

[Academic Script]

Consumer Equilibrium

Subject:	Business Economics
Course:	B. A., 1st Semester, Undergraduate
Paper No. & Title:	Paper – 101 Microeconomics – I
Unit No. & Title:	Unit – 2 Consumer Equilibrium: Analysis of Indifference Curve
Lecture No. & Title:	Lecture – 3 Consumer Equilibrium: Analysis of Indifference Curve

1. Introduction

Meaning of Consumer equilibrium

Consumer equilibrium refers to a situation, in which a consumer attains maximum satisfaction. The point of maximum satisfaction is achieved by studying indifference map and budget line together. The indifference curve analysis assumes that the consumer is rational who wants to maximise his satisfaction. In addition to this other assumptions are:

- 1) The consumer has a given indifference map exhibiting his scale of preferences for various combinations of two goods, X and Y.
- 2) He has a fixed amount of money to spend on the two goods. He has to spend whole of his given money on the two goods.
- 3) Prices of the goods are given and constant for him. He cannot influence the prices of the goods by buying more or less of them.
- 4) Goods are homogeneous and divisible.

Diagram 1 shows the consumer indifference map together with his budget line BL. Good X is measured on the X-axis and good Y is measured on the Y-axis. With a given budget to buy and given prices of goods X and Y, the consumer can buy any combination of the goods which lie on the budget line BL. In order to maximize his satisfaction the consumer would like to reach at the highest possible indifference curve. The budget constraint restricts consumer to remain on the given budget line.

In diagram-1, the highest indifference curve to which the consumer can reach is IC3 to which the budget line BL is tangent at point Q. Since indifference curves are convex to the origin, all other points on the budget line BL, above or below the point Q, would lie on lower indifference curves. However the combinations, which are on the higher indifference curves like IC4, can not be purchased due to budget constraint although they would higher greater satisfaction than Q.

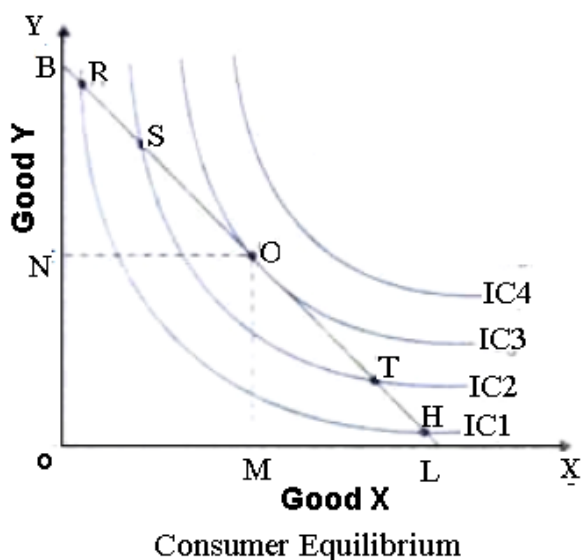


Diagram 1: Consumer Indifference Map and Budget Line

At the tangency point Q, the slopes of the budget line BL and IC3 are equal. Slope of the indifference curve shows the marginal rate of substitution of X for Y (MRS_{xy}), while the slope of the budget line indicates the ratio between the prices of two goods P_x/P_y . Thus, at equilibrium point Q.

$$MRS_{xy} = \text{Price of good X} / \text{Price of good Y} = P_x/P_y$$

When the marginal rate of substitution of X for Y (MRS_{xy}) is greater or less than the price ratio between the two goods, it is

advantageous for the consumer to substitute one good for the other. He will continue to do so until the marginal rate of substitution becomes equal to the price ratio at which the given budget line BL becomes tangent to the indifference curve.

Conditions for Consumer Equilibrium

Consumer equilibrium under the indifference curve theory, is subject to the following two conditions:

1. Budget line must be tangent to an indifference curve, or marginal rate of substitution of X for Y (MRS_{xy}) must be equal to the price ratio of the two goods P_x/P_y .
2. Indifference curve must be convex to the origin at the point of tangency.

2. Price Effect: Price Consumption Curve

Price effect is the measurement of change in demand for a good due to the change in its price. Price consumption curve shows how a consumer reacts to changes in the price of a good while his money income, tastes and prices of other goods remaining unchanged. When the price of a good changes, the real income of the consumer also changes due to which he would either be better off or worse off than before, depending upon whether the price decreases or increases. When the price of a good changes, the equilibrium position of a consumer would shift to a higher indifference curve in case the price falls and vice versa.

