

CONSUMER EQUILIBRIUM THROUGH INDIFFERENCE CURVE ANALYSIS,

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Consumer Equilibrium refers to a situation in which the consumer has allocated his given income on different commodities or services in such a way that he gets the maximum possible satisfaction, and he is in no mood to change from the situation.

Ordinal approach :- The ordinal approach postulates/says that utility is not measurable as the consumer may not be able to express the utility of various commodities in accurate no.s.

It is sufficient for him to be able to rank the various commodities according to their satisfaction. He must be able to determine this order of preference among different bundles of goods.

The ordinal approach employs the tool of indifference curve for the purpose of determination of consumer equilibrium. A set of IC plotted in is known as an Indifference Map, and it determines consumer's order of preferences.

(Consumer Equilibrium is established at the point where an IC is tangent to the given budget line.)

② 4
* Indifference Curve :- is a locus of all such points showing combinations of 2 goods which gives us the same level of satisfaction or utility, so that a consumer is indifferent among the different points along the curve.

3 ①
* Assumptions :-

- ① Rationality :- A consumer acts rationally so as to maximize his satisfaction given his income and market price.
- ② Ordinal utility :- The IC analysis is based on the concept of ordinal utility, as utility cannot be measured cardinally.
- ③ Consistency :- The consumer is consistent in his choice that if he prefers a commodity basket A over commodity basket B in one period of time. Then he will not prefer B over A in another period of time.

Symbolically,

$A \succ B \rightarrow$ at first period.

$B \not\succ A \rightarrow$ at second period.

- ④ Transitivity :- If commodity basket A is preferred to B and B is preferred to C, then A is preferred to C.

Symbolically,

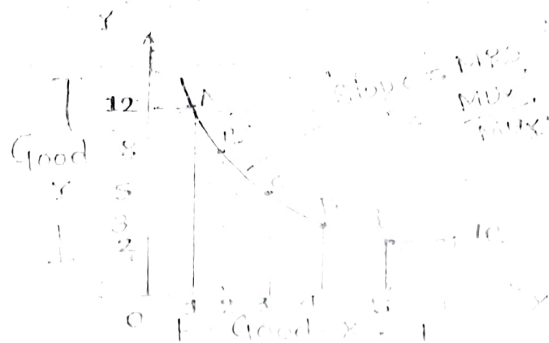
If $A \succ B, B \succ C$, then $A \succ C$.

- ⑤ Diminishing Marginal Rate of Substitution (DMRS) :-

The DMRS of X for Y diminishes as more and more of X is substituted for Y. In other words, as the consumer has more & more of commodity X, his willingness to sacrifice Y decreases.

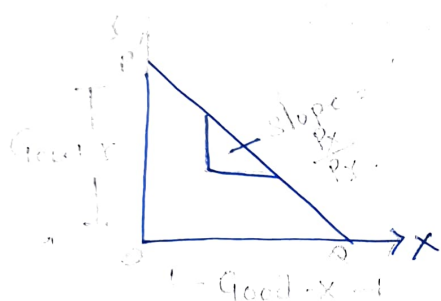
* An IC can be drawn as follows :-

(9)



In the above diagram, the convex curve is known as the IC, and the convexity of this curve is due to the application of DMRS. The slope of the IC is given by MRS_{xy} and which is given as $\frac{MU_x}{MU_y}$.

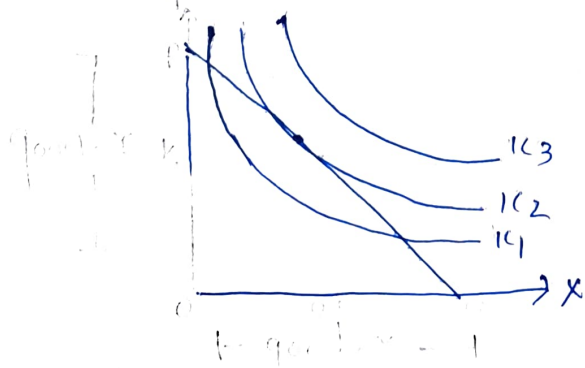
* Budget line :- A Budget line shows combination of two goods that the consumer can purchase with his entire income. It can be shown with the help of the following diagram :-



In the above diagram the negative sloping line is known as the budget line, and the equation of this line is given as $P_x X + P_y Y = M$. Here, P_x and P_y are the price of good X and Y, and X and Y are the qty. purchase of commodity X and Y, and lastly, M is the income of the consumer.

