

THEORY OF CONSUMER BEHAVIOR

Unit Objectives

After completing this unit, you will be able to:

- analyze the different theories of consumer choice and behaviour.

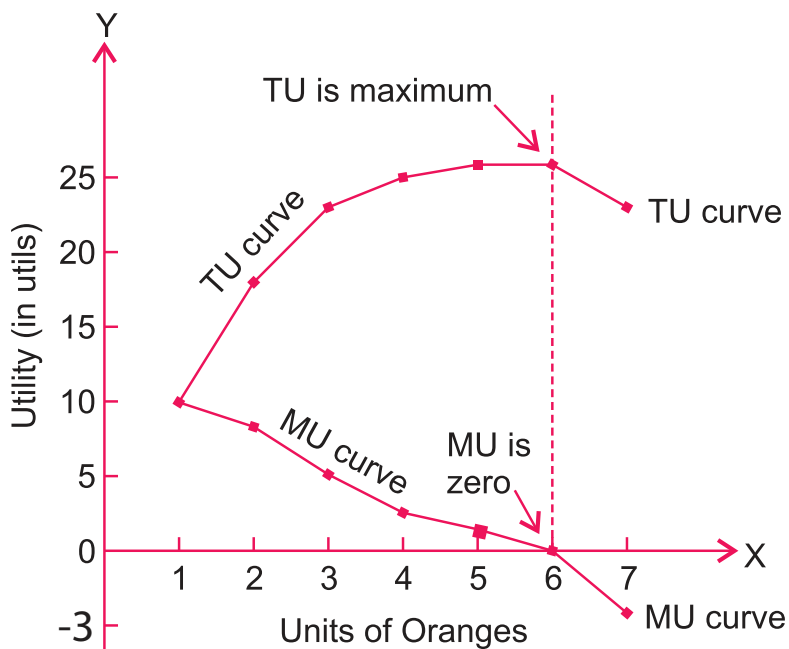
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INTRODUCTION

In the previous unit we have learnt about the law of demand. It tells us that a consumer buys more of a commodity when its price falls and vice-versa. The question now is why does he or she do so? Not only that, the basic question is why does a consumer buy a commodity? or how does a consumer decide about the purchase of a commodity, its quantity at a given price, etc.? In short, we may say, our question is what regulates consumer behaviour in the market? Economists have developed various theories to explain consumer behaviour, and that is the subject matter of our present unit.

We begin this unit with the notion of utility, which gives a basic explanation of consumer behaviour, discusses various theories of consumer behaviour, and examines how consumer's behaviour is affected by a change in his income or the price of the commodity.


3.1 THE CONCEPT OF UTILITY


At the end of this section, you will be able to:

- define the concept of utility and total marginal utility;
- state the law of diminishing marginal utility;
- classify the theories of utility.

Key Terms and Concepts

 Utility

 Total utility

 Marginal utility

Start-up Activity

Why is it essential to buy commodities and services?

The notion of utility gives us a basic explanation of consumer behaviour. Before we discuss the concept of utility, let us note some assumptions that we make about an average consumer.

The consumer is assumed to be rational. Given his income and the market prices of the various commodities, he/she plans the spending of his/her income so as to attain the highest possible satisfaction or utility. It is assumed that the consumer has full knowledge of all the information relevant to his/her decision, that is, he/she has complete knowledge of all the available commodities, their prices and

his/her income. In order to attain this objective, the consumer must be able to compare the utility (satisfaction) of the various ‘baskets of goods’ which he/she can buy with his/her income.

Utility

Why do we purchase commodities or services? Obviously, the answer would be that consumption of these commodities and services gives us satisfaction. *The satisfaction which a consumer gets by having or consuming goods or services is called utility.* The same commodity gives different utilities to different consumers. Even for the same consumer, utility varies from unit to unit, from time to time and from place to place.

Measurement of Utility

Conceptually, we measure utility in units called utils. Since utils are not well-defined, it is, in fact, not possible to measure utility in terms of these units. Yet we discuss them because this helps us to understand the consumer’s behaviour. It is useful, analytically, to distinguish between the two utility concepts:

- i total utility, and
- ii marginal utility.

I *Total Utility*

The total utility refers to *the sum total of satisfaction which a consumer receives by consuming the various units of the commodity.* The more units of a commodity she/he consumes, the greater will be her/his total utility or satisfaction from it, up to a certain point. As he/she keeps on increasing the consumption of the commodity, he/she eventually reaches the point of saturation represented by maximum total utility. If further units of the commodity are consumed, her/his total utility starts declining.

II *Marginal Utility*

The marginal utility of a good is defined as the change in total utility resulting from one unit change in the consumption of the good, i.e.,

$$MU_x = \frac{\Delta TU_x}{\Delta Q_x} \quad (3.1)$$

Where, MU = Marginal utility,
 Δ TU = Change in total utility,
 Δ Q = change in quantity of good X consumed.

Relationship between Total Utility and Marginal Utility

The relation between total utility and marginal utility can be easily discussed with the help of the following table.

