INDIFFERENCE CURVE ANALYSIS

Structure

2.0   Objectives

- To understand the concept of indifference curve
- To know marginal rate of substitution

2.1   Introduction

Indifference curve method has been evolved to supersede the marginal utility analysis of demand which was discussed in the last chapter. The indifference curve method seeks to derive all rules and laws about consumer's demand that are derivable from the cardinal utility analysis. At the same time the inventors and supporters of new method contend that their analysis is based on fewer and more reasonable assumptions. The indifference curve analysis has, however, retained some of the assumptions of old marginal utility analysis like price of the goods; market in which these are available; amount of satisfaction derived from the goods. Further, it is assumed that the consumer acts rationally in the sense that, given the prices of goods and the money income, he will choose the combination from among the various possible combinations that gives him maximum satisfaction. Moreover, the assumption of 'continuity' has also been retained by Hicks –Allen indifference curve method. Continuity assumption means that the consumers are capable of ordering or ranking all conceivable combinations of goods according to the satisfaction they yield.

The fundamental approach of indifference curve analysis is that it has abandoned the concept of cardinal utility and instead has adopted the concept of ordinal utility. According to the

supporters of the indifference curves theory, utility is a psychic entity and it cannot therefore be measured in quantitative cardinal terms.

The ordinal utility implies that the consumer is capable of simply 'comparing the different levels of satisfaction'.

For deriving the theory of consumer's behavior, it is sufficient to assume that the consumer is able to rank his preferences consistently. This means that if the consumer is presented with a number of various combinations of goods, he can order or rank them in a 'scale of preferences.'

The consumer formulates his scale of preferences independently of the market prices of goods keeping in view only the satisfaction which he hopes to get from various combinations of goods. Moreover, the indifference curve analysis assumes that the preference and indifference relations are 'transitive'. It is important to mention that indifference curve analysis of demand is based upon the weak–ordering implying that there is possibility of the consumer being indifferent between two combinations.

2.2   Indifference Curve

The basic tool of Hicks-Allen ordinal analysis of demand is the indifference curve which represents all those combinations of goods which give same level of satisfaction to the consumer. Since all the combinations on an indifference curve give equal satisfaction to the consumer, he will be indifferent between them. In schedule 2.1, indifference schedule is given. The schedule shows that consumer gets the same level of satisfaction U_0 whether he takes combination A representing 1 unit of X and 12 units of Y, or combination B with 2 units of X and 8 units of Y, or combination C with 3 units of X and 5 units of Y, D with 4 units of X and 3 units of Y or E with 5 units of X and 2 units of Y. Since he gets same level of satisfaction from all these combinations, he will be indifferent between all these combinations.

Table 2.1

Indifference Schedule I

Combination	Good X	Good Y	Amount of Utility
A	1	12	U_0
B	2	8	U_0
C	3	5	U_0
D	4	3	U_0
E	5	2	U_0

In figure 2.1 an indifference curve IC is drawn by plotting the various combinations of the table 2.1 **indifference schedule I**. The quantity of good X is measured on the horizontal axis, and the quantity of the good Y is measured on the vertical axis. As in an indifference schedule, combinations lying on an indifference curve will also be equally desirable to the consumer, that is, will give him the same satisfaction. The smoothness and continuity of an indifference curve means that goods in question are assumed to be perfectly divisible.
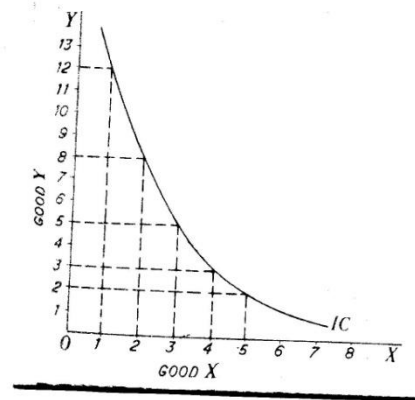

Figure 2.1: Indifference Curve

Any combination comprising of more units of at least one good without the lesser quantity of another good will give more satisfaction to the consumer and thus will be preferred. Such combinations of more quantities of two goods are represented by higher indifference curve. Any combination on a higher indifference curve will be preferred to any combination on a lower indifference curve. It is thus clear that the indifference curve lying above and to the right of an indifference curve will indicate higher level of satisfaction than the latter.