The slope of the budget line is given by $\frac{P_x}{P_y}$.

(Having knowledge of the IC and budget line we can show consumer equilibrium (through ordinal approach) at the tangency point of the IC and the budget line. This is depicted in the following diagram :-



In the above diagram, the consumer equilibrium is established at point E, where the budget line PQ is tangent to IC_2 . (In other words, the consumer equilibrium at point E implies that given the budget line PQ the consumer can attain a maximum level of satisfaction level of IC_2 . At point E, we can say that the slope of both the curves are same.

i.e. $MRS_{xy} = \frac{P_x}{P_y}$. Or, $\frac{MU_x}{MU_y} = \frac{P_x}{P_y}$. Thus, to be in equilibrium (1)

the consumer must satisfy the following 2 conditions:-

(1) The first condition is that MRS should be equal to ratio of commodity prices. (NECESSARY CONDITION).

(2) The IC must be convex to the point of origin.

(SUFFICIENT CONDITION).

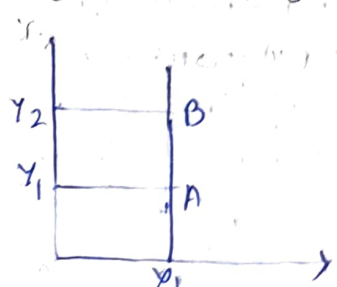
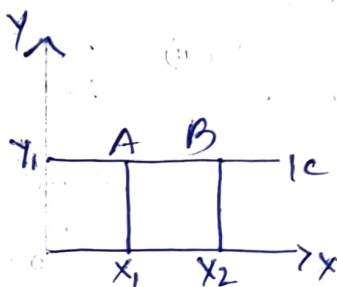
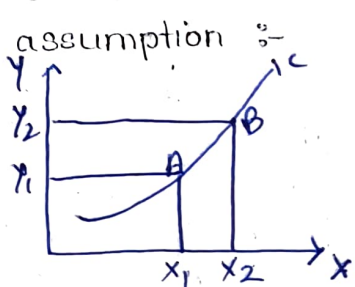
Thus the ~~conc~~ 1st condition is denoted graphically by the point of tangency between the budget line and IC.

and the 2nd condition is implied by the convex shape of IC. Thus at point E, both necessary and sufficient conditions are fulfilled and the consumer attains equilibrium by purchasing OQ of commodity X and OK of commodity Y.

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* Properties of IC :-

(1) The slope of IC is negative, i.e., a downward sloping curve.
from left to right. :- It denotes that if the quantity of one commodity (say X) increases, then the quantity of commodity Y decreases in order to keep the consumer at the same level of satisfaction. This can be proved by taking IC contrary to the assumption :-



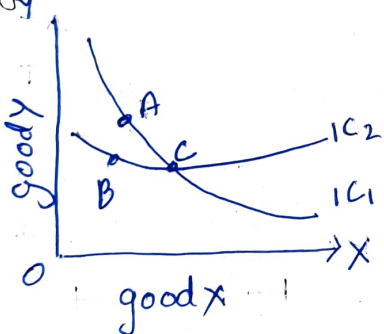
In the above panel (i), (ii) and (iii), the IC is assumed to be upward sloping, horizontal parallel to X-axis and vertical parallel to Y-axis respectively. In panel (i), it can be seen that if a consumer moves from point A to B, he is consuming more of both the commodities. Thus, it could be brought to assume that A and B yields same level of satisfaction. Similarly, In panel (ii), when a consumer moves from A

to B, he is consuming more amount of X and a constant level of Y. Thus, point B will be associated with a higher level of satisfaction. Therefore, can't be represented by the same horizontal IC. (11)

In panel (iii), ~~the~~ when a consumer is consuming 2 commodities, X and Y. Commodity X is constant and consumption of commodity Y is more. As a result, it can't be placed in an IC.