Downward sloping price consumption curve (PCC)

Diagram 2 explains the situation when the price consumption curve takes the shape of downward sloping. The PCC for good X slopes downwards when the demand for it more elastic, (i.e., price elasticity is greater than one).

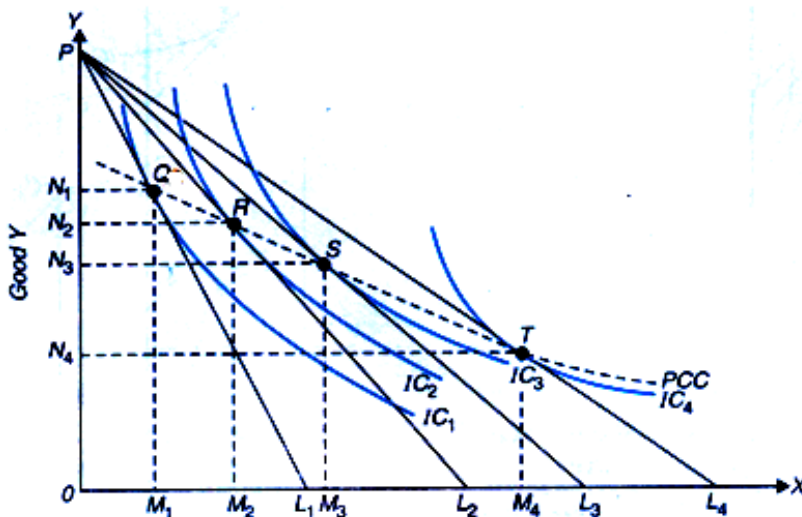


Diagram 2: Downward Sloping Price Consumption Curve

With given prices of goods X and Y, and a given money income as represented by the budget line PL_1 , the consumer is in equilibrium at Q on indifference curve IC_1 and buys OM_1 of X and ON_1 of Y. Suppose the price of good X falls while the price of good Y and his money income remain unchanged. As a result, the budget line shifts to PL_2 . With the new budget line PL_2 , the consumer attains a new equilibrium at R that lies on the higher indifference curve IC_2 where he purchases OM_2 of X and ON_2 of Y. Thus he has become better off as his level of satisfaction has increased due to the fall in the price of good X. In the same way if the price of good X continue to falls further it would cause a shift in his budget line to PL_3 and then to PL_4 which will give him new equilibrium positions at S on indifference curve IC_3 and T on indifference curve IC_4 respectively.

When all the equilibrium points such as Q, R, S, and T are joined together, a new curve is generated which is called Price Consumption Curve (PCC). PCC shows how the changes in price of good X will affect the purchase decisions of the consumer assuming the price of good Y, his tastes and money income remaining unaltered. Diagram 2 shows that the price consumption curve (PCC) for a normal good X slopes downward. Downward-sloping PCC for good X states that the demand for it is elastic (i.e., price elasticity is greater than one).

3. Income Effect: Income Consumption Curve (ICC)

Income consumption curve (ICC) explains how the consumer will behave when his money income changes assuming the prices of the goods and his tastes and preferences remaining unchanged. In diagram 3, With given prices and a given money income as indicated by the budget line P_1L_1 the consumer is initially in equilibrium at point Q_1 on the indifference curve IC_1 and purchases OM_1 of X and ON_1 of Y. Suppose the income of the consumer increases due to which the budget line shifts upward to P_2L_2 . With new budget line P_2L_2 , the consumer achieves equilibrium at point Q_2 on IC_2 and purchases OM_2 of X and ON_2 of Y.

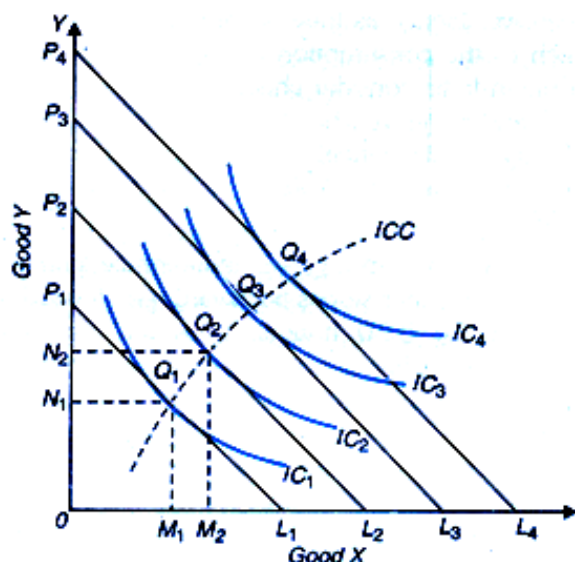


Diagram 3: Income Consumption Curve

Thus with an increase in his income the consumer buys more quantity of both the goods. Since he is on the higher indifference curve IC_2 he will be better off than before i.e., his satisfaction will increase. If his income increases further and the budget line shifts to P_3L_3 , and thereafter P_4L_4 , the consumer is in equilibrium at point Q_3 on indifference curve IC_3 and point Q_4 on indifference curve IC_4 .

Thus, when the budget line shifts to the right the consumer's income increases, he switches to higher indifference curves and enjoys higher levels of satisfaction. Now if various points Q_1 , Q_2 , Q_3 and Q_4 showing consumer's equilibrium at various levels of income are joined together, it will generate a new curve called Income Consumption Curve (ICC). Income consumption curve is thus the locus of equilibrium points at various levels of consumer's income.

The income effect can either be positive or negative. Income effect for a good is positive when with the increase in income, the consumer demand for the good also increases. This is the normal good case. However, for some goods, the income effect is negative. Such goods for which income effect is negative are called Inferior Goods. On the other hand if the purchase of a good increases more than proportionate to the increases in income, it is called a luxury good.

4. The Engel Curve

A nineteenth century German statistician Ernet Engel empirically examined the family budgets and found the pattern of consumption expenditure on different goods and services by the households at different levels of income. His conclusions established that as the income of a family increases, the proportion of its income spent on necessities such as food falls and that spent on luxuries increases. In other words, the poor families spend relatively large proportion of their income on necessities, while rich families spend a relatively a large part of their income on luxuries. This change in the pattern of consumption expenditure (that is, decline in the proportion of income spent on food and other necessities and increase in the proportion of income spent on luxuries) with the rise in income of the families has been called Engel's law. Diagram 4 shows the income ICC in the analysis of indifference curves.

To draw an Engel curve from income consumption curve, income is represented on Y-axis and quantity of the good purchased on the X-axis. Panel (a) of diagram 4 shows the indifference map

which represents the preferences of a consumer and the prices of two goods X and Y. The ICC is the income consumption curve showing the equilibrium levels (R, S, T) of different quantities of good X purchased by the consumer as his income increases from Rs. 300 to Rs. 400 and then Rs. 500 per day.

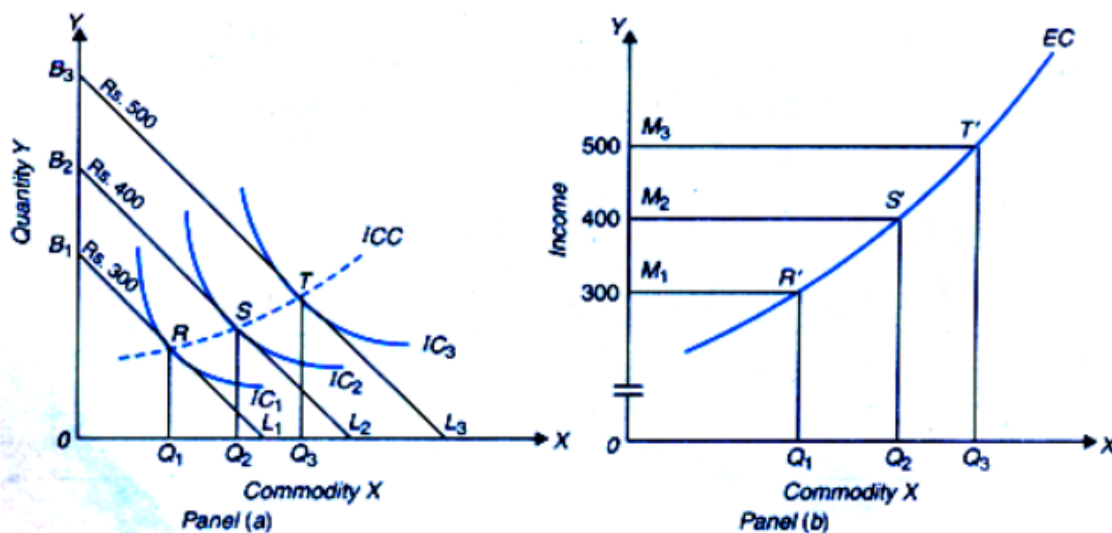


Diagram 4: Derivation of Engel Curve from Income Consumption Curve

Panel (a) of diagram 4 shows that when the income to buy goods is Rs. 300, at the given prices of goods X and Y, the consumer buys OQ₁ quantity of good X. In panel (b) of the diagram, the level of income is represented on the vertical axis (Y-axis) and quantity purchased of commodity X is represented on the horizontal axis (X-axis). A point R is directly plotted to indicate the quantity OQ₁ against income level of Rs. 300. Similarly points S and T represent the quantity Q₂ and Q₃ purchased when the income increases to Rs. 400 and 500 respectively. A curve drawn through the points R, S and T is called the Engel Curve in case of Necessities.

It may be noted that like income consumption curve (ICC), the Engel Curve will also take different shapes of in case of luxury goods, inferior goods and neutral goods.

5. Derivation of Individual Demand Curve from Indifference Curve Analysis

In indifference curve analysis, the demand curve is derived without taking into consideration the assumptions of Marshallian demand curve which is based on the assumption that utility is cardinally measurable and marginal utility of money remain constant when the price of good changes. The procedure to derive individual demand curve from indifference curve analysis can be explained with the help of a demand schedule and a diagram. Suppose a consumer has an income or budget of Rs. 300 to buy a good X.

Table 1: Demand Schedule

Price of good X (Rs.)	Budget Line	Quantity Demanded
15	PL ₁	OA
10	PL ₂	OB
7.5	PL ₃	OC
6	PL ₄	OD

As per the demand schedule presented in the table-1, the budget line PL₁ shows that the price of good X is Rs. 15 per unit. As price of good X falls from Rs. 15 to Rs. 10, the budget line shifts to PL₂. Similarly the budget lines PL₃ and PL₄ are the relevant budget lines when the price of good X falls to Rs. 7.5 and Rs. 6

respectively. Thus different budget lines become relevant to take decision by the consumer to buy good X when there is change in the price of good X.

In diagram 5, when the tangency points between the various budget lines and indifference curves are joined together by a line it takes the shape of a price consumption curve (PCC).

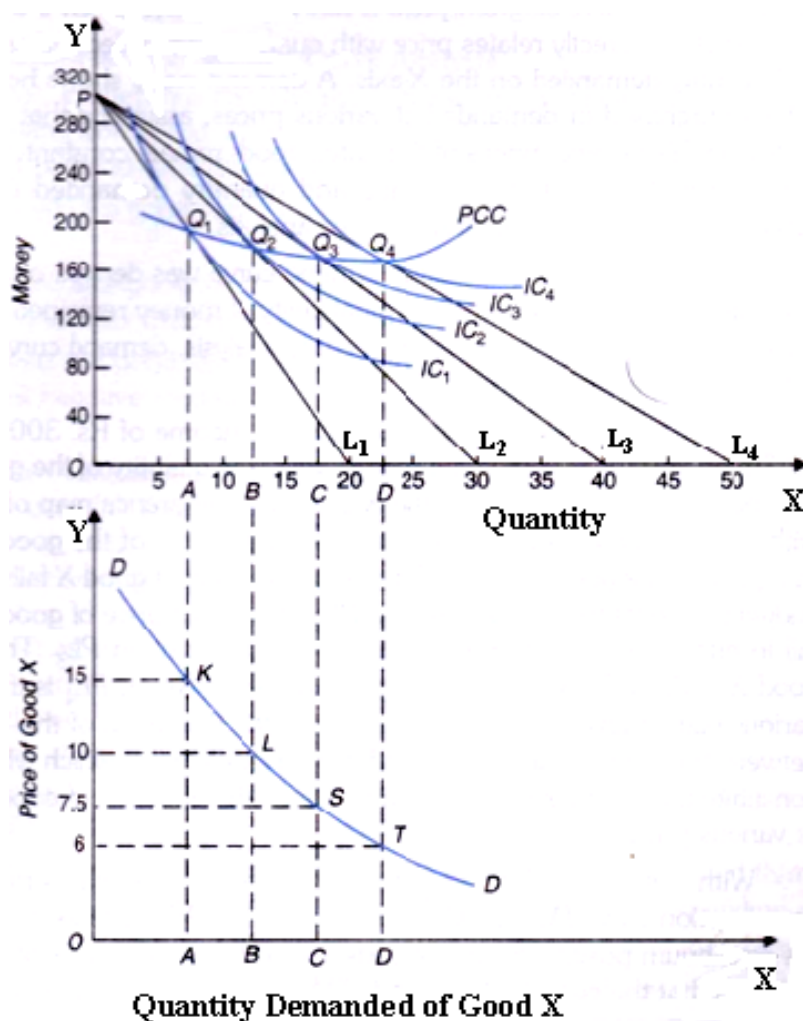


Diagram 5: Derivation of Individual Demand Curve from Indifference Curve Analysis

The PCC shows the quantity of good X demanded at different prices. At budget line PL_1 , the consumer is in equilibrium at point Q_1 on the price consumption curve where budget line PL_1 is

tangent to indifference curve IC_1 . In equilibrium level at Q_1 , the consumer will buy OA units of good X. The lower part of diagram shows that the consumer demands OA units of good X when its price is Rs. 15.

Subsequently a fall in price to Rs. 10, would lead to a shift in budget line to PL_2 and equilibrium point at Q_2 . At Q_2 , the consumer purchases OB units of good X. The lower part of diagram shows that the consumer demands OB units of good X at price Rs. 10.

Likewise, with budget lines PL_3 and PL_4 , the consumer will be in equilibrium at points Q_3 and Q_4 of the price consumption curve PCC and his demand for good X will be OC units at price Rs. 7.5 and OD units at price Rs. 6 respectively. Thus a price consumption curve PCC provides required information to draw the demand curve which show different quantities of good X demanded at various prices and budget lines.

In the lower part of diagram, the quantity demanded is measured on the X-axis and the price per unit of good is measured on the Y-axis. In order to derive the demand curve, various points K, L, S and T representing the corresponding equilibrium points Q_1 , Q_2 , Q_3 and Q_4 on the upper part of the diagram are plotted after taking into account the different prices of good X as given in the demand schedule which was used to draw the upper part of diagram 5. By joining the points K, L, S and T a demand curve DD is generated.

6. Substitution Effect

Substitution effect is based on the principle that when prices rise, consumers will replace more expensive goods with cheaper substitutes assuming income remains the same. There are two different concepts of substitution effect. One was developed, by Hicks and Allen which is called the Hicksian Substitution Effect and second was developed by E. Slutsky, which is called Slutsky Substitution Effect.

Hicksian Substitution Effect

Hicksian substitution effect occurs when a change in price is accompanied by substantial change in money income so that the consumer is neither better off nor worse off than before due to which he reaches at the original level of satisfaction. Thus the Hicksian substitution effect takes place on the same indifference curve as explained in diagram 6.

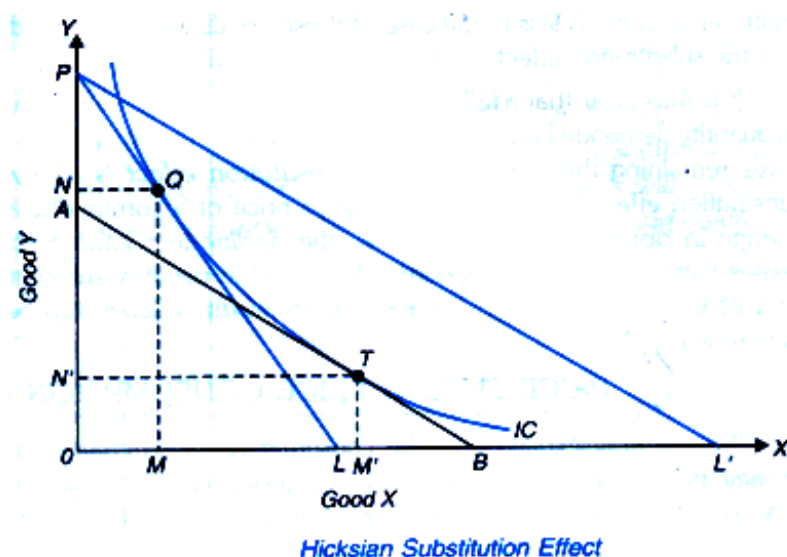


Diagram 6: Hicksian Substitution Effect

With a given money income and given prices of the two goods as shown by the budget line PL, the consumer is in equilibrium at point Q on the indifference curve IC where he purchases OM of good X and ON of good Y. Suppose the price of X falls while the price of Y remain unchanged due to which the budget line shifts to PL'. With a fall in the price of X, the real income or purchasing power of the consumer would increase. In order to find the substitution effect, this gain in real income should be wiped out by reducing the money income of the consumer by such an amount which forces him to remain on the same indifference curve IC on which he was before the change in the price of good X.

When some money is taken away from the consumer in order to nullify the gain in real income, then the budget line, which shifted to position PL' should now shift backward in such a way so that it remain parallel to PL'. Thus the new budget line AB that is parallel to PL' would be drawn at some distance from PL' so that it touches the indifference curve IC. This indicates the reduction in consumer income by PA (in terms of Y) or L'B (in terms of X) has been done so that he remain on the same indifference curve. Thus PA or L'B is the compensating variation in income.

Now, the budget line AB represents the new relative prices of X and Y, which were obtained when the price of X had fallen. Compared to budget line PL, good X is relatively cheaper at the new budget line AB. Now the consumer is in equilibrium at point T and is now buying OM' quantity of X and ON' quantity of good Y. Therefore, movement from Q to T represents the Hicksian substitution effect.

Slutsky Substitution Effect

In Slutsky approach, the income is reduced or increased (as the case may be), by the amount, which leaves the consumer to be just able to purchase the same combination of goods, which he was buying at the old price. Thus, in Slutsky substitution effect, the income is reduced or increased not by compensating variation as in case of the Hicksian substitution effect but by the cost difference.

Slutsky Substitution Effect for a Fall in Price

Slutsky substitution effect is illustrated in diagram 7. With a given money income and the given prices of two goods as represented by the price line PL , the consumer is in equilibrium at Q on the indifference curve IC_1 and purchases OM of X and ON of Y . Suppose the price of X falls while the price of Y and money income of the consumer remain unchanged. Because of fall in the price of X , the price line will shift to PL' and the real income or the purchasing power of the consumer will increase.

In order to measure the Slutsky substitution effect, the money income of the consumer must be reduced by the cost-difference, so that he is just able to purchase the old combination Q , if he so desires. For this, a price line GH which is parallel to PL' and passes through point Q is drawn. This indicates that income equal to PG in terms of Y or $L'H$ in terms of X has been taken away from the consumer due to which he can buy the combination Q , if he so desires, since Q also lies on the price line GH .

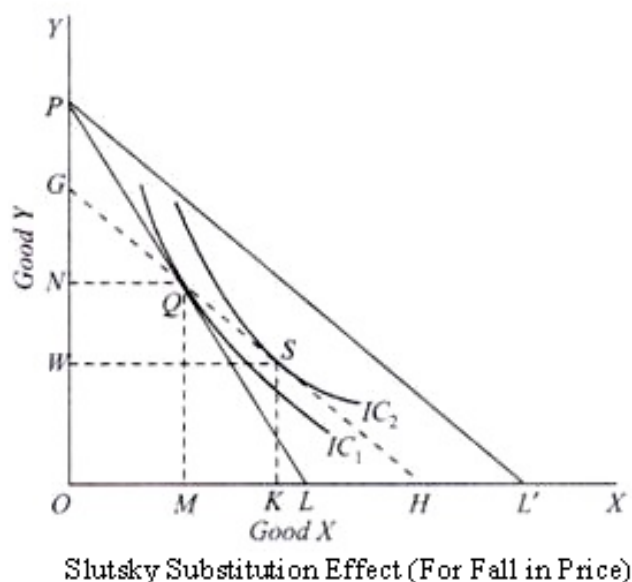


Diagram 7: Slutsky Substitution Effect

The change in relative prices will induce the consumer to rearrange his purchases of X and Y. Therefore, the consumer will substitute X for Y. In Slutsky substitution effect, a rational consumer does not move along the same indifference curve IC_1 , because the price line or budget line GH, on which the consumer has to remain due to the new price-income changes, is not tangent to the indifference curve IC_1 . However the price line GH is tangent to the higher indifference curve IC_2 at point S. Therefore, the consumer will now be in equilibrium at a point S on IC_2 . This movement from Q to S represents Slutsky substitution effect.

7. Summary

Consumer equilibrium is a situation where a consumer attains maximum satisfaction out of the consumption of given goods. The indifference curve analysis explains how maximum satisfaction could be achieved with given prices of goods and a given budget for the purchase of such goods. The application

indifference approach is based on certain assumptions and conditions. Indifference curves are used extensively to examine the price effects, income effects and substitution of effects on consumer behaviour.