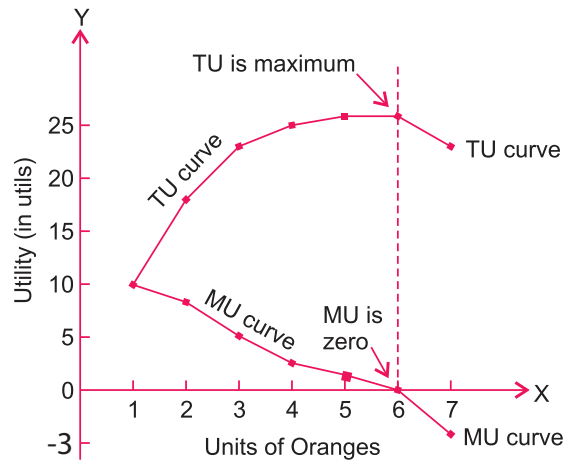
Table 3.1: Marginal Utility and Total Utility

Units of Oranges Consumed	Marginal Utility (utils)	Total Utility (utils)
0	–	0
1	10	10
2	8	18
3	5	23
4	2	25
5	1	26
6	0	26
7	–3	23

If a consumer consumes only one orange, the first unit is the marginal unit, so the marginal utility as well as total utility is 10 utils. If she/he consumes 2 oranges, the second orange is the additional unit and utility from it is marginal utility which is 8 utils. The total utility from 2 oranges is now 18 utils (10 from first orange + 8 from second orange). In this way total utility can be calculated from consuming 3, 4 or 5 oranges. We may say total utility is the sum of marginal utilities of various units of a commodity.

$$\text{Total Utility} = \text{Sum of all Marginal Utilities} \quad (3.2)$$

Table 3.1 can be represented graphically in the form of TU and MU curves, as follows.



Where, TU = Total utility and MU = Marginal utility.

Figure 3.1: Relationship between total utility and marginal utility

A study of Table 3.1 and Figure 3.1 indicates the following relationship between Total Utility (TU) and Marginal Utility (MU).

- TU increases as long as marginal utility is positive .
- TU is maximum when MU is zero.
- TU starts declining when MU becomes negative.

Activity 3.1



- 1 Can the level of satisfaction obtained by consuming the same product by different individuals be different? Think about the consumption of different goods by different people known to you, and try to obtain a rational answer to the above question.
- 2 What happens to total utility if a consumer consumes a commodity beyond that level when its marginal utility becomes zero?
- 3 Ms. Hiwot is a managerial economist by profession and believes in the validity of economic laws. After a long wait she finally found the time to go to a movie — a pastime she cherishes. In the 15 minute interval time she walked out of the hall and sat down on the sofa placed in a restaurant in the theatre lobby. She happened to glance at the price list displayed at the side of the restaurant and found that a cup of coffee was available for Birr 10. Being an economist in every thought and action she immediately calculated that to her the satisfaction

expected from the cup of coffee was not higher than the satisfaction she could derive by spending Birr 10 on some alternative purchase. She decided not to buy the cup of coffee.

Then to her surprise, she noticed that the cup of coffee was accompanied by a pair of biscuits (at no extra cost). She ordered a cup of coffee. Think about the above case problem, discuss it with your friends, and try to find the rationale behind the evaluation of the choice made by Ms Hiwot.




- 4 Discuss and try to find out if the total utility derived from the consumption of a certain unit of a commodity can ever be zero or negative.

3.2 THE CARDINAL UTILITY THEORY

At the end of this section, you will be able to:

- describe the cardinal utility theory; and
- examine how the cardinalists maximize their total utility and compute and interpret the algebraical restatement.

Key Terms and Concepts

-  Cardinal utility
-  Law of diminishing marginal utility
-  Consumer's equilibrium

Start-up Activity

Assume you are thirsty and need three glasses of water to satisfy.

Which glass of water do you think yields more satisfaction to you? The first, the second or the third? What would happen if you continue drinking the 4th, 5th, 6th - glass of water to your satisfaction?

Economists have developed various theories to explain consumer behaviour, particularly a consumer's equilibrium, in respect to his/her purchase of different commodities. A consumer will be in equilibrium when he/she spends his/her given income on the purchase of different goods in such a way so as to maximise his/her total utility.

In this section we discuss how cardinal utility theory explains the consumer behaviour based on the concepts of total and marginal utility. This theory has been given by traditional economists and it makes the following assumptions.

Assumptions

- **Rationality** - The consumer is rational. She/he aims at the maximisation of her/his utility, subject to the constraints imposed by her/his given income.
- **Cardinal utility**: The utility of each commodity is measurable. Utility is a cardinal concept.
- **Constant Marginal Utility of Money**: This assumption is necessary if the monetary unit is used as the measure of utility. The essential feature of a standard unit of measurement is that it is constant.
- **Diminishing Marginal Utility**: The utility gained from the successive units of a commodity diminishes. In other words, the marginal utility of a commodity diminishes as the consumer consumes larger quantities of it. This is the axiom of diminishing marginal utility.

The Law of Diminishing Marginal Utility

This is the basic hypothesis of cardinal utility theory. According to the law of diminishing marginal utility, “for any individual consumer the value that she/he attaches to successive units of a particular commodity will diminish steadily as her/his total consumption of that commodity increases, the consumption of all other goods being held constant.” (R.G. Lipsey)

The law can also be stated in a simple language as follows: *As the amount of a commodity increases, the utility derived by the consumer from the additional units, that is, marginal utility, goes on decreasing.*

In other words, as the consumer consumes more, her/his total utility will increase but at a decreasing rate. It is a natural fact that when a consumer consumes additional units of a particular good at a point of time, her/his desire for every successive unit become less intense, consequently utility derived from each successive unit diminishes. We can use [Table 3.1](#) and [Figure 3.1](#) to explain the law.

[Table 3.1](#) presents a numerical illustration of the law. It clearly shows that as the consumption of oranges is increased, the total utility increases but at a diminishing rate. It means that marginal utility decreases with increase in consumption. This is shown in the second column of the table.