(2) IC are always convex to origin :- The convexity of IC is due to the assumption of DMRs. It implies that the marginal rate of substitution diminishes as more and more of commodity X is substituted for Y. In other words, as a consumer has more and more of Good X, his willingness to sacrifice Y reduces.

(3) IC do not intersect each other :- If they did the point of intersection would imply 2 different levels of satisfaction which is impossible. It can be shown with the help of a diagram :-



In the figure, 2 different curves, IC_1 and IC_2 intersect each other at point C.

IC_1 implies utility of A = utility of C. Similarly IC_2 implies utility of B = utility of C. Thus, it can be said that utility A = utility B.

However, this cannot be possible because combination A and combination B lies on 2 different ICs which implies 2 different levels of satisfaction.

(4) A higher IC represents a higher level of satisfaction :-

Income Substitution effect is defined as change in consumption of a product as a result of change in its price only, keeping income of consumer constant.

Income effect is defined as change in consumption of a product caused by an change in income keeping price constant.

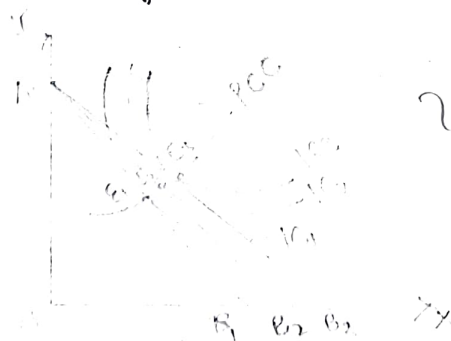
(22)

* Income Consumption Curve (ICC) :- An income consumption curve (ICC) shows the equilibrium combination of 2 commodities X and Y purchased at different levels of money income, nominal price remaining constant. The derivation of ICC is shown as follows :-



In the figure, as the level of money income increases the budget line shifts rightwards from A_1B_1 to A_2B_2 and further to A_3B_3 . Accordingly, consumer equilibrium also shifts from E_1 to E_2 , then E_2 and E_3 respectively. By joining these various equivalent points, we get a line known as ICC.

* Price Consumption Curve (PCC) :- A PCC shows equilibrium combination of 2 commodities X and Y purchased when their price ratio changes, the money income remaining constant.



$$\begin{cases}
 P_x X + P_y Y = M \\
 \text{Given } P_y = 1, P_x = 5, M = 10 \\
 \text{If } Y = 0, \text{ and if } X = 0 \\
 P_x X = 10 & P_y Y = 10 \\
 \Rightarrow X = 2 & \Rightarrow Y = 10 \\
 \text{If } Y = 0, \text{ and if } X = 0 \\
 P_x X = 10 & P_y Y = 10 \\
 \Rightarrow X = 2 & \Rightarrow Y = 10
 \end{cases}$$

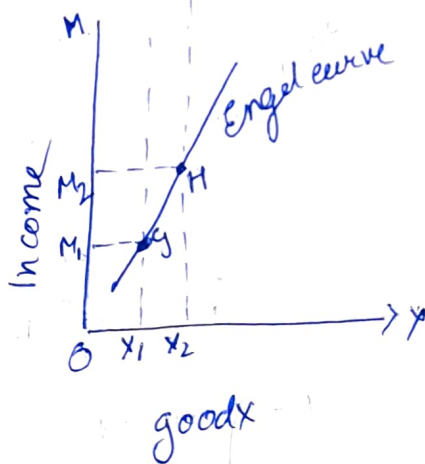
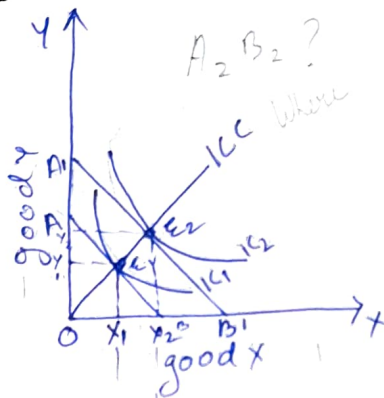
As the price of the commodity X falls, the budget line A_1B_1 rotates rightward to A_2B_2 . With further fall in price of X the budget line rotates further right to A_3B_3 . With every fall in the price of X the consumer equilibrium point shifts from E_1 to E_2 and further to E_3 . By joining the 3 equilibrium points, we obtain the PCC.

* Engel Curve :- and its derivation from Income Consumption Curve.

* An Engel curve shows the relationship betⁿ qty. dd of a good and the level of consumer's income. Since, with the increase in income, normally, more qty. of a good is demanded, Engel curve sloped upward i.e., it has a positive slope.

Derivation :- Engel curve can be derived using IC Analysis with the help of ICC. (ICC is a locus of consumer's eq^{il} points at diffⁿ level of money income, ceteris paribus).

The process of derivation of engel curve from ICC can be shown as follows :-



Given the price of the commodity and Income, the initial budget line is AB. As money income of the consumer increases the budget line shifts to A₂B₂ and so does the consumer's equilibrium from E₁ to E₂. If Now, if we join the points of eq^{il} consumer's equilibrium at diffⁿ levels of income, we get what is known as ICC.

Now, it can be seen from the diagram that at equilibrium E₁ and E₂ the corresponding levels of commodity X are x₁ and x₂. These quantities of X are extended to panel B and each quantity is plotted against its income. For instance, pt. G shows that x₁ amt. of good X is demanded at M₁ level of income.

Similarly, Point H shows x₂ level of good X is demanded at M₂ level of Income. Now, if we join pt. G and pt. H by a straight line, then we tend to get what is known as Engel curve. Thus, the figure shows that the Engel curve is a positively slope line moving upward from left to right.

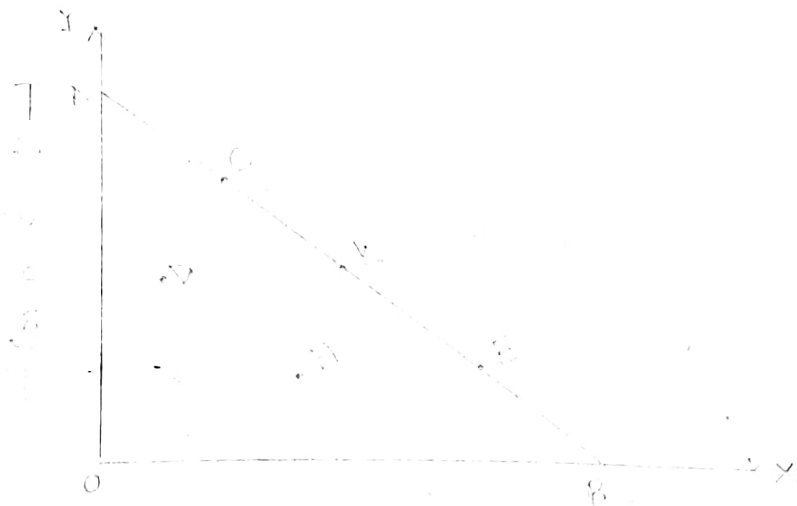
Note:- ^{positively slope} Engel curve may not be. Slope all the time. For instance, it may be a vertical straight line in case of necessary commodities whose demand remains same even after increment in the level of income. Similarly, the Engel curve may be backward bending in case of inferior commodities.

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* Revealed Preference Theory ⁽¹⁾ :- It has been given by P.A. Samuelson after criticising utility Analysis given by Marshall and IC Analysis given by J.R. Hicks. The basic idea of the theory can be stated as follows :-

Given the income of a consumer ⁽²⁾ and price of 2 goods (X and Y) AB is the budget line as shown in the following diagram.



Income of consumer = I

In the figure, AOB is the area of consumer's selection, that is the budget space. The consumer can select any of the combination, C, K, E, D, H, with the help of his budget constraint AB. If the consumer chooses to buy

combination K , then K is revealed preferred to C, E, D, H . In Samuelson world, he reveals his preference for K over all other position available to the consumer, and therefore all other combination are inferior. This theory is known as Strong Ordering Hypothesis.

According to Hicks, if a consumer makes his choice for a particular combination K , it does not mean that K is preferred to all other position within or on the triangle $\triangle AOB$.

It simply means that no other position within or on the triangle is preferred to K . It is quite possible that some rejected position may be as good as K , and the consumer may be indifferent between K and C and E . In this case, the position which are inferior are D and H . This is known as Weak Ordering Hypothesis.

The main difference between strong ordering and weak ordering is that under strong ordering, a position chosen on AB is preferred to all other positions, on and within the triangle AOB ; whereas under weak ordering a chosen position on AB is preferred to all other position within the $\triangle AOB$, but the consumer may be indifferent or between the position lying on the budget line AB .

Assumptions of the Theory

- (1) Rationality :- The consumer behaves rationally and he aims to maximise his satisfaction given his income, budget constraint.

(2) Consistency :- If at a period of time the consumer prefers A to B then at other period of time he cannot prefer A to B.

(3) Transitivity :- It implies if $A > B$ and $B > C$, then $A > C$.

(4) Taste and preferences of consumers are given or constant over the period of analysis.

* Price effect :- is the total change in quantity demanded due to change in the price of the commodity, given the income, taste and preferences, and price of other goods. The price effect is the sum total of income effect and substitution effect.

* Income effect :- is the change in quantity demanded resulting exclusively from a change in real income, all other prices and money income held constant.

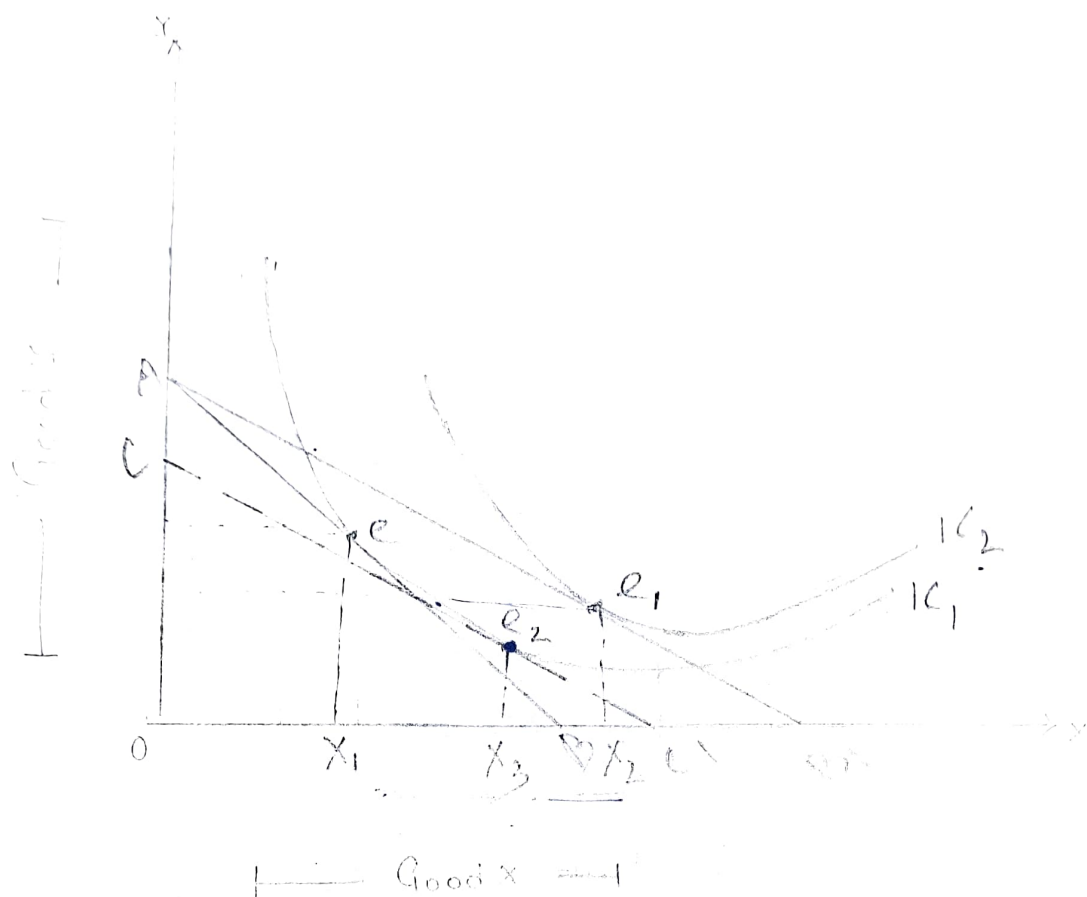
* Substitution effect :- is the change in quantity demanded resulting from a change in relative price after compensating the consumer for a change in real income.