A complete description of consumer's tastes and preferences can be represented by an indifference map which consists of a set of indifference curves. In figure 2.2 an indifference map consists of five indifference curves has been shown. It is a moral usual to label the indifference curves by ordinal numbers as I, II, III, IV, V as is done in Figure 2.2. An indifference map portrays consumer's scale of preferences. The indifference map is drawn on the basis of assumption that consumer's taste and preferences remains unchanged.
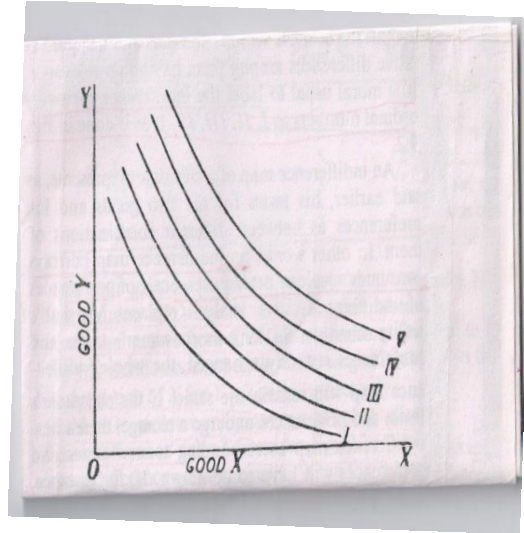
Figure 2.2: Indifference Map

2.3   Marginal Rate of Substitution

The concept of marginal rate of substitution is an important tool of indifference curve analysis of demand. The rate at which the consumer is prepared to exchange goods X and Y is known as marginal rate of substitution. In our indifference scheduled above, which is reproduced in table 2.2, in the beginning the consumer gives up 4 units of Y for the gain of 1 additional unit of X and in this process his level of satisfaction remains the same. Therefore, at this stage consumer's marginal rate of substitution of X for Y is 4:1. Thus, we may define the marginal rate of substitution of X for Y as the amount of Y whose loss can just be compensated by a unit gain in X.

When the consumer moves from combination B to combination C on his indifference schedule he forgoes 3 units of Y for the additional one unit gain in X. Hence, the marginal rate of substitution of X for Y is 3. Likewise, when the consumer moves from C to D, and then from D to equal to in his indifference schedule, the marginal rate allows the substitution of X for Y is 2 and 1 respectively.

Table 2.2

Indifference Schedule

Combination	Good X	Good Y	MRS$_{x,y}$
A	1	12	
B	2	8	4:1
C	3	5	3:1
D	4	3	2:1
E	5	2	1:1

How to measure marginal rate of substitution on an indifference curve? Consider figure 2.3a where an indifference curve is shown. When the consumer moves from point A to B on this indifference curve he gives up AS of Y and takes up SB of X and remains on the same indifference curve (or, in other words, at the same level of satisfaction).

It follows that the consumer is prepared to exchange AS of Y for SB increase in X. In other words, marginal rate of substitution of X for Y (MRS$_{x,y}$) is equal to AS/SB.

Therefore, it follows that:

Marginal rate of substitution of X for Y (MRS$_{x,y}$) = $\frac{AS}{SB} = \frac{\Delta Y}{\Delta X}$.

Now, suppose that points A and B are very close to each other so that it can be assumed that both of them lie on the same tangent tT as shown in figure 2.3b the slope of the indifference curve on point A or B is equal to the tangent of $\llcorner$ tTO.
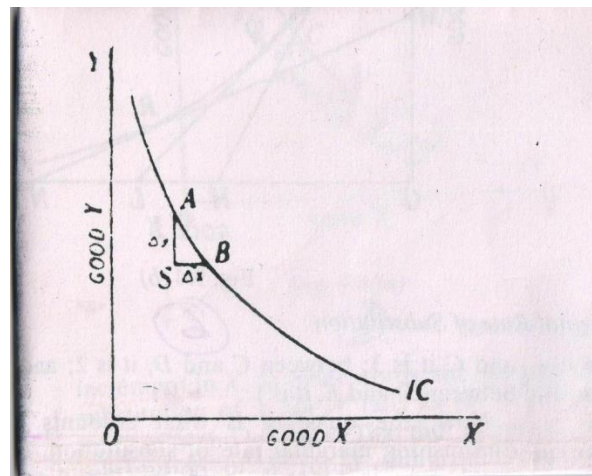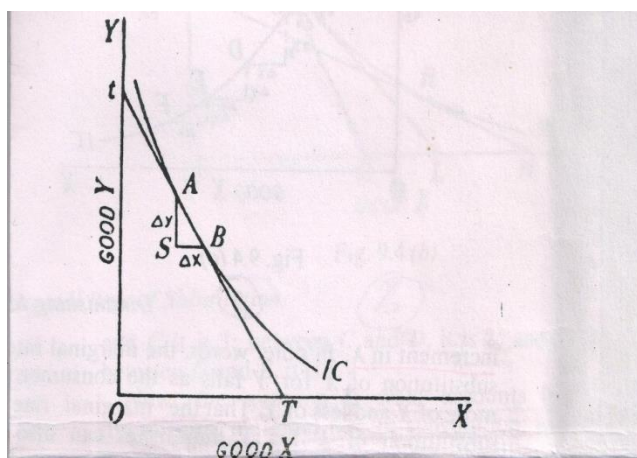

Figure 2.3a

Figure2.3b

2.3.1 Principal of Diminishing Marginal Rate of Substitution

An important principal of economic theory is that marginal rate of substitution of X for Y diminishes as more and more of good X is substituted for good Y. In other words, as the consumer has more and more of good X, he is prepared to forgo less and less of good Y. The principle of diminishing marginal rate of substitution is illustrated in figure 2.4a. In figure 2.4a when the consumer slides down from A to B on the indifference curve he gives up ΔY_1 of Y and get Δ X of good X. Therefore, the marginal rate of substitution ($MRS_{x,y}$) here is equal to $\frac{\Delta Y_1}{\Delta X}$. But as the consumer slides down the curve, the length ΔY becomes shorter and shorter, while the length ΔX is kept the same. It will thus be seen from figure 2.4a that ΔY_2 is less than ΔY_1; ΔY_3 is less than ΔY_2; and ΔY_4 is less than ΔY_3. It means that as the consumer's stock of X increases and his stock of Y decreases, he is willing to forgo less and less of Y for a given increment in X.

The marginal rate of substitution of X for Y diminishes can also be known from drawing tangents at different points on an indifference curve. The slope of tangent lines diminishes as we move from left to right. It follows that $MRS_{x,y}$ diminishes as the consumer slides down on his indifference curve.
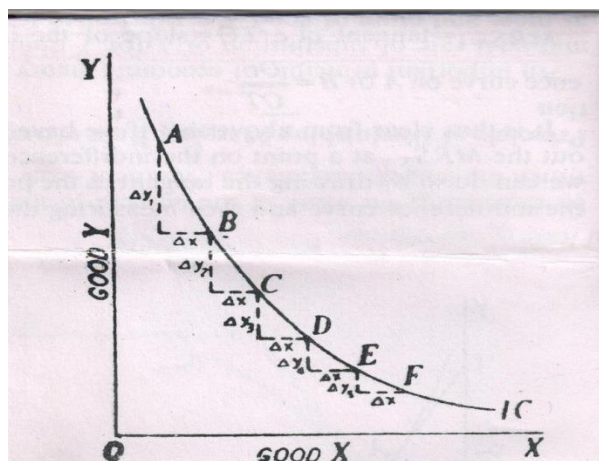
Figure 2.4a

2.3.2 Reasons for Diminishing Marginal Rate of Substitution

Now, the question is what accounts for diminishing marginal rate of substitution. The following factors are responsible for diminishing marginal rate of substitution.

1.   The want for a particular good is satiable so that as the consumer has more and more goods the intensity of his want for that good goes on declining. As the individual substitutes more and more of X for Y, he is prepared to give up less and less of Y for a unit increase in X.

2.   The second reason for the decline in marginal rate of substitutes is that the goods are imperfect substitutes of each other.

3.   The principle of diminishing marginal rate of substitution will hold good only if the increase in the quantity of one good does not increase the want satisfying power of the other.

Exercises

1. What are Indifference Curves? Discuss their properties.
2. State and explain law of diminishing marginal rate of substitution. How far can this law be treated as an improvement over the law of diminishing marginal utility?

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