The law is graphically illustrated in [Figure 3.1](#). TU curve, which is concave from above, and the negatively sloping MU curve illustrates that as the consumer consumes more and more units of a commodity, the marginal utility from each successive unit goes on decreasing.

Assumptions of the Law of Diminishing Marginal Utility

- Various units of the good are homogeneous,
- There is no time gap between consumption of the different units,
- Consumer is rational (that is, she/he has complete knowledge and maximises utility),
- Tastes, preferences and fashions remain unchanged.

Consumer's Equilibrium or Law of Equi-Marginal Utility

How should a consumer spend his/her income money on different commodities? How much of different commodities should be purchased by the consumer? Or, how should a consumer allocate his/her given income money among different commodities?

To answer all these questions, economists have developed the concept of consumer's equilibrium and the law of equi-marginal utility.

As already stated, a consumer will be in equilibrium when she/he spends her/his given income on the purchase of different commodities in such a way so as to maximise her/his total utility. This is sometimes also referred as Utility Maximizing Rule.

Assumptions

The concept of consumer's equilibrium is based on the following assumptions:

- The consumer is rational. She/he aims the maximisation of her/his utility or satisfaction,
- Cardinal measurement of utility is possible,
- If utility is measured in terms of money, marginal utility of money remains constant,
- The law of diminishing marginal utility operates,
- Consumer's income is given and remains constant,
- Prices of commodities are given and remain constant.

Explanation

Suppose a consumer wants to purchase many commodities from his/her given income. The fundamental condition of consumer's equilibrium is the law of

equi-marginal utility. The law of equi-marginal utility states that *a consumer gets maximum satisfaction when the ratio of marginal utilities of all commodities and their prices is equal. In other words, the consumer should incur expenditure on different commodities in such a manner that the marginal utility of the last Birr spent on each one of them is equal.*

Thus, in the situation of consumer's equilibrium the utility derived from spending an additional unit of money must be the same for all commodities. If the consumer derives greater utility from any one commodity, she/he can increase her/his satisfaction by spending more on that commodity and less on the others. It will continue till the above equilibrium condition is reached.

Mathematically, the conditions of equilibrium are as follows.

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \dots = \frac{MU_n}{P_n} \quad (3.3)$$

Where, MU_x = Marginal utility of commodity x;

MU_y = Marginal utility of commodity y;

MU_n = Marginal utility of commodity n

P_x = Price of x

P_y = Price of y

P_n = Price of n

Expenditure on x + Expenditure on y + ... + Expenditure on n = Consumer's Income

or

$$P_x \times Q_x + P_y \times Q_y + \dots + P_n \times Q_n = I \quad (3.4)$$

Where, Q_x , Q_y and Q_n are quantities of commodities x, y and n, respectively and I = consumer's income.

An Illustration

Suppose there are two commodities x and y. P_x = Birr 4 per unit; P_y = Birr 2 per unit; consumer's money income = Birr 30. Marginal utilities of x and y are given in Table 3.2 below.

Table 3.2:

Unit	MU_x	MU_y
1	80	40
2	72	38
3	64	36
4	56	34
5	48	32
6	40	30
7	32	28
8	24	26
9	16	24
10	8	22

Let us see how the consumer should allocate his income between x and y . Or, what respective quantities of x and y should be purchased so that the consumer can obtain maximum satisfaction. To maximise her/his satisfaction, the consumer will equate $\frac{MU_x}{P_x}$ (per Birr MU_x) with $\frac{MU_y}{P_y}$ (per Birr MU_y).

This means that the consumer will equate the marginal utility of the last Birr spent on these two commodities. In order to know the position of the consumer's equilibrium, we may restructure the above mentioned table by dividing MU_x by Birr 4 and MU_y by Birr 2.

Table 3.3: Per Birr MU of x and y

Unit	MU_x/P_x	MU_y/P_y
1	20	20
2	18	19
3	16	18
4	14	17
5	12	16
6	10	15
7	8	14
8	6	13
9	4	12
10	2	11

To obtain maximum utility, the consumer will purchase 4 units of x and 7 units of y , because it satisfies the following two conditions required for the consumer's equilibrium:

At 4 units of $x = \frac{MU_x}{P_x} = 14$ and at 7 units of $y = \frac{MU_y}{P_y} = 14$.

$$\therefore \frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

Also, $P_x \times Q_x = 4 \times 4 = \text{Birr } 16$

$P_y \times Q_y = 2 \times 7 = \text{Birr } 14$ and $I = \text{Birr } 30$

$\therefore P_x \times Q_x + P_y \times Q_y = I: (16 + 14 = 30)$

Activity 3.2



- 1 Assume that a consumer consumes two goods, A and B. His/her limited income to spend on his/her consumption is Birr 10, and the price of good A is Birr 1 per unit and that of good B is Birr 2 per unit. From the following hypothetical data, find the level of his/her consumption, so that he/she maximises his/her utility.

Unit	Mu_A/P_A	Mu_B/P_B
1	10	24
2	8	20
3	7	18
4	6	16
5	5	12
6	4	6
7	3	4

- 2 In a group, discuss the law of diminishing marginal utility. Examine the application of the law in the case of different commodities. As a conclusion of your discussion, if possible, try to give an explanation (or more) for the basis of the law.
- 3 You have studied the Law of Demand in the previous unit and the Law of Diminishing Marginal Utility in this unit. In a group, discuss whether there is any relationship between the two laws. If possible, try to describe the relationship in your own words.
- 4 Does the law of diminishing marginal utility apply to money? Discuss this question in a group, and prepare a report on your observations.

3.3 THE ORDINAL UTILITY THEORY: INDIFFERENCE CURVE APPROACH

At the end of this section, you will be able to:

- ❑ define the concepts of indifference set, curve and map and the theory of ordinal utility;
- ❑ state the characteristics of indifference curves;
- ❑ elaborate the concept of marginal rate of substitutions;
- ❑ explain what a budget line is; and
- ❑ interpret how a change in consumer income and price affects, consumer satisfaction.

Key Terms and Concepts

➤ Ordinal utility

➤ Indifference set

➤ Indifference curve

➤ Indifference map

Start-up Activity

Can we numerically measure the satisfaction we derive from consuming a good? How do you compare the levels of satisfaction of consuming two different goods?

As utility is subjective, its measurement in absolute terms is not really possible. Keeping this in mind, modern economists have developed an alternative to the Cardinal Utility Theory. This is known as Ordinal Utility Theory, which deals with consumer behaviour under the assumption that utility from different units of a good or between different goods need only be rankable and not measurable. If a consumer gets more utility from bundle *A* than from bundle *B*, it means that the consumer will rank bundle *A* above bundle *B*. Her/his need is not known by “how much” *A* is preferred to *B*. This is the major premise on which the theory of ordinal utility is based.

Note

Since Ordinal Utility Theory makes use of indifference curves to study consumer behaviour, it is also known as Indifference Curve Approach.

Assumptions of Ordinal Utility Theory

- **Rationality:** A consumer aims to maximise her/his utility (subject to income and prices) under conditions of certainty.
- **Complete Ordering:** All possible combinations of goods can be ordered into preferred, indifferent or inferior combinations when compared to a given combination of the good.
- **Consistency:** This condition requires that if a consumer prefers bundle A to bundle B, he/she does not, at the same time, prefer bundle B to bundle A.
- **Transitivity:** If consumer prefers bundle A to B and B to C, she/he prefers A to bundle C.
- **Non-satiation:** A bigger bundle is preferred to a smaller bundle.
- **Diminishing Marginal Rate of Substitution:** This means that as the consumer substitutes more and more of one commodity (say Y) for another commodity (say X), she/he will be prepared to give up lesser units of the later (X) for each additional unit of the former (Y).

Indifference Set, Curve, and Map

Indifference Set

An indifference set refers to a table that shows various combinations of two goods which give equal level of satisfaction (utility) to the consumer. Since each of these combinations gives equal satisfaction, the consumer is indifferent among them.

Table 3.4: Indifference Set

Combination	Good X (units)	Good Y (units)
A	1	10
B	2	7
C	3	5
D	4	4

The above indifferent set shows that the consumer gets equal satisfaction from all the four combinations, namely A, B, C and D of good X and good Y. At combination 'A', he/she has 1 unit of good X and 10 units of good Y; at combination 'B' he/she has 2 units of good X and 7 units of good Y and so on. In order to have one more unit of good X he/she has to sacrifice some amount of the good Y in such a way that there is no change in the level of his/her satisfaction from each of these combinations.

Indifference Curve

An indifference curve shows various combinations of two goods which give equal satisfaction to the consumer. It is the locus of points, each point representing a different combination of two goods, which yield the same level of satisfaction to the consumer so that he/she is indifferent between these combinations. In other words, an indifference curve is a graphical presentation of indifference set. Based on Table 3.4, indifference curve is shown in Figure 3.2.

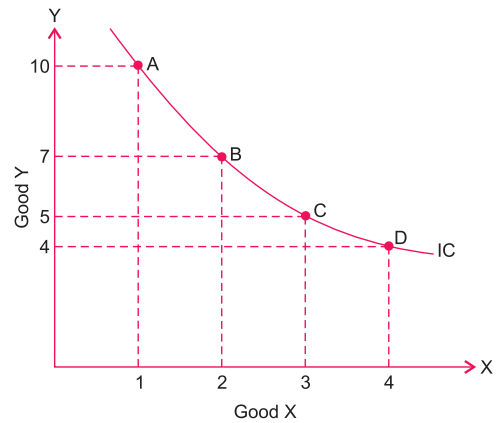


Figure 3.2: Indifference Curve

Different points A , B , C and D on indifference curve IC show the combinations of good X and good Y which give equal satisfaction to the consumer. An indifference curve is also known as Iso-Utility Curve or Equal-Utility Curve.

Indifference Map

An indifference map is a group or set of indifference curves, each one of which represents a given level of satisfaction. Figure 3.3 shows such an indifference map consisting of various indifference curves IC_1 , IC_2 , IC_3 and IC_4 . Each indifference curve represents a different level of satisfaction. All points on a particular indifference curve indicate alternative combinations of good X and good Y that give the consumer an equal level of satisfaction.

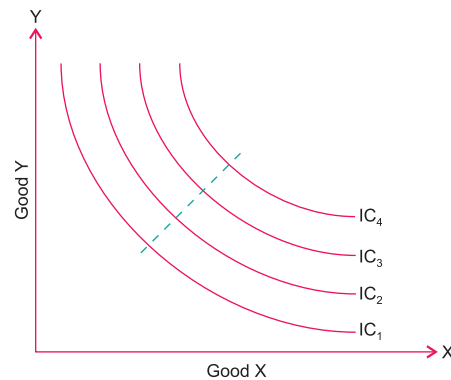


Figure 3.3: Indifference Map

The farther the curve is from the origin, the higher is the level of satisfaction it represents. For example, IC_3 is a higher indifference curve than IC_2 , which means that all points on IC_3 yield a higher level of satisfaction than the points on IC_2 . Note that an indifference map represents the preference pattern of the consumer.

Properties of Indifference Curve

i **Indifference curve is downward sloping:** By definition, different points on an indifference curve represent the same level of utility. If we decrease the consumption of one good, obviously we need to increase the consumption of the other good to attain the same level of satisfaction as before the change. This gives rise to a downward sloping indifference curve.

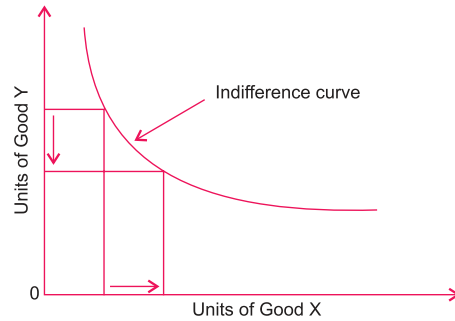


Figure 3.4: Downward Slope of Indifference Curve

ii **Indifference curve is convex to the origin:** Convexity of indifference curve implies that the two goods can substitute for one another, but not perfectly. As the consumer gets additional units of good X at the cost of good Y, marginal utility of good X (MU_X) decreases. On the other hand, due to reduced availability of good Y the marginal utility of Y (MU_Y) increases. So, the consumer would be ready to sacrifice lesser and lesser amount of Y for each additional unit of X. This gives rise to diminishing marginal rate of substitution. In case, the phenomenon of diminishing marginal rate of substitution holds good the indifference curve would be convex to the origin.

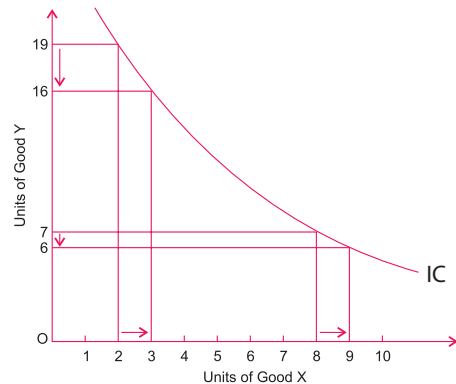


Figure 3.5: Convexity of Indifference Curve

iii **Two indifference curves never intersect each other:** Two indifference curves may lie close to each other, but they never intersect. This follows from the fact that each indifference curve represents different level of satisfaction so they do not intersect or touch each other. If the two indifference curves intersect each other, this would imply that a combination of two goods corresponding to the point of intersection would give two different levels of satisfaction, which is absurd.

Marginal Rate of Substitution (MRS)

The marginal rate of substitution of X for Y ($MRS_{X,Y}$) is defined as the number of units of good Y that must be given up in exchange for an extra unit of good X so that the consumer maintains the same level of satisfaction. In other words, it shows the rate at which one

good is substituted for another good, while remaining on the same indifference curve. Thus,

$$MRS_{x,y} = \frac{\text{Amount of Y lost}}{\text{Amount of X gained}} = \frac{\Delta Y}{\Delta X} \quad (3.5)$$

Table 3.5: Marginal Rate of Substitution

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

The above Table 3.5 shows that when the consumer moves from combination A to B, he gives up 4 units of Y for the gain of one additional unit of X. Therefore, his MRS of X for Y is given by

$$MRS_{x,y} = \frac{\Delta Y}{\Delta X} = \frac{4}{1} = 4$$

Similarly, when he/she moves from combination B to C, he/she forgoes 3 units of Y for the additional one unit gain in X and hence $MRS_{x,y} = 3$ and so on.

Observe that as a consumer consumes more and more of good X, $MRS_{x,y}$ goes on diminishing. This is known as the principle of diminishing marginal rate of substitution, which means that the 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, she/he is prepared to forgo less and less of good Y.

...The Budget Line or Iso-Expenditure Line.....

A good is demanded by the consumer if he/she has:

- a preference for that good, and
- purchasing power to buy the good, his/her preference pattern is represented by a set of indifference curves (indifference map), while his/her purchasing power depends upon her/his money income and market prices of the goods. Assume that the consumer has allocated some money to be spent on goods X and Y, whose prices are P_X and P_Y . Then his/her purchasing power can be represented in terms of a budget equation:

$$E = Q_X \cdot P_X + Q_Y \cdot P_Y \quad (3.6)$$

Where, E = Expenditure on goods X and Y

Q_X and Q_Y = Quantity of good X and good Y respectively

P_X and P_Y = prices of good X and good Y respectively

The budget equation (Equation 3.6) gives us a budget line. Let a consumer have $E =$ Birr 2,000, $P_X =$ Birr 50 and $P_Y =$ Birr 40. The maximum amount of X which he can buy can be found from his budget equation:

$$2000 = 50(Q_X) + 40(0) \text{ or } Q_X = 40$$

Similarly, we find that the maximum amount of $Q_Y = 50$.

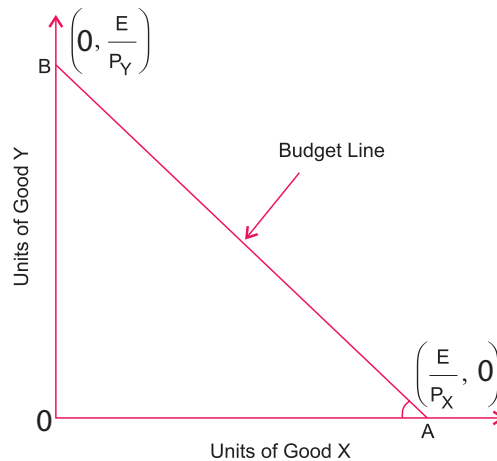


Figure 3.6: The Budget Line

So, the combinations (40, 0) and (0, 50) are possible consumption bundles within the budgeted amount of money. By joining these two points in a graph we get the budget line AB (Figure 3.6). All combinations of goods X and Y on the budget line can be purchased by the consumer if she/he spends whole of his allocated money on X and Y, given prices of goods X and Y.

In general, we may define budget line as *a graph that shows various combinations of two commodities which can be purchased with a given budget at given prices of the two commodities*. Any combination of the two commodities on or within the budget line is attainable, whereas any combination above the budget line is not attainable (because of the budget constraint).

Note that the slope of the budget line AB (Figure 3.6) would be equal to

$$\frac{\Delta Y}{\Delta X} = \frac{E/P_Y}{E/P_X} = \frac{P_X}{P_Y} \text{ relative prices of X and Y.}$$

Effect of Change in Income/Price of Goods

In case income of the consumer changes, with prices of the two goods remaining the same, there will be a parallel shift in the budget line (Figure 3.7). Whereas with a change in price of good, say X, (income and price of Y remaining constant), the budget line shifts only at its end touching the relevant-axis (X-axis here) (Figure 3.8). The budget line A_1B_1 shifts outward to A_1B_2 when price of X declines. It would have shifted inward if price of X increased.

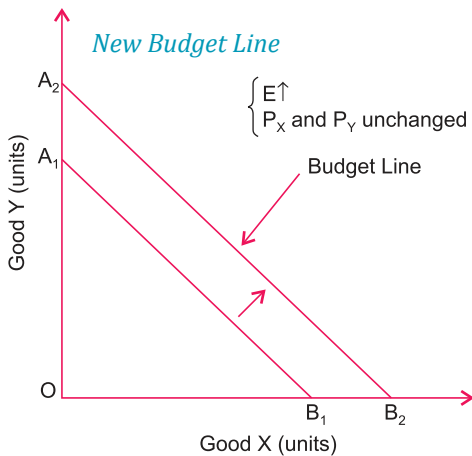


Figure 3.7: Change in Consumer's Income

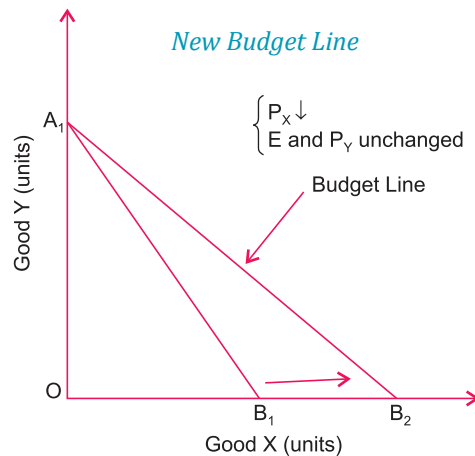


Figure 3.8: Decrease in Price of Good X

Consumer's Equilibrium

Now we can explain consumer's equilibrium with the help of the indifference curve approach (ordinal utility theory). As in the case of cardinal utility analysis, the indifference curve analysis also assumes that the consumer tries to maximise his/her utility.

A consumer shall be in equilibrium where she/he can maximise her/his utility, subject to her/his budget constraint. In other words, where the indifference curve and the budget line are tangent to each other (that is, their slopes are equal) the consumer will attain equilibrium. The equilibrium combination of the goods X and Y gives her/him maximum satisfaction because that relates to the highest indifference curve the consumer can reach within his/her available budget.

This is shown in Figure 3.9, where E is the equilibrium point, having combination X^* and Y^* of goods X and Y respectively. Any other point, like (C, D, F, G, etc.), cannot be considered as optimum point because it lies on a lower indifference curve than I_3 (where point E lies). On the other hand, any point like H is unattainable, because it is outside the budget line.

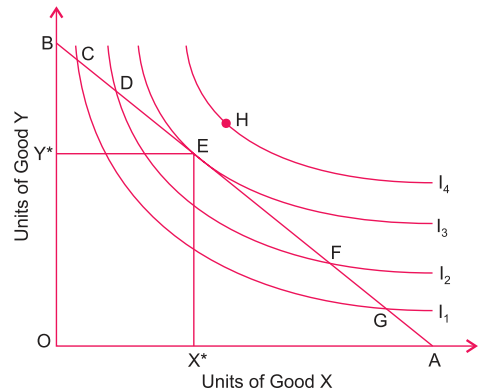


Figure 3.9: Consumer's Equilibrium

Note that at the point of tangency E,

Slope of budget line = Slope of indifference curve I_3

Also, slope of budget line = $\frac{P_x}{P_y}$ (price ratio of X and Y) and,

slope of indifference curve = $\frac{\Delta Y}{\Delta X} = MRS_{xy}$

∴ At equilibrium point E,

$$\frac{P_x}{P_y} = \frac{\Delta Y}{\Delta X} \quad (3.7)$$

So we may express the condition of consumer equilibrium in another way, as below.

Price ratio of two goods = MRS

Income Effect (Income Consumption Curve)

When income of the consumer rises, the budget line moves outwards by the proportion of increase in the purchasing power. While when income declines the budget line moves inwards in accordance with the decrease in the purchasing power. For example, if the consumer's income increases from Birr 1,000 to Birr 1,200, P_x and P_y remaining constant, the points A and B would instead shift to A_1 and B_1 respectively (Figure 3.10). Consequently, the new budget line is the straight line A_1B_1 . There would, on the other hand, be a downward shift like A_2B_2 when income of the consumer declines. Thus, we get a family of budget lines depending on different levels of income of the consumer, given the prices

of the goods. We also know that for every budget line, there is an indifference curve which is tangent to it. When we join these points of tangency (E_1 , E_2 , E_3 , etc.) we get an *income consumption curve* (ICC) which shows the way in which consumption varies as income of the consumer changes (prices remaining constant). This change is known as *income effect*. In case of normal goods, ICC slopes up and to the right.