* Price effect is the combination of income and substitution effect. (Hicksian approach towards the separation of income and substitution).

Hicksian substitution effect takes place on the same level. Hicks separated the price effect into income effect and

substitution effect by compensation variation in income.

Compensation variation is the income change in income that is sufficient to compensate the consumer for a change in the price of a good.



In the figure, the initial budget line is AB and the consumer is in equilibrium ^{at pt.} E_1 on IC_1 . With the fall in price of good X, the budget line rotates to AB_1 . The new equilibrium point is at point E_2 on IC_2 . The

The total change in quantity demanded is X_1X_2 or $OX_2 - OX_1$.

$X_1X_2 = OX_2 - OX_1$. This is called price effect.

To isolate the substitution effect we hold the real income of the consumer constant, by taking away some amount of money income, just sufficient enough to return him to the previous IC. Graphically, we show it by drawing a

on an imaginary budget line, CC_1 , which is placed to the left of budget line. The imaginary budget line is tangent to IC_1 at point E_2 . The movement from pt E to E_2 can be regarded as showing the consumer's response to a change in the relative price ratio alone, real income remaining constant. The change in qty. dd X_1, X_3 is called the substitution effect. The movement from E_2 to E_1 and the corresponding change in the qty. dd shows the income effect. Thus,

$$P_E = S_E + I_E$$

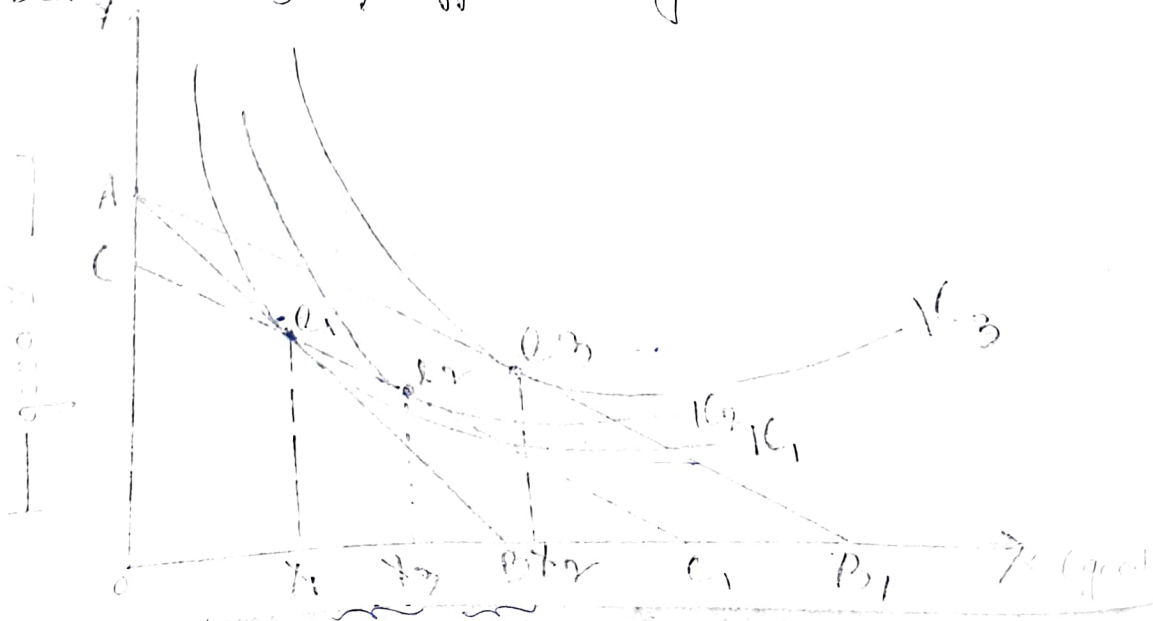
$$\Rightarrow X_1 X_2 = X_1 X_3 + X_3 X_2$$

