ADVANCED MICRO ECONOMICS - I

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UNIT – I

Theory of consumer behaviour

Consumer theory is the concept that deals with how people determine to expend their money, provided their proclivity and budget restrictions. A part of microeconomics, consumer theory manifests how people make choices, provided restrains, their income and the prices of commodities and services.

The customer has to determine how to expend his or her earnings on different commodities. However, a few renowned economists have named this the **'issue of choice'**. Usually, any customer would want to get a blend of commodities that gives him or her utmost content. This relies upon the preferences of the customer and what the customer can manage to purchase. The 'likes' of the customers are also named 'preferences'. And what the customer can manage to purchase, certainly relies on prices of the commodities and the earnings of the customer.

CARDINAL UTILITY ANALYSIS

From time to time, different theories have been advanced to explain consumer's demand for a good and to derive a valid demand theorem.

Cardinal utility analysis is the oldest theory of demand which provides an explanation of consumer's demand for a product and derives the law of demand which establishes an inverse relationship between price and quantity demanded of a product.

Introduction:

The price of a product depends upon the demand for and the supply of it. In this part of the book we are concerned with the theory of consumer's behaviour, which explains his demand for a good and the factors determining it. Individual's demand for a product depends upon price of the product, income of the individual, the prices of related goods.

It can be put in the following functional form:

$D_{x=} f(P_x, I, P_y, P_2, T$ etc.$)$

where D_x stands for the demand of good X, P_x for price of good X, I for individual's income, $P_y P_z$ for the prices of related goods and T for tastes and preferences of the individual. But among these determinants of demand, economists single out price of the good in question as the most important factor governing the demand for it. Indeed, the function of a theory of consumer's behaviour is to establish a relationship between quantity demanded of a good and its own price and to provide an explanation for it.

Recently, cardinal utility approach to the theory of demand has been subjected to severe criticisms and as a result some alternative theories, namely, Indifference Curve Analysis, Samuelson's Revealed Preference Theory, and Hicks' Logical Weak Ordering Theory have been propounded.

ASSUMPTIONS OF CARDINAL UTILITY ANALYSIS

The Cardinal Measurability of Utility:

The exponents of cardinal utility analysis regard utility to be a cardinal concept. In other words, they hold that utility is a measurable and quantifiable entity. According to them, a person can express utility or satisfaction he derives from the goods in the quantitative cardinal terms. Thus, a person can say that he derives utility equal to 10 units from the consumption of a unit of good A, and 20 units from the consumption of a unit of good B.

Moreover, the cardinal measurement of utility implies that a person can compare utilities derived from goods in respect of size, that is, how much one level of utility is greater than another. A person can say that the utility he gets from the consumption of one unit of good B is double the utility he obtains from the consumption of one unit of good A.

According to Marshall, marginal utility is actually measurable in terms of money. Money represents the general purchasing power and it can therefore be regarded as a command over alternative utility-yielding goods. Marshall argues that the amount of money which a person is prepared to pay for a unit of a good rather than go without it is a measure of the utility he derives from that good.

Thus, according to him, money is the measuring rod of utility Some economists belonging to the cardinalist school measure utility in imaginary units called "utils" They assume that a consumer is capable of saying that one apple provides him utility equal to 4 utils. Further, on this ground, he can say that he gets twice as much utility from an apple as compared to an orange.

The Hypothesis of Independent Utilities:

The second important tenet of the cardinal utility analysis is the hypothesis of independent utilities. On this hypothesis, the utility which a consumer derives from a good is the function of the quantity of that good and of that good only In other words, the utility which a consumer obtains from a good does not depend upon the quantity consumed of other goods; it depends upon the quantity purchased of that good alone.

On this assumption, then the total utility which a person gets from the whole collection of goods purchased by him is simply the total sum of the separate utilities of the goods. Thus, the cardinalist school regards utility as 'additive', that is, separate utilities of different goods can be added to obtain the total sum of the utilities of all goods purchased.

Constancy of the Marginal Utility of Money:

Another important assumption of the cardinal utility analysis is the constancy of the marginal utility of money. Thus, while the cardinal utility analysis assumes that marginal utilities of commodities diminish as more of them are purchased or consumed, but the marginal utility of money remains constant throughout when the individual is spending money on a good and due to which the amount of money with him varies. Daniel Bernoulli first of all introduced this assumption but later Marshall adopted this in his famous book "Principles of Economics'.

As stated above, Marshall measured marginal utilities in terms of money. But measurement of marginal utility of goods in terms of money is only possible if the marginal utility of money itself remains constant. It should be noted that the assumption of constant marginal utility of money is very crucial to the Marshallian analysis, because otherwise Marshall could not measure the marginal utilities of goods in terms of money. If money which is the unit of measurement itself varies as one is measuring with it, it cannot then yield correct measurement of the marginal utility of goods.

When price of a good falls and as a result the real income of the consumer rises, marginal utility of money to him will fall but Marshall ignored this and assumed that marginal utility of money did not change as a result of the change in price. Likewise, when price of a good rises the real income of the consumer will fall and his marginal utility of money will rise. But Marshall ignored this and assumed that marginal utility of money remains the same. Marshall defended this assumption on

the ground that "his (the individual consumer's) expenditure on any one thing is only a small part of his whole expenditure."

Introspective Method:

Another important assumption of the cardinal utility analysis is the use of introspective method in judging the behaviour of marginal utility. "Introspection is the ability of the observer to reconstruct events which go on in the mind of another person with the help of self-observation. This form of comprehension may be just guesswork or intuition or the result of long lasting experience."