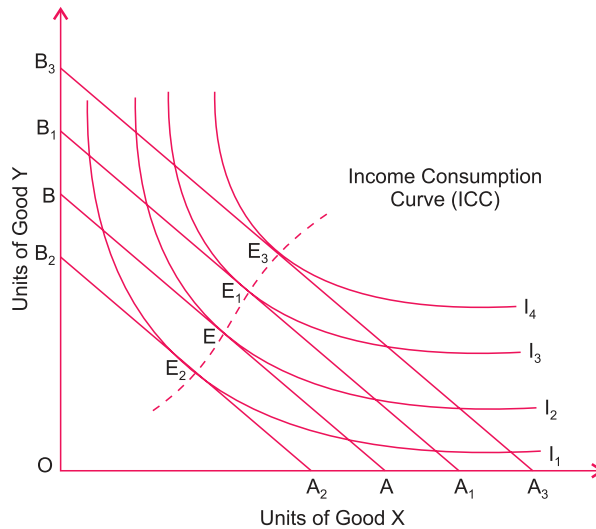


Figure 3.10: Income Effect

Price Effect (Price Consumption Curve)

As discussed earlier, when the price of a commodity falls, the consumer can buy more of it. So the budget line shifts to the right on that axis, which represents that commodity. For example, in [Figure 3.11](#), when the price of good X falls, the budget line shifts from AB_1 to AB_2 , while, if the price of X rises, it shifts from AB_1 to AB_3 . The new budget line (AB_2) is tangent to the higher indifference curve and a new equilibrium occurs at E_2 , to the right of E_1 , showing that as the price of X falls, more of X will be bought. If the price of X rises, the budget line shifts from AB_1 to AB_3 and the new equilibrium point E_3 is on a lower indifference curve. If we join the successive equilibrium

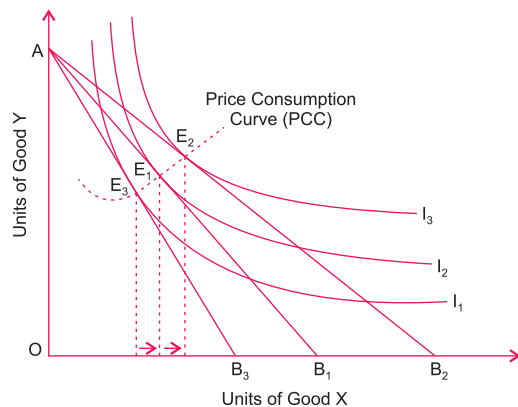


Figure 3.11: Price Effect

points, we get the *price-consumption curve* (PCC) which shows the way in which consumption varies as price of a commodity changes (income of the consumer and price of the other commodity remaining constant). This change is known as *price effect*.

Activity 3.3



- 1 You have learned that indifference curves are downward sloping. Draw one or more upward sloping curves, and consider different points on them to find the reason why an indifference curve does not slope upwards.
- 2 Examine the hypothetical data, given the following indifference set.
 - a Calculate $MRS_{x,y}$ for each stage of substitution.
 - b Does the third stage show less sacrifice of Y for X than the second stage?

Combination	Good X (units)	Good Y (units)
A	1	10
B	3	7
C	5	5
D	7	4

- 3 Consider a number of combinations of two goods that you consume. Fix any suitable amount as your planned expenditure for each combination of two goods. Identify the market price per unit of each good from each combination. Draw a *budget line* for each pair of goods. Based on a study of this set of budget lines, try to point out the main properties of a budget line. Prepare a report of your project and get it checked by your teacher.

UNIT REVIEW

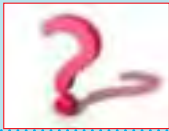
UNIT SUMMARY

- ❑ *Utility* refers to the want-satisfying power of a commodity.
- ❑ *Total utility* refers to the total satisfaction derived by the consumer from the consumption of a given quantity of a commodity.
- ❑ *Marginal utility* refers to the additional utility derived from the consumption of an additional unit of a commodity.
- ❑ *Total utility curve* is concave from above, while *marginal utility curve* is negatively sloped.
- ❑ When total utility *increases*, marginal utility is *positive*, when total utility is *maximum*, marginal utility is *zero*, and when total utility *decreases*, marginal utility is *negative*.
- ❑ Assumptions of Cardinal Utility Theory are:
 - *Consumer is rational,*
 - *Utility is measurable in cardinal numbers,*
 - *Utility gained from successive units of a commodity diminishes.*
- ❑ Conceptually, utility is measured in units called *utils*.
- ❑ *Law of diminishing marginal utility* states that as the amount consumed of a commodity increases the utility derived by the consumer from the additional units (*marginal utility*) goes on decreasing.
- ❑ Consumer will be in equilibrium when he/she maximises the utility from his/her purchase.
- ❑ *Law of equi-marginal utility* states that a consumer gets maximum satisfaction when the ratio of marginal utilities of all commodities and their prices is equal.
- ❑ Assumptions of Ordinal Utility Theory are:
 - *Consumer is rational,*
 - *All possible combinations of goods can be ordered in terms of preference,*
 - *Consumer's preference is consistent,*
 - *Consumer's preference follows transitivity,*
 - *Marginal rate of substitution (MRS) is diminishing.*
- ❑ An indifference curve refers to a curve that shows various combinations of two commodities which give equal satisfaction to the consumer.
- ❑ An indifference map is a set of indifference curves, each one of which represents a given level of satisfaction.
- ❑ Properties of Indifference Curve:
 - *An indifference curve slopes downward from left to right,*
 - *An indifference curve is convex to the origin,*
 - *Two indifference curves do not intersect each other,*
- ❑ *Higher indifference curve gives higher satisfaction.*

$$\text{MRS}_{x,y} = \frac{\text{Amount of } Y \text{ lost}}{\text{Amount of } X \text{ gained}} = \frac{\Delta Y}{\Delta X}$$

- ❑ Budget line shows various combinations of two commodities which can be purchased with a given budget at given prices of the two commodities. It is a negatively sloping line. Its slope is equal to the price-ratio of two commodities.
- ❑ Equilibrium of the consumer takes place at the point of tangency of budget line with indifference curve. At the point of tangency, marginal rate of substitution (MRS) = price ratios of two commodities, i.e.,

$$\text{MRS}_{x,y} = \frac{P_x}{P_y}$$



REVIEW EXERCISE FOR UNIT 3

I Write detailed answers to the following.

- 1 Explain the relationship between total utility and marginal utility.
- 2 Explain the 'law of diminishing marginal utility', using a diagram, and state its assumptions.
- 3 State the assumptions of cardinal utility theory.
- 4 Explain why consumer's equilibrium is attained when the marginal utility of a product is equal to its price?
- 5 State the assumptions of ordinal utility theory.
- 6 What is an indifference curve? What are the properties of an indifference curve? Explain with the help of diagrams.
- 7 What is meant by marginal rate of substitution? Discuss with examples the principles of diminishing marginal rate of substitution.
- 8 Discuss the concept of budget line and explain how change in income/price of goods shifts the budget line.
- 9 Explain consumer's equilibrium with the help of indifference curve.
- 10 Why does the consumer choose a point where the indifference curve is tangent to the budget line?
- 11 Discuss how a change in the income of a consumer affects his equilibrium consumption, when the prices of commodities remain constant.
- 12 Describe the concept of price consumption curve using diagram.

II Distinguish between the following:

- 13 Total utility and marginal utility.
- 14 Indifference set and indifference curve.
- 15 Cardinal and ordinal utility.
- 16 Price consumption curve and income consumption curve.

III Write 'True' or 'False' in case of each of the following:

- 17 Total utility is the sum of all marginal utilities.
- 18 Total utility increases as long as marginal utility is negative.
- 19 Total utility is minimum when marginal utility is zero.
- 20 Cardinal utility theory is given by modern economists.
- 21 Cardinal utility theory assumes that a consumer is rational.
- 22 An indifference curve is also known as iso-utility curve.
- 23 An indifference curve is upward sloping.
- 24 An indifference curve is convex to the origin.
- 25 When the income of the consumer rises, the budget line moves outwards.
- 26 Two indifference curves can touch each other at a common point.

IV Match the following:Column AColumn B

- | | | |
|---|---|-------------------------------------|
| 27 Ordinal utility | A | Sum of all marginal utilities |
| 28 Negative MU | B | Law of diminishing marginal utility |
| 29 TU is maximum | C | TU declines |
| 30 Principle of diminishing marginal rate of substitution | D | Budget line moves inwards |
| 31 Fall in consumer income | E | Utility cannot be measured |
| 32 Total utility | F | MU is zero |

V Write very short answers to the following questions

- 33 What is the conceptual unit to measure utility?
- 34 How is marginal utility derived from total utility?
- 35 How is total utility derived from marginal utility?
- 36 What is the shape of marginal utility curve?

- 37 When total utility is maximum how much is the marginal utility?
- 38 When is marginal utility negative?
- 39 State the law of diminishing marginal utility.
- 40 When is marginal utility positive?
- 41 State two assumptions of cardinal utility theory.
- 42 State two properties of an indifference curve.
- 43 State two assumptions of the law of diminishing marginal utility.
- 44 If total utility derived from 6 units of a good is 24, and that from 5 units is 25, what is the marginal utility of 6th unit?
- 45 What is consumer's equilibrium?
- 46 What is a budget line?
- 47 Why does the budget line slope downwards?
- 48 What determines the slope of the budget line?
- 49 State the condition of consumer's equilibrium in terms of cardinal utility approach.
- 50 State the condition of consumer's equilibrium in terms of indifference curve approach.
- 51 State one similarity between marginal utility approach and indifference curve approach.
- 52 State one difference between cardinal utility analysis and indifference curve analysis.

VI Numericals

- 53 Derive MU schedule of a person from the TU schedule given below and draw the graph of TU and MU.

Units of a Commodity	TU (utils)
0	0
1	20
2	35
3	45
4	53
5	60

- 54 The MU schedule of a person is given below. Derive his TU schedule, assuming that the TU of zero unit is zero.

Units of a Commodity	MU (utils)
1	8
2	10
3	7
4	5
5	3
6	0

- 55 Copy and fill in the 3rd column of the following table.

Units Purchased	MU	TU
1	8	
2	6	
3	4	
4	2	
5	0	
6	-2	

- 56 Copy and fill in the 4th column of the following table.

Combination	Good a (units)	Good b (units)	MRS _{a,b}
A	1	12	
B	2	8	
C	3	5	
D	4	3	
E	5	3	

- 57 Assume that the total expenditure of a consumer on two goods X and Y is $E = \text{Birr } 2000$, and prices of goods X and Y are $P_X = \text{Birr } 50$ and $P_Y = \text{Birr } 40$. Formulate his budget equation.