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* Start Slutsky method of separation of price effect into income and substitution effect :-

Slutsky also decomposed the price effect into income and substitution effect by holding real income constant, but in a slightly different way.



(19)

Let AB be the initial budget line and the consumer is in equilibrium at point E_1 on IC_1 . At equilibrium the consumer consumes OX_1 of commodity X . Now, if the price of good X falls, the budget line changes to AB_1 and the equilibrium point shifts from point E_1 to point E_3 . Now, at the new equilibrium point the consumer consumes OX_2 of good X . Thus, the change in qty. dd of X is equal to X_1X_2 .

Now, Slutsky assumes that we take away some nominal income from the consumer so that the consumer will have to go back to point E_1 . This is shown by drawing -g an imaginary budget line through pt. E_1 . This line is CC_1 in the above diagram. But at CC_1 the consumer does not like to go back to point E_1 rather he prefers E_2 , which is on a higher^h IC (IC_2). On this IC_2 he likes to purchase more of commodity X i.e., OX_3 .

This increased purchased of X i.e., $OX_3 - OX_1 = X_1X_3$ is due to fall in the relative price of X , and is considered as the substitution effect. Likewise, an increase in qty. purchased of X from OX_3 to OX_2 i.e., X_3X_2 is considered as income effect.

(20)

Note: In the Slutsky's method, the imaginary budget line passes through the initial equilibrium point E_1 and thus it is different from Hicksian's method. Another line of difference is that in Hicksian's method E_2 lies on the same IC (i.e., IC_1) as that of E_1 , whereas in Slutsky's method E_2 lies on a higher IC (IC_2).

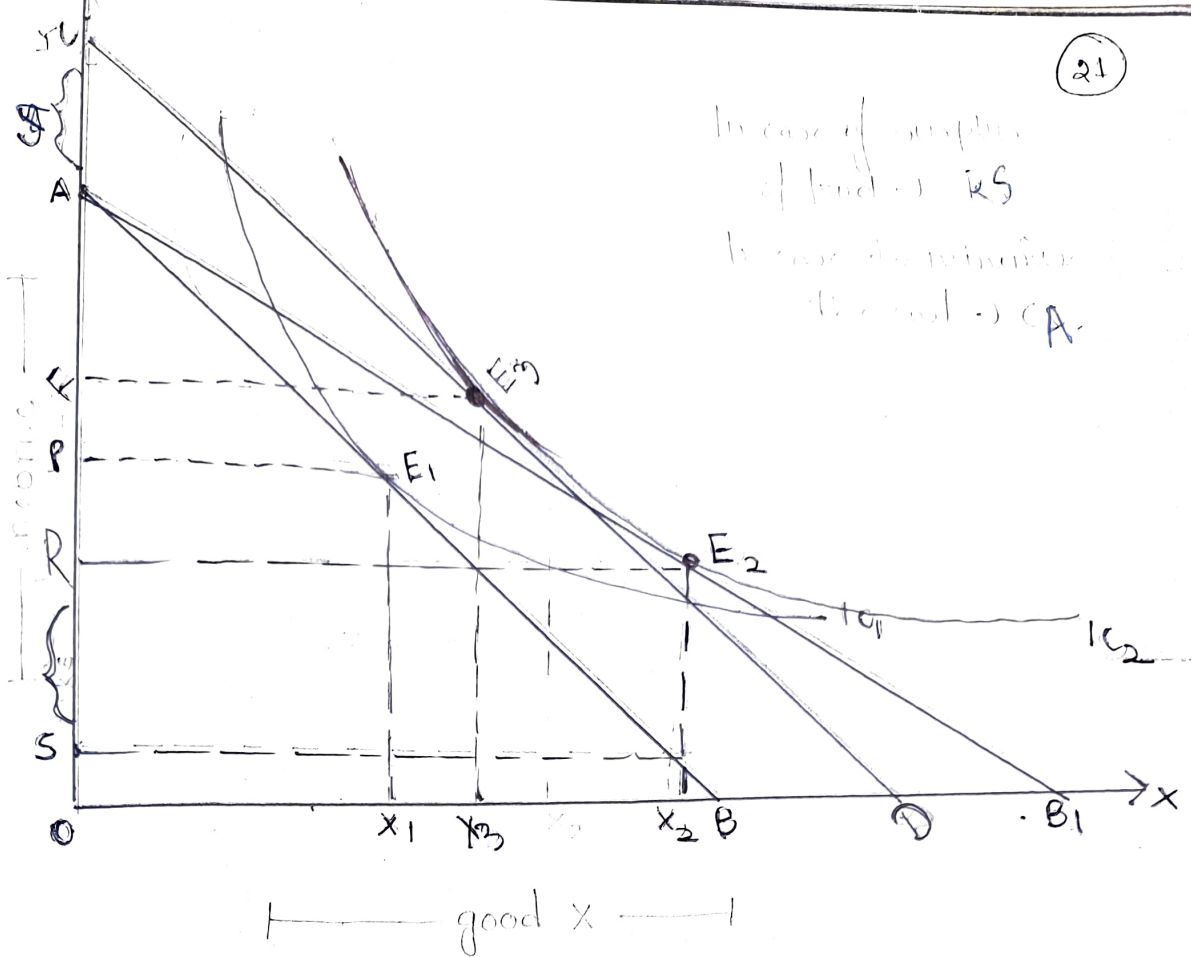
* Evaluation of Government Policies with regards to cash subsidy and kind subsidy, with the help of Indifference Curve (IC). :-

The IC may be used to examine the policies of cash subsidy and kind subsidy with respect to their cost and effect on the demand pattern of the consumers. We can illustrate this by assuming a single pensioner who gets an income of amount Y and uses this income to consume good X and good Z .

ii) The effect of the food subsidy :- This can be best understood with the help of the following diagram

Assume that the government does not interfere in the economy at the first case. At this point the consumer is at equilibrium E_1 where his initial budget line (AB) is tangent to IC_1 . The consumer is consuming OX_1 of good X at the initial equilibrium point.

Now, let us assume that the govt. starts to



interfere in the economy by giving food subsidies to the pensioners in order to increase their welfare. In other words, the govt. reduces the price of good X for only the pensioners. This in turn rotates the budget line to AB_1 at the new equilibrium E_2 the pensioners are able to buy x_2 amt. of good X by spending AR amt. of his income. Now, if the govt. did not opt for food subsidy then for consuming OX_2 of good X the pensioner would have paid AS amount of his income. but due to subsidy the consumer only pays AR amt. of his income. Therefore, RS ($AS - AR$) is ~~both~~ the burden borne by the govt.

Effect of cash subsidy :-

(22)

In spite of the kind subsidy policy if the govt. adopts cash subsidy policy and provides some transfer payment to the pensioner for free, the budget line of the pensioner would shift from AB to CD. With a higher income level, the pensioners will attain equilibrium at point E_3 located at a higher IC (IC_2). At this equilibrium point, the consumer consumes OX_3 of good X. In this case, the burden borne by the govt. is ΔAC .

Thus, we can see that the govt. is able to promote welfare from both the policies. This is because due to the effect of both the policies the pensioner moves from IC_1 to higher IC (IC_2). However, the burden in case of cash subsidy is less than kind subsidy. (i.e., $\Delta C < \Delta RS$). Thus, from the cost minimising point of view cash subsidy is a better policy choice than kind subsidy. However, if there is a surplus food in the economy, the govt. may adopt the policy of kind subsidy which will boost up the consumption pattern of the pensioners and also benefit the producers by reducing the surplus