Thus, the economists construct with the help of their own experience the trend of feeling which goes on in other men's mind. From his own response to certain forces and by experience and observation one gains understanding of the way other people's minds would work in similar situations. To sum up, in introspective method we attribute to another person what we know of our own mind. That is, by looking into ourselves we see inside the heads of other individuals.

So the law of diminishing marginal utility is based upon introspection. We know from our own mind that as we have more of a thing, the less utility we derive from an additional unit of it. We conclude from it that other individuals' mind will work in a similar fashion, that is, marginal utility to them of a good will diminish as they have more units of it.

With the above basic premises, the founders of cardinal utility analysis have developed two laws which occupy an important place in economic theory and have several applications and uses.

These two laws are:

(1) Law of Diminishing Marginal Utility and

(2) Law of Equi-Marginal Utility.

It is with the help of these two laws about consumer's behaviour that the exponents of cardinal utility analysis have derived the law of demand. We explain below these two laws in detail and how law of demand is derived from them.

LAW OF DIMINISHING MARGINAL UTILITY

An important tenet of cardinal utility analysis relates to the behaviour of marginal utility. This familiar behaviour of marginal utility has been stated in the Law of Diminishing Marginal Utility according to which marginal utility of a good diminishes as an individual consumes more units of a good. In other words, as a consumer takes more units of a good, the extra utility or satisfaction that he derives from an extra unit of the good goes on falling.

It should be carefully noted that it is the marginal utility and not the total utility that declines with the increase in the consumption of a good. The law of diminishing marginal utility means that the total utility increases at a decreasing rate.

Marshall who has been a famous exponent of the cardinal utility analysis has stated the law of diminishing marginal utility as follows:

"The additional benefit which a person derives from a given increase of his stock of a thing diminishes with every increase in the stock that he already has."

This law is based upon two important facts. First, while the total wants of a man are virtually unlimited, each single want is satiable. Therefore, as an individual consumes more and more units of a good, intensity of his want for the good goes on falling and a point is reached where the individual no longer wants any more units of the good. That is, when saturation point is reached, marginal utility of a good becomes zero. Zero marginal utility of a good implies that the individual has all that he wants of the good in question.

The second fact on which the law of diminishing marginal utility is based is that the different goods are not perfect substitutes for each other in the satisfaction of various wants. When an individual consumes more and more units of a good, the intensity of his particular want for the good diminishes but if the units of that good could be devoted to the satisfaction of other wants and yielded as much satisfaction as they did initially in the satisfaction of the first want, marginal utility of the good would not have diminished.

It is obvious from above that the law of diminishing marginal utility describes a familiar and fundamental tendency of human nature. This law has been arrived at by introspection and by observing how consumers behave.

Illustration of the Law of Diminishing Marginal Utility:

Consider Table 7 1 where we have presented the total and marginal utilities derived by a person from cups of tea consumed per day. When one cup of tea is taken per day the total utility derived by the person is 12 utils. And because this is the first cup its marginal utility is also 12 utils with the consumption of 2nd cup per day, the total utility rises to 22 utils but marginal utility falls to 10. It will be seen from the table that as the consumption of tea increases to six cups per day, marginal utility from the additional cup goes on diminishing (i.e. the total utility goes on increasing at a diminishing rate).

However, when the cups of tea consumed per day increases to seven, then instead of giving positive marginal utility, the seventh cup gives negative marginal utility equal to – 2 utils. This is because too many cups of tea consumed per day (say more than six for a particular individual) may cause acidity and gas trouble. Thus, the extra cups of tea beyond six to the individual in question gives him disutility rather than positive satisfaction.

Table 7.1. Diminishing Marginal Utility

Cups of tea consumed per day (Q)	Total Utility (utils) TU	Marginals Utility (utils) $\dfrac{\Delta TU}{\Delta Q}$
1	12	12
2	22	10
3	30	8
4	36	6
5	40	4
6	41	1
7	39	-2
8	34	-5

Figure 7 1 illustrates the total utility and the marginal utility curves. The total utility curve drawn in Figure 7.1 is based upon three assumptions. First, as the quantity consumed per period by a consumer increases his total utility increases but at a decreasing rate. This implies that as the consumption per period of a commodity by the consumer increases, marginal utility diminishes as shown in the lower panel of Figure 7.1.
Secondly, as will be observed from the figure when the rate of consumption of a commodity per period increases to Q_4, the total utility of the consumer reaches its maximum level.

Therefore, the quantity Q_4 of the commodity is called satiation quantity or satiety point. Thirdly, the increase in the quantity consumed of the good per period by the consumer beyond the satiation point has an adverse effect on his total utility that is, his total utility declines if more than Q_4 quantity of the good is consumed.

This means beyond Q_4 marginal utility of the commodity for the consumer becomes negative ads will be seen from the lower panel of Figure 7.1 beyond the satiation point Q_4 marginal utility curve MU goes below the X-axis indicating it becomes negative beyond quantity Q_4 per period of the commodity consumed.

It is important to understand how we have drawn the marginal utility curve. As stated above marginal utility is the increase in total utility of the consumer caused by the consumption of an additional unit of the commodity per period. We can directly find out the marginal utility of the successive units of the commodity consumed by measuring the additional utility which a consumer obtains from successive units of the commodity and plotting them against their respective quantities.

However, in terms of calculus, marginal utility of a commodity X is the slope of the total utility function $U = f(Q_x)$. Thus, we can derive the marginal utility curve by measuring the slope at various points of the total utility curve TU in the upper panel of Figure7.1 by drawing tangents at them. For instance, at the quantity Q_1 marginal utility (i.e. $dU/dQ = MU_1$) is found out by drawing tangent at point A and measuring its slope which is then plotted against quantity in the lower panel of Figure 7.1. In the lower panel we measure marginal utility of the commodity on the Y-axis. Likewise, at quantity Q_2 marginal utility of the commodity has been obtained by measuring slope of the total utility curve TU at point B and plotting it in the lower panel against the quantity Q_2.

It will be seen from the figure that at Q_4 of the commodity consumed, the total utility reaches at the maximum level T. Therefore, at quantity Q_4 the slope of the total utility curve is zero at this point. Beyond the quantity Q_4 the total utility declines and marginal utility becomes negative. Thus, quantity Q_4 of the commodity represents the satiation quantity.
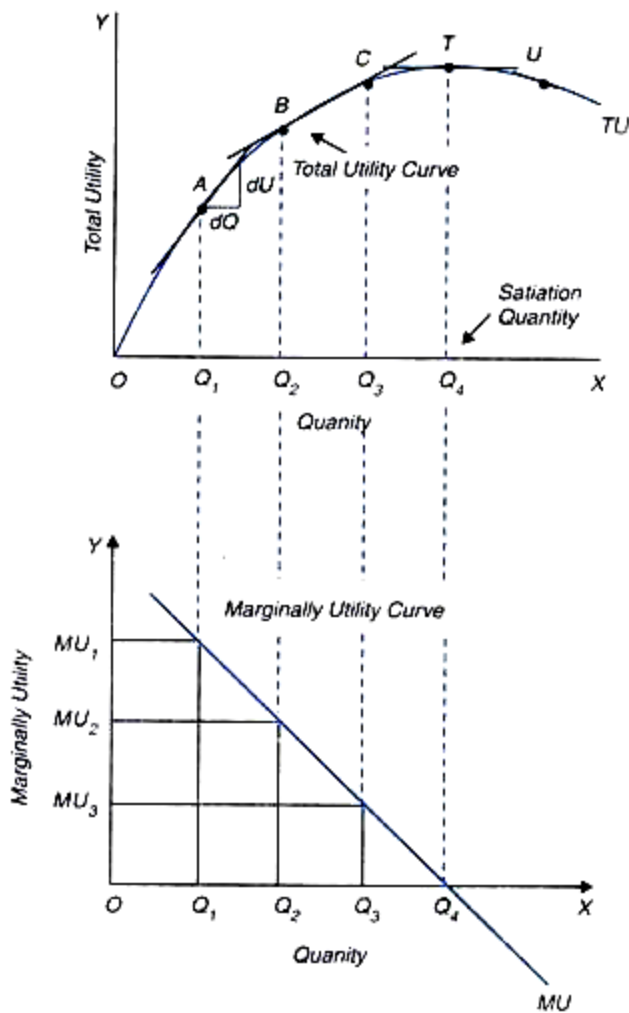
Fig. 7.1. , *Total Utility and Marginal Utility*

Another important relationship between total utility and marginal utility is worth noting. At any quantity of a commodity consumed the total utility is the sum of the marginal utilities. For example, if marginal utility of the first, second, and third units of the commodity consumed are 15, 12, and 8 units, the total utility obtained from these three units of consumption of the commodity must equals 35 units (15 + 12 + 8 = 35).

Similarly, in terms of graphs of total utility and marginal utility depicted in Figure 7.1 the total utility of the quantity Q_4 of the commodity consumed is the sum of the marginal utilities of the units of commodity up to point Q_4. That is, the entire area under the marginal utility curve MU in lower panel up to the point Q_4 is the sum of marginal utilities which must be equal to the total utility Q_4T in the upper panel.

Marginal Utility and Consumer's Tastes and Preferences:

The utility people derive from consuming a particular commodity depends on their tastes and preferences. Some consumers like oranges, others prefer apples and still others prefer bananas for consumption. Therefore, the utility which different individuals get from these various fruits depends on their tastes and preferences.

An individual would have different marginal utility curves for different commodities depending on his tastes and preferences. Thus, utility which people derive from various goods reflect their tastes and preferences for them. However, it is worth noting that we cannot compare utility across consumers. Each consumer has a unique subjective utility scale. In the context of cardinal utility analysis, a change in consumer's tastes and preferences means a shift in his one or more marginal utility curves.

However, it may be noted that a consumer's tastes and preferences do not frequently change, as these are determined by his habits. Of course, tastes and preferences can change occasionally. Therefore, in economic theory we generally assume that tastes or preferences are given and relatively stable.

Significance of Diminishing Marginal Utility:

The significance of the diminishing marginal utility of a good for the theory of demand is that it helps us to show that the quantity demanded of a good increase as its price falls and vice versa. Thus, it is because of the diminishing marginal utility that the demand curve slopes downward. If properly understood the law of diminishing marginal utility applies to all objects of desire including money.

But it is worth mentioning that marginal utility of money is generally never zero or negative. Money represents purchasing power over all other goods, that is, a man can satisfy all his material wants if he possesses enough money. Since man's total wants are practically unlimited, therefore, the marginal utility of money to him never falls to zero.

The marginal utility analysis has a good number of uses and applications in both economic theory and policy. The concept of marginal utility is of crucial significance in explaining determination of the prices of commodities. The discovery of the concept of marginal utility has helped us to explain the paradox of value which troubled Adam Smith in "The Wealth of Nations."

Adam Smith was greatly surprised to know why water which is so very essential and useful to life has such a low price (indeed no price), while diamonds which are quite unnecessary, have such a high price. He could not resolve this water-diamond paradox. But modern economists can solve it with the aid of the concept of marginal utility.

According to the modern economists, the total utility of a commodity does not determine the price of a commodity and it is the marginal utility which is crucially important determinant of price. Now, the water is available in abundant quantities so that its relative marginal utility is very low or even zero. Therefore, its price is low or zero. On the other hand, the diamonds are scarce and therefore their relative marginal utility is quite high and this is the reason why their prices are high.

Prof. Samuelson explains this paradox of value in the following words:

The more there is of a commodity, the less the relative desirability of its last little unit becomes, even though its total usefulness grows as we get more of the commodity. So, it is obvious why a large amount of water has a low price or why air is actually a free good despite its vast usefulness. The many later units pull down the market value of all units.

Besides, the Marshallian concept of consumer's surplus is based on the principle of diminishing marginal utility.

PRINCIPLE OF EQUI - MARGINAL UTILITY

Principle of equi-marginal utility occupies an important place in cardinal utility analysis. It is through this principle that consumer's equilibrium is explained. A consumer has a given income which he has to spend on various goods he wants. Now, the question is how he would allocate his given money income among various goods, that is to say, what would be his equilibrium position in respect of the purchases of the various goods. It may be mentioned here that consumer is assumed to be 'rational', that is, he carefully calculates utilities and substitutes one good for another so as to maximise his utility or satisfaction.

Suppose there are only two goods X and Y on which a consumer has to spend a given income. The consumer's behaviour will be governed by two factors first, the marginal utilities of the goods and secondly, the prices of two goods. Suppose the prices of the goods are given for the consumer.

The law of equi-marginal utility states that the consumer will distribute his money income between the goods in such a way that the utility derived from the last rupee spent on each good is equal. In other words, consumer is in equilibrium position when marginal utility of money expenditure on each good is the same. Now, the marginal utility of money expenditure on a good is equal to the marginal utility of a good divided by the price of the good. In symbols,

$MU_m = MU_x / P_x$

Where MU_m is marginal utility of money expenditure and MU_m is the marginal utility of X and P_x is the price of X. The law of equi-marginal utility can therefore be stated thus: the consumer will spend his money income on different goods in such a way that marginal utility of money expenditure on each good is equal. That is, consumer is in equilibrium in respect of the purchases of two goods X and V when

$MU_x / P_x = MU_y / P_y$

Now, if MU_x / P_x and MU_y / P_y are not equal and MU_x / P_x is greater than MU_y / P_y, then the consumer will substitute good X for good Y. As a result of this substitution, the marginal utility of good X will fall and marginal utility of good y will rise. The consumer will continue substituting good X for good Y until MU_x / P_x becomes equal to MU_y / P_y. When MU_x / P_x becomes equal to MU_y / P_y the consumer will be in equilibrium.

But the equality of MU_x / P_x with MU_y / P_y can be achieved not only at one level but at different levels of expenditure. The question is how far does a consumer go in purchasing the goods he wants. This is determined by the size of his money income. With a given income and money expenditure a rupee has a certain utility for him: this utility is the marginal utility of money to him.

Since the law of diminishing marginal utility applies to money income also, the greater the size of his money income the smaller the marginal utility of money to him. Now, the consumer will go on purchasing goods until the marginal utility of money expenditure on each good becomes equal to the marginal utility of money to him.

Thus, the consumer will be in equilibrium when the following equation holds good:

$MU_x / P_x = MU_y / P_y = MU_m$

Where MU_m is marginal utility of money expenditure (that is, the utility of the last rupee spent on each good).

If there are more than two goods on which the consumer is spending his income, the above equation must hold good for all of them. Thus

$MU_x / P_x = MU_y / P_y = \ldots\ldots = MU_m$

Let us illustrate the law of equi-marginal utility with the aid of an arithmetical table given below:

Table 7.2. Marginal Utility of Goods X and Y

Units	MU_x (Utils)	MU_y (Utils)
1	20	24
2	18	21
3	16	18
4	14	15
5	12	9
6	10	3

Let the prices of goods X and Y be Rs. 2 and Rs. 3 respectively. Reconstructing the above table by dividing marginal utilities (MU) of X by Rs. 2 and marginal utilities (MU) of 7 by Rs. 3 we get the Table 7.3.

Table 7.3. Marginal Utility of Money Expenditure

Units	$\dfrac{MU_x}{P_x}$	$\dfrac{MU_y}{P_y}$
1	10	8
2	9	7
3	8	6
4	7	5
5	6	3
6	5	1

Suppose a consumer has money income of Rs. 24 to spend on the two goods. It is worth noting that in order to maximise his utility the consumer will not equate marginal utilities of the goods because prices of the two goods are different. He will equate the marginal utility of the last rupee (i.e. marginal utility of money expenditure) spent on these two goods.

In other words, he will equate MU_x / P_x with MU_y / P_y while spending his given money income on the two goods. By looking at the Table 7.3 it will become clear

that MU_x / P_x is equal to 5 utils when the consumer purchases 6 units of good X and MU_y / P_y is equal to 5 utils when he buys 4 units of good Y. Therefore, consumer will be in equilibrium when he is buying 6 units of good X and 4 units of good 7and will be spending (Rs. 2 x 6 + Rs. 3 x 4) = Rs. 24 on them that are equal to consumer's given income. Thus, in the equilibrium position where the consumer maximises his utility.

$$MU_x / P_x = MU_y / P_y = MU_m$$

$$10/2 = 15/3 = 5$$

Thus, marginal utility of the last rupee spent on each of the two goods he purchases is the same, that is, 5 utils.

Consumers' equilibrium is graphically portrayed in Fig. 7.2. Since marginal utility curves of goods slope downward, curves depicting and MU_x / P_x and MU_y / P_y also slope downward. Thus, when the consumer is buying OH of X and OK of Y, then

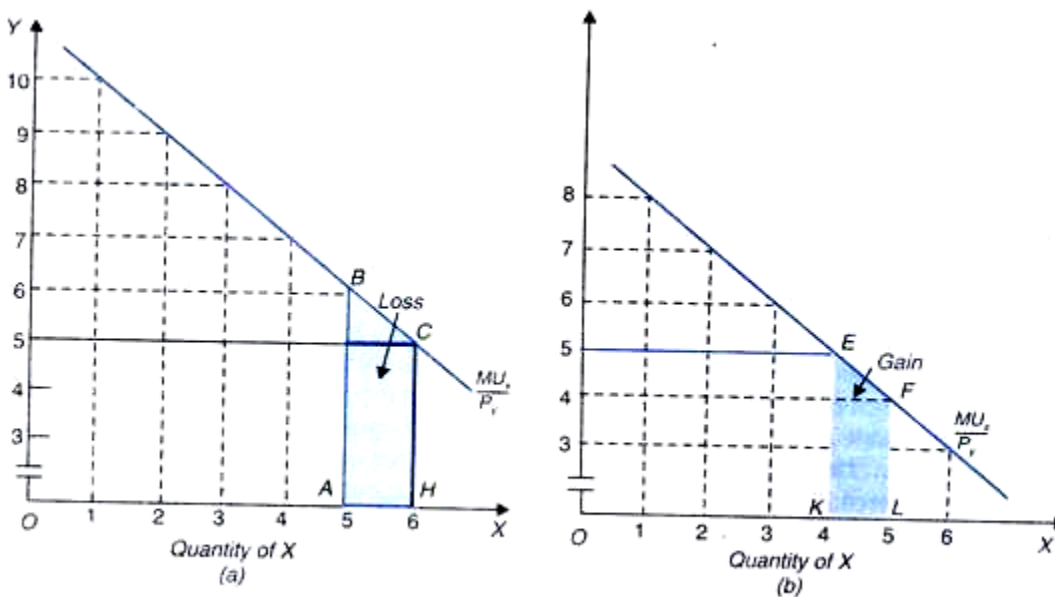$$MU_x / P_x = MU_y / P_y = MU_m$$

Fig. 7.2. *Equi-Marginal Utility Principle and Consumer's Equilibrium*

Therefore, the consumer is in equilibrium when he is buying 6 units of X and 4 units of Y. No other allocation of money expenditure will yield him greater utility than when he is buying 6 units of commodity X and 4 units of commodity Y. Suppose the consumer buys one unit less of good X and one unit more of good Y.

This will lead to the decrease in his total utility. It will be observed from Figure 7.2 (a) that the consumption of 5 units instead of 6 units of commodity X means a loss in satisfaction equal to the shaded area ABCH and from Fig. 7.2(b) it will be seen that consumption of 5 units of commodity Y instead of 4 units will mean gain in utility equal to the shaded area KEFL. It will be noticed that with this rearrangement of purchases of the two goods, the loss in utility ABCH exceeds gain in utility KEFL.

Thus, his total satisfaction will fall as a result of this rearrangement of purchases. Therefore, when the consumer is making purchases by spending his given income in such a way that $MU_x / P_x = MU_y / P_y$, he will not like to make any further changes in the basket of goods and will therefore be in equilibrium situation by maximizing his utility.

Limitations of the Law of Equi-Marginal Utility:

Like other laws of economics, law of equi-marginal utility is also subject to various limitations. This law, like other laws of economics, brings out an important tendency among the people. This is not necessary that all people exactly follow this law in the allocation of their money income and therefore all may not obtain maximum satisfaction.

This is due to the following reasons:

(1) For applying this law of equi-marginal utility in the real life, consumer must weigh in his mind the marginal utilities of different commodities. For this he has to calculate and compare the marginal utilities obtained from different commodities.

But it has been pointed out that the ordinary consumers are not so rational and calculating. Consumers are generally governed by habits and customs. Because of their habits and customs they spend particular amounts of money on different commodities, regardless of whether the particular allocation maximises their satisfaction or not.

(2) For applying this law in actual life and equate the marginal utility of the last rupee spent on different commodities, the consumers must be able to measure the marginal utilities of different commodities in cardinal terms. However, this is easier said than done. It has been said that it is not possible for the consumer to measure utility cardinally.

Being a state of psychological feeling and also there being no objective units with which to measure utility, it is cardinally immeasurable. It is because of the immeasurability of utility in cardinal terms that the consumer's behaviour has beenexplained with the help of ordinal utility by J.R. Hicks and R.G.D. Allen.

(3) Another limitation of the law of equi-marginal utility is found in case of indivisibility of certain goods. Goods are often available in large indivisible units. Because the goods are indivisible, it is not possible to equate the marginal utility of money spent on them. For instance, in allocating money between the purchase of car and foodgrains, marginal utilities of the last rupee spent on them cannot be equated.

An ordinary car costs about Rs. 300,000 and is indivisible, whereas foodgrains are divisible and money spent on them can be easily varied. Therefore, the marginal utility of rupee obtained from cars cannot be equalised with that obtained from foodgrains. Thus, indivisibility of certain goods is a great obstacle in the way of equalisation of marginal utility of a rupee from different commodities.

Derivation of Demand Curve and the Law of Demand:

We now turn to explain how the demand curve and law of demand is derived in the marginal utility analysis. As stated above, the demand curve or law of demand shows the relationship between price of a good and its quantity demanded. Marshall derived the demand curves for goods from their utility functions.

It should be further noted that in his utility analysis of demand Marshall assumed the utility functions of different goods to be independent of each other. In other words, Marshallian technique of deriving demand curves for goods from their utility functions rests on the hypothesis of additive utility functions, that is, utility function of each good consumed by a consumer does not depend on the quantity consumed of any other good.

As has already been noted, in case of independent utilities or additive utility functions, the relations of substitution and Complementarity between goods are ruled out. Further, in deriving demand curve or law of demand Marshall assumes the marginal utility of money expenditure (Mu_m) in general to remain constant.

We now proceed to derive demand curve from the law of equi-marginal utility. Consider the case of a consumer who has a certain given income to spend on a number of goods. According to the law of equi-marginal utility, the consumer is in

equilibrium in regard to his purchases of various goods when marginal utilities of the goods are proportional to their prices.

Thus, the consumer is in equilibrium when he is buying the quantities of the two goods in such a way that satisfies the following proportionality rule:

$MU_x / P_x = MU_y / P_y = MU_m$

Where MU_m stands for marginal utility of money income in general.

With a certain given income for money expenditure the consumer would have a certain marginal utility of money (Mu_m) in general. In order to attain the equilibrium position, according to the above proportionality rule, the consumer will equalise his marginal utility of money (expenditure) with the ratio of the marginal utility and the price of each commodity he buys.

It follows therefore that a rational consumer will equalise the marginal utility of money (MU_m) with MU_x / P_x of good X, with MU_m / P_Y of good 7 and so on. Given Ceteris Paribus assumption, suppose price of good X falls. With the fall in the price of good X, the price of good Y, consumer's income and tastes remaining unchanged, the equality of the MU_x / P_x with MU_y / P_y and MU_m in general would be disturbed.

With the lower price than before MU_x / P_x will be greater than MU_y / P_y or MU_m (It is assumed of course that the marginal utility of money does not change as a result of the change in the price of one good). Then, in order to restore the equality, marginal utility of X or MU_x must be reduced. And the marginal utility of X or MU_x can be reduced only by the consumer buying more of the good X.

It is thus clear from the proportionality rule that as the price of a good falls, its quantity demanded will rise, other things remaining the same. This will make the demand curve for a good downward sloping. How the quantity purchased of a good increases with the fall in its price and also how the demand curve is derived in the cardinal utility analysis is illustrated in Fig. 7.3.
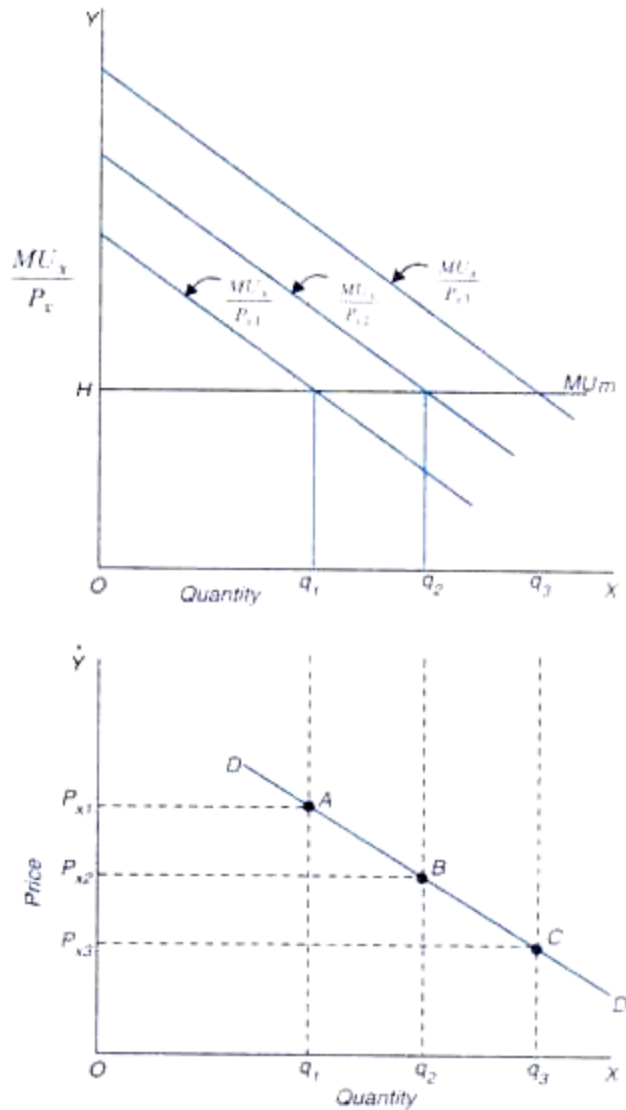
Fig. 7.3. *Derivation of Demand Curve*

In the upper portion of Fig. 7.3, on the Y-axis MU_x / P_x is shown and on the X-axis the quantity demanded of good X is shown. Given a certain income of the consumer, marginal utility of money in general for him is equal to OH. The consumer is buying Oq_1 of good X when price is P_{x1} since at the quantity Oq_1 of X, marginal utility of money OH is equal to MU_x / P_{x1}.

Now, when price of good X falls to P_{x2}. The curve will shift upward to the new position MU_x/P_{x2}. In order to equate marginal utility of money (OH) with the new MU_x / P_{x2} the consumer increases the quantity demanded to Oq_2. Thus, with the fall in price of good X to P_{x2}, the consumer buys more of it.

It should be noted that no account is taken of the increase in real income of the consumer as a result of fall in price of good X. This is because if change in real income is taken into account, then marginal utility of money will also change and this would have an effect on the purchases of goods. Marginal utility of money can remain constant in two cases. First, when the elasticity of marginal utility curve (price elasticity of demand) is unity so that even with increase in the purchase of a commodity following the fall in price, the money expenditure made on it remains the same.

Second, marginal utility of money will remain approximately constant for small changes in price of unimportant goods, that is, goods which account for negligible part of consumer's budget. In case of these unimportant goods increase in real income following the fall in price is negligible and therefore can be ignored.

At the bottom of Figure 7.3 the demand curve for X is derived. In this lower panel, price is measured on the Y-axis. As in the upper panel, the X-axis represents quantity. When the price of good X is Px_1, the relevant curve of MU/P is MU_x / P_{x1} which is shown in the upper panel. With $MU_x / P_x 1$, he buys Oq_1 of good X. Now, in the lower panel this quantity Oq_1 is directly shown to be demanded at the price Px_2.

When price of X falls to Px_2, the curve of MU/P shifts upward to the new position MU_x / P_{x2}. With MU_x / P_{x2} the consumer buys Oq_2 of X. This quantity Oq_2 is directly shown to be demanded at price Px_2 lower panel. Similarly, by varying price further we can know the quantity demanded at other prices. Thus, by joining points A, B and C we obtain the demand curve DD. The demand curve DD slopes downward which shows that as price of a good falls, its quantity purchased rises.

Critical Evaluation of Marshall's Cardinal Utility Analysis:

(1) Cardinal measurability of utility is unrealistic:

Cardinal utility analysis of demand is based on the assumption that utility can be measured in absolute, objective and quantitative terms. In other words, it is assumed in this analysis that utility is cardinally measurable. According to this, how much utility a consumer obtains from goods can be expressed or stated in cardinal numbers such as 1, 2, 3, 4 and so forth. But in actual practice utility cannot be measured in such quantitative or cardinal terms.

Since utility is a psychic feeling and a subjective thing, it cannot be measured in quantitative terms. In real life, consumers are only able to compare the

satisfactions derived from various goods or various combinations of the goods. In other words, in the real life consumer can state only whether a good or a combination of goods gives him more or less, or equal satisfaction as compared to another. Thus, economists like J.R. Hicks are of the opinion that the assumption of cardinal measurability of utility is unrealistic and therefore it should be given up.

(2) Hypothesis of independent utilities is wrong:

Utility analysis also assumes that utilities derived from various goods are independent. This means that the utility which a consumer derives from a good is the function of the quantity of that good and of that good alone. In other words, the assumption of independent utilities implies that the utility which a consumer obtains from a good does not depend upon the quantity consumed of other goods; it depends upon the quantity purchased of that good alone.

On this assumption, the total utility which a person gets from the whole collection of goods purchased by him is simply the total sum of the separate utilities of various goods. In other words, utility functions are additive.

Neo-classical economists such as Jevons, Menger, Walras and Marshall considered that utility functions were additive. But in the real life this is not so. In actual life the utility or satisfaction derived from a good depends upon the availability of some other goods which may be either substitutes for or complementary with each other. For example, the utility derived from a pen depends upon whether ink is available or not.

On the contrary, if you have only tea, then the utility derived from it would be greater but if along with tea you also have the coffee, then the utility of tea to you would be comparatively less. Whereas pen and ink are complements with each other, tea and coffee are substitutes for each other.

It is thus clear that various goods are related to each other in the sense that some are complements with each other and some are substitutes for each other. As a result of this, the utilities derived from various goods are interdependent, that is, they depend upon each other. Therefore, the utility obtained from a good is not the function of its quantity alone but also depends upon the existence or consumption of other related goods (complements or substitutes).

It is thus evident that the assumption of the independence of utilities by Marshall and other supporters of marginal utility analysis is a great defect and shortcoming of their analysis. As we shall see below, the hypothesis of independent utilities

along with the assumption of constant marginal utility of money reduces the validity of Marshallian demand theorem to the one- commodity model only.

(3) Assumption of constant marginal utility of money is not valid:

An important assumption of cardinal utility analysis is that when a consumer spends varying amount on a good or various goods or when the price of a good changes, marginal utility of money remains unchanged. But in actual practice this is not correct. As a consumer spends his money income on the goods, money income left with him declines.

With the decline in money income of the consumer as a result of increase in his expenditure on goods, the marginal utility of money to him rises. Further, when price of a commodity changes, the real income of the consumer also changes. With this change in real income, marginal utility of money will change and this would have an effect on the demand for the good in question, even though the total money income available with the consumer remains the same.

But utility analysis ignores all this and does not take cognizance of the changes in real income and its effect on demand for goods following the change in price of a good. As we shall see below, it is because of the assumption of constant marginal utility of money that Marshall ignored the income effect of the price change which prevented Marshall from understanding the composite character of the price effect (that is, price effect is the sum of substitution effect and income effect).

Moreover, as we shall see later, the assumption of constant marginal utility of money together with the hypothesis of independent utilities renders the Marshall's demand theorem to be valid in case of one commodity. Further, it is because of the constant marginal utility of money and therefore the neglect of the income effect by Marshall that he could not explain Giffen Paradox.

According to Marshall, utility from a good can be measured in terms of money (that is, how much money a consumer is prepared to sacrifice for a good). But, to be able to measure utility in terms of money marginal utility of money itself should remain constant. Therefore, assumption of constant marginal utility of money is very crucial to Marshallian demand analysis. On the basis of constant marginal utility of money Marshall could assert that "utility is not only measurable in principle" but also "measurable in fact".

But, as we shall see below, in case a consumer has to spread his money income on a number of goods, there is a necessity for revision of marginal utility of money

with every change in price of a good. In other words, in a multi-commodity model marginal utility of money does not remain invariant or constant.

Now, when it is realised that marginal utility of money does not remain constant, then Marshall's belief that utility is 'measurable in fact' in terms of money does not hold good. However, if in marginal utility analysis, utility is conceived only to be 'measurable in principle' and not in fact, then it practically gives up cardinal measurement of utility and comes near to the ordinal measurement of utility.

(4) Marshallian demand therem cannot genuinely be derived except in a one commodity case:

J.R. Hicks and Tapas Majumdar have criticised Marshallian utility analysis on the ground that "Marshallian demand theorem cannot genuinely be derived from the marginal utility hypothesis except in a one-commodity model without contradicting the assumption of constant marginal utility of money. In other words, Marshall's demand theorem and constant marginal utility of money are incompatible except in a one commodity case. As a result, Marshall's demand theorem cannot be validity derived in the case when a consumer spends his money on more than one good.

In order to know the truth of this assertion consider a consumer who has a given amount of money income to spend on some goods with given prices? According to utility analysis, the consumer will be in equilibrium when he is spending money on goods in such a way that the marginal utility of each good is proportional to its price. Let us assume that, in his equilibrium position, consumer is buying q_1 quantity of a good X at a price P_1. Marginal utility of good X, in his equilibrium position, will be equal to its price p_1 multiplied by the marginal utility of money (which, in Marshallian utility analisis, serves as the unit of measurement).

Thus, in the equilibrium position, the following equation will be fulfilled:

$MU_x / = MU_m \times p_1$

Since the consumer is buying q_1 quantity of good X at price P_1, he will be spending $P_1 Q_1$ amount of money on it. Now, suppose that the price of good X rises from p_1 to p_2. With this rise in price of X, all other things remaining the same, the consumer will at once find himself in disequilibrium state, for the marginal of good X will now be less than the higher price pg multiplied by the marginal utility of money (Mu_m) which is assumed to remain unchanged and constant. Thus, now there will be

$MU_x < MU_m . P_2$

In order to restore his equilibrium, the consumer will buy less of good X so that the marginal utility of good X (MUx) would rise and become equal to the product of p_2 and MU_m. Suppose in this new equilibrium position, he is buying q_2 of good X which will be less than q_1. With this he will now be spending p_2q_2 amount of money on good X. Now the important thing to see is that whether his new expenditure p_2q_2 on good X is equal to, smaller or greater than $P_1 q_1$.

This depends upon the elasticity of marginal utility curve i.e., price elasticity of demand. If the elasticity of marginal utility curve of good X is unity, then the new expenditure on good X (i.e. p_2q_2) after the rise in its price from p_1 to p_2 will be equal to the initial expenditure p_1q_1. When the monetary expenditure made on the good remains constant as a result of change in price, then the Marshallian theory is valid.

But constant monetary expenditure following a price change is only a rare phenomenon. However, the Marshallian demand theory breaks down when the new expenditure p_2q_2 after the rise in price, instead of being equal is smaller or greater than the initial expenditure p_2q_2.

If elasticity of marginal utility curve is greater than one (that is, price demand for the good is elastic), then the new expenditure p_2q_2, after the rise in price from p_1 to p_2, will be less than the initial expenditure p. On the other hand, if the elasticity of marginal utility curve is less than unity, then the new expenditure p_2q_2 after the rise in price will be greater than the initial expenditure p_1q_1.

Now, if the new expenditure p_2q_2 on good X is less than the initial expenditure p_1q_1 or it, it means more money will be left with the consumer to spend on goods other than X. And if the new expenditure p_2q_2 on good X is greater than the initial expenditure p_1q_1 on it, then less money would be left with him to spend on goods other than X.

In order that the consumer spends the entire amount of money available with him, then in case of new expenditure p_2q_2 on good X being smaller or greater than initial expenditure p_1q_1 on it, the expenditure or goods other than X and therefore consumer's demand for them will change.

But in Marshallian theoretical framework, this further adjustment in consumer's expenditure on goods other than X can occur only if the unit of utility

measurement, that is, the marginal utility of money revised or changed. But Marshall assumes marginal utility of money to remain constant.

Thus, we see that marginal utility of money cannot be assumed to remain constant when the consumer has to spread his money income on a number of goods. In case of more than one good, Marshallian demand theorem cannot be genuinely derived while keeping the marginal utility of money constant.

If, in Marshallian demand analysis, this difficulty is avoided " by giving up the assumption of constant marginal utility of money, then money can no longer provide the measuring rod, and we can no longer express the marginal utility of a commodity in units of money. If we cannot express marginal utility in terms of common numeraire (which money is defined to be) the cardinality of utility would be devoid of any operational significance.

Only in case there is one good on which the consumer has to spend his money, Marshallian demand theorem can be validity derived. To conclude, in the words of Majumdar, "Except in a strictly one-commodity world, therefore, the assumption of a constant marginal utility of money would be incompatible with the Marshallian demand theorem.

Without the assumption of an invariant unit of measurement, the assertion of measurability would be entirely meaningless. The necessity and the possibility of revision of the unit of utility measurement, following every change in price, had been assumed away in Marshallian theory under the cover of 'other things remaining the same' clause."

(6) Cardinal utility analysis does not split up the price affect into substitution and income effects: The third shortcoming of the cardinal utility analysis is that it does not distinguish between the income effect and the substitutional effect of the price change.

We know that when the price of a good falls, the consumer becomes better off than before, that is, a fall in price of a good brings about an increase in the real income of the consumer. In other words, if with the fall in price the consumer purchases the same quantity of the good as before, then he would be left with some income.

With this income he would be in a position to purchase more of this good as well as other goods. This is the income effect of the fall in price on the quantity demanded of a good. Besides, when the price of a good falls, it becomes relatively cheaper than other goods and as a result the consumer is induced to substitute that

good for others. This results is increase in quantity demanded of that good. This is the substitution effect of the price change on the quantity demanded of the good.

With the fall in price of a good, the quantity demanded of it rises because of income effect and substitution effect. But cardinal utility analysis does not make clear the distinction between the income and the substitution effects of the price change. In fact, Marshall and other exