in income of the consumer, it is said to be income greater than unity. For example: When the consumer's income rises by 10% and the demand rises by 5%, it is the case of income elasticity less than unity.



In the given figure, quantity demanded and consumer's income is measured along X-axis and Y-axis respectively. The greater rise in income from **OY** to **OY_1** has caused small rise in the quantity demanded from **OQ** to **OQ_1** and vice versa. Thus, the demand curve **DD** shows income elasticity less than unity.

2. Negative Income Elasticity Of Demand (EY < 0):

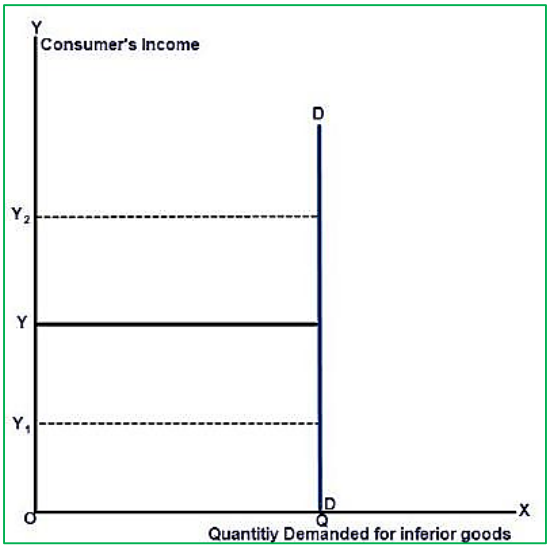
If there is inverse relationship between income of the consumer and demand for the commodity, then income elasticity will be negative. That is, if the quantity demanded for a commodity decreases with the rise in income of the consumer and vice versa, it is said to be negative income elasticity of demand. For example: As the income of consumer increases, they either stop or consume less of inferior goods.



In the given figure, quantity demanded and consumer's income is measured along X-axis and Y-axis respectively. When the consumer's income rises from **OY** to **OY1** the quantity demanded of inferior goods falls from **OQ** to **OQ_1** and vice versa. Thus, the demand curve **DD** shows negative income elasticity of demand.

3. Zero Income Elasticity Of Demand ($E_Y = 0$):

If the quantity demanded for a commodity remains constant with any rise or fall in income of the consumer and, it is said to be zero income elasticity of demand. For example: In case of basic necessary goods such as salt, kerosene, electricity, etc. there is zero income elasticity of demand.



In the given figure, quantity demanded and consumer's income is measured along X-axis and Y-axis respectively. The consumer's income may fall to **OY_1** or rise to **OY_2** from **OY**, the quantity demanded remains the same at **OQ**. Thus, the demand curve **DD**, which is vertical straight line parallel to Y-axis shows zero income elasticity of demand.

Nature of Income Elasticity of Demand:

Description	Elasticity	Definition	Example
Positive Elasticity	Positive (Ey > 0)	Demand increases with the increase in income of the consumer	
	Greater than 1 (Ey > 1)	% change in demand is greater than % change in income	Watch
	Smaller than 1 (Ey < 1)	% change in demand is smaller than % change in income	Flour
	Equal to 1(Ey = 1)	% change in demand is equal to % change in income	
Negative Elasticity	Negative (Ey < 0)	Demand decrease with increase in income of the consumer.	Millet
Zero Elasticity	Zero (Ey = 0)	Demand does not change with change in income of the consumer.	Salt

Cross Elasticity of Demand (Ec):

The cross-price elasticity of demand is the degree of responsiveness of quantity demanded of a commodity due to the change in price of another commodity.

Cross elasticity of demand is the percentage change in the quantity demanded of good X due to certain percent change in the price of good Y.

Mathematically,

$$Ec = \frac{percentage\ change\ in\ quantity\ demanded\ of\ good\ X}{percentage\ change\ in\ price\ of\ good\ Y}$$

$$Ec = \frac{\frac{\Delta Qx}{Qx} * 100\%}{\frac{\Delta Py}{Py} * 100\%}$$

$$\therefore Ec = \frac{Py}{Qx} * \frac{\Delta Qx}{\Delta Py}$$

Where,

Ec	=	Coefficient of cross elasticity of demand
Qx	=	Initial quantity demanded of good X
Py	=	Initial price of good Y
ΔQx	=	Change in quantity demanded of good X
ΔPy	=	Change in price of good Y

According to **C. E. Ferguson**, *"Cross elasticity of demand is the proportionate change in the quantity demanded of good X divided by the proportionate change in the price of good Y."*

For example, suppose X and Y are two substitute goods, when the initial price of Y is Rs. 40, the initial quantity of X is 50kg. When the price of good Y increase to Rs. 5 the quantity demanded for X increases to 60kg. Then find cross elasticity of demand.

Solution,

Initial demand of good X (Qx) = 50kg

New demand of good X (Qx1) = 60kg

Change in demand of good X (Qx1 - Qx) = 60 kg - 50 kg = 10kg

Initial price of good Y (Py) = Rs. 40

New price of good Y (Py1) = Rs. 45

Change in price of good Y (Py1 - Py) = Rs. 45 - Rs. 40 = Rs. 5

$$Ec = \frac{40}{50} * \frac{10}{5}$$

$$\therefore Ec = 1.5$$

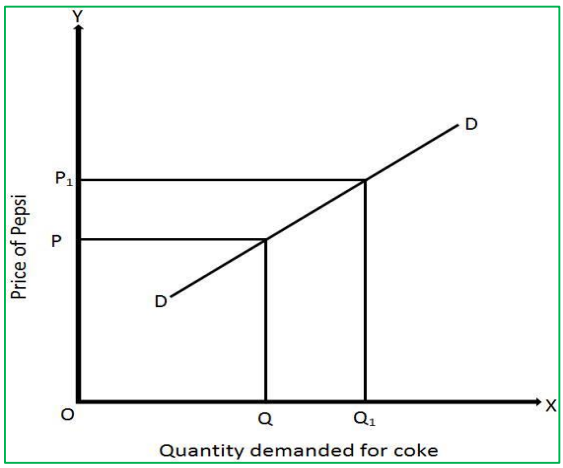
Interpretation: Ec = 1.5 indicates that 1 percent increase in price of good Y leads to 1.5 percentage increase in quantity demanded of good X.

Types of Cross Elasticity of Demand:

1. Positive Cross Elasticity of Demand: Substitute Goods (Ec > 0):

If the two goods are substitutes for each other, the cross elasticity of demand will be positive. When the price of one good goes up the demand of the other will increase and vice-versa. For

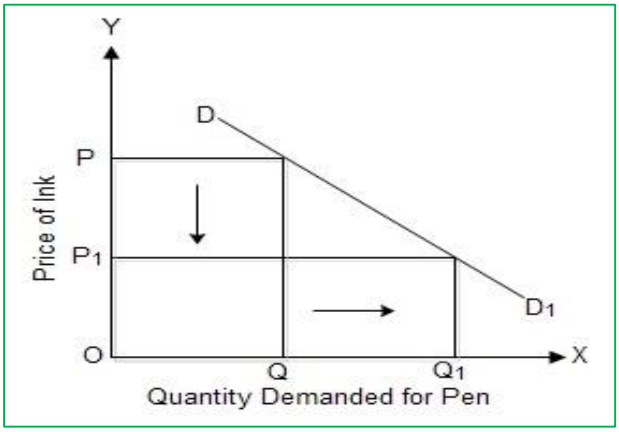
example, in response to an increase in the price of Pepsi, the demand for Coke will rise. It is denoted by Ec > 0.



In the given figure, price of Pepsi and demand of coke is measured along Y-axis and X-axis respectively. With the increase in price of Pepsi from OP to OP1, demand for coke has increased from OQ to OQ1 i.e. if the price of Pepsi raises the demand for coke rises. The DD curve shows the positive relationship between price for Pepsi and demand for coke.

2. Negative Cross Elasticity of Demand: Complementary Goods (Ec < 0):

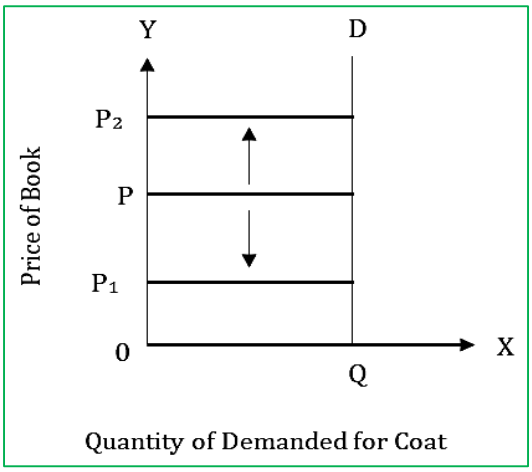
If the two goods are complementary for each other, the cross elasticity of demand will be negative. When the price of one good increases the demand of the other will decrease. For example, response to an increase in the price of Ink, the demand for Pen will decrease. It is denoted by Ec < 0.



In the given figure, price of Ink and demand of Pen is measured along Y-axis and X-axis respectively. With the decrease in price of Ink from OP to OP1, demand for Pen has increased from OQ to OQ1 i.e. if the price of Ink falls the demand for coke rises. The DD curve shows the negative relationship between price for Ink and demand for pen.

3. Zero Cross Elasticity of Demand: Neutral Goods (Ec = 0):

When the goods are not related to each other i.e. neutral goods, the cross elasticity is zero. These goods have no price and demand relation with one another. As for example, Price of Book and demand of Coat. The change in price of book does not affect the demand for the coat.



In the given figure, price of book and demand of coat is measured along Y-axis and X-axis respectively. With the increase or decrease in price of book from OP to OP2 or OP to OP1, demand for coat remain neutral OQ. The DQ curve shows, there is no price and demand relation between book and coat.

Supply and Supply Function:

Supply is the quantity of a good or service that producers are willing and able to sell at a given price in a given time period. According to **R.G. Lipsey**, *"The amount of commodity that firms will be willing and able to offer for sale is called the quantity supplied of a commodity."*

Supply function shows the functional relationship between supply of a commodity and its various determinants. In other words, supply of a commodity is a function of several factors as expressed in the following equation: Sx = f (Px, Pr, Nf, G, Pf, T, Ex, Gp) where,

Sx	=	Supply of commodity-x
F	=	Functional relationship
Px	=	Price of commodity-x
Pr	=	Price of related goods
Nf	=	Number of firm
G	=	Goal of the firm
Pf	=	Price of factors of production
T	=	Technology
Ex	=	Expected future price
Gp	=	Government policy

Price Elasticity of Supply:

In Economics, elasticity is defined as the degree of change in demand and supply of consumers and producers with respect to the change in income or price of the commodity.

Particularly, price elasticity of supply is a measure of the degree of change in the supplied amount of commodity in response to the change in the commodity's price. In simple words, it can be defined as the rate of change in supply in response to a price change. It is denoted as PES or E_s.

Mathematically, price elasticity of demand is expressed as

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

$$= \frac{\frac{\text{change in quantity supplied}}{\text{initial quantity supplied}} \times 100\%}{\frac{\text{change in price}}{\text{intial price}} \times 100\%}$$

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

Degrees or Types of Price Elasticity of Supply:

1. **Infinite/Perfectly Elastic Supply:**

When a slight or minimal change in price causes infinite change in quantity supplied, it is said to be infinite or perfectly elastic supply. In a graph, such situation is represented by a straight line which is parallel to X-axis.

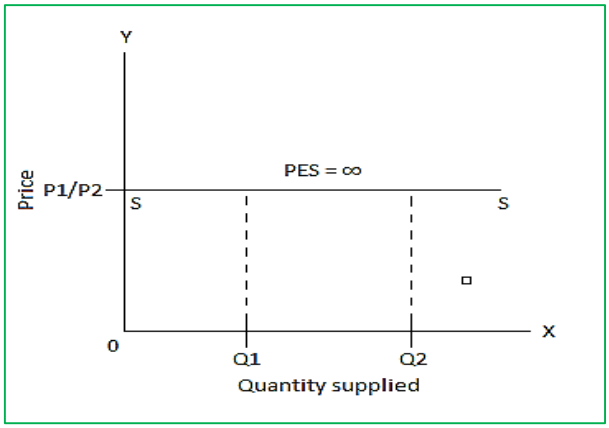


Fig: Perfectly Inelastic Supply Curve

In the above figure, we can see that quantity supplied has varied significantly even at the same price level. This kind of price elasticity is expected to occur in highly luxurious goods. However, perfectness of anything, including perfectly inelastic supply is considered to be rare or impractical in economy.

2. **Zero/Perfectly Inelastic Supply:**

When quantity supplied remains unchanged with change in price, it is said to be zero or perfectly inelastic supply. Such situation in graph is represented by a straight line which is parallel to Y-axis.

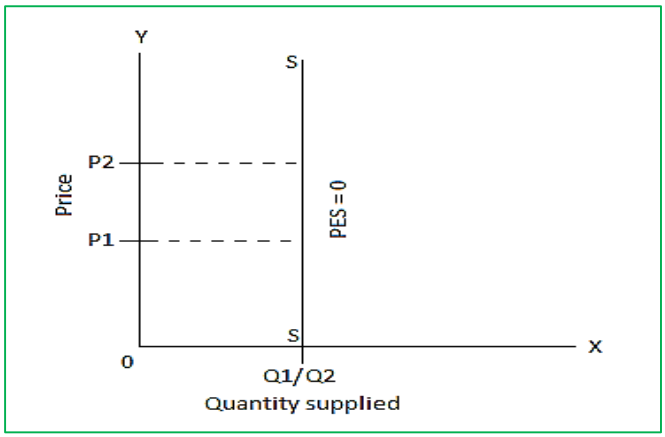


Fig: Perfectly Inelastic Supply

In above figure, we can see that the amount of commodity supplied has remained unchanged even when the price has greatly changed. This type of price elasticity is expected to be observed in highly essential goods such as medicines. However, as mentioned earlier, perfectness of anything in economy is rare or impractical.

3. Relatively Elastic Supply:

When percentage change in quantity supplied is greater than percentage change in price, the condition is known as relatively elastic supply. This situation when plotted in graph makes an upward slope which intersects positive Y-axis.

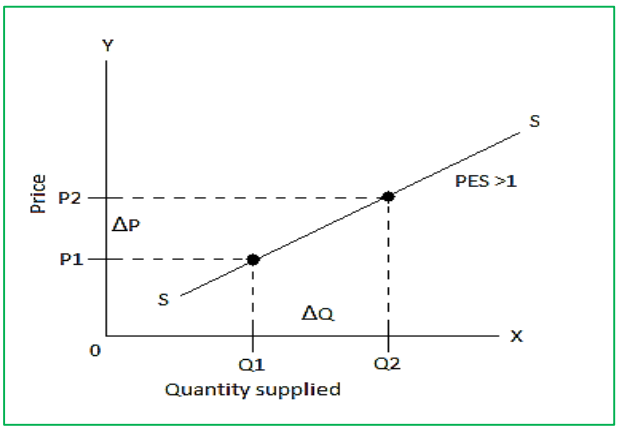


Fig.: Relatively Elastic Supply Curve

In figure above, we can see that ratio of change in quantity supplied is greater than the ratio of change in price. As a result, when we put their values in the above mathematical expression, we get PES>1. Elasticity tends to be greater than 1 in case of products which are not necessary to sustain our lives. Luxury goods such as expensive smart phone, gold, etc. show this kind of price elasticity.

4. Relatively Inelastic Supply:

When the percentage change in quantity supplied is lesser than percentage change in price, the condition is known as relatively inelastic supply. This situation when plotted in graph makes highly inclined upward slope which intersects positive X-axis.

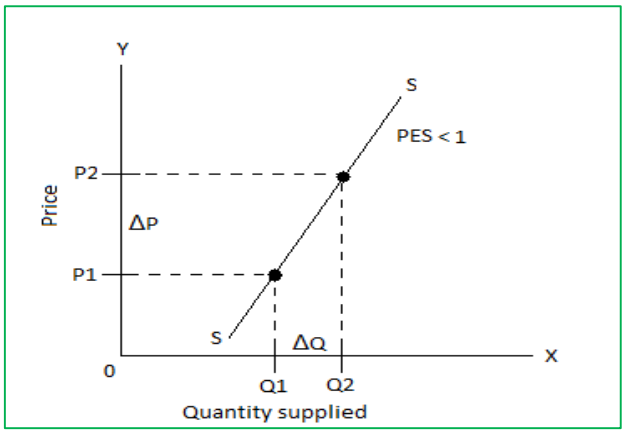


Fig: Relatively Inelastic Supply Curve

In the above figure, it is clearly shown that ratio of change in price is greater than ratio of change in quantity, whose value when substituted in the given expression, we get PES<1. Such kind of price elasticity can be observed in goods which are necessary in our day to day lives. Clothes, foods, etc. are good examples of these kinds of goods.

5. **Unitary Elastic Supply:**

When percentage change in quantity supplied is exactly equal to percentage change in price, the situation is known as unitary elastic supply. This situation is graph is represented by an upward slope which intersects the origin.

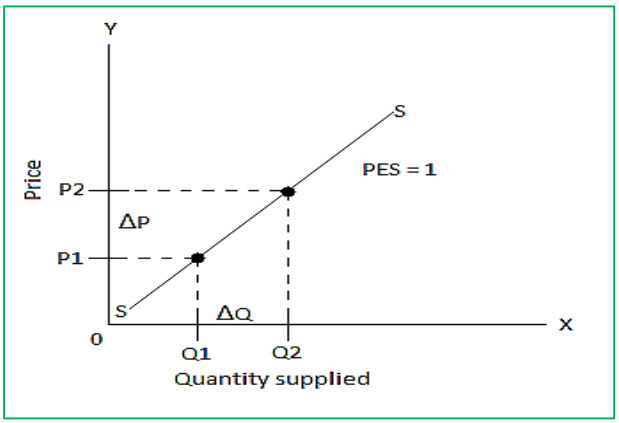


Fig: Unitary Elastic Supply

In the above figure, the ratio of change in quantity supplied is equal to the ratio of change in price. Consequently, when the value of these variables are substituted in the given expression, we get PES=1. This behavior between price and quantity supplied of commodity is also known as lock-step movement.

Economics of Speculation:

Speculation is the purchase of an asset (a commodity, goods, or real estate) with the hope that it will become more valuable at a future date. In finance, speculation is also the practice of engaging in risky financial transactions in an attempt to profit from short term fluctuations in the market value of a tradable financial instrument rather than attempting to profit from the underlying financial attributes embodied in the instrument such as capital gains, dividends, or interest.

Many speculators pay little attention to the fundamental value of a security and instead focus purely on price movements. Speculation can in principle involve any tradable good or financial instrument. Speculators are particularly common in the markets for stocks, bonds, commodity futures, currencies, fine art, collectibles, real estate, and derivatives.

Speculators play one of four primary roles in financial markets, along with hedgers, who engage in transactions to offset some other pre-existing risk, arbitrageurs who seek to profit from situations where fungible instruments trade at different prices in different market segments, and investors who seek profit through long-term ownership of an instrument's underlying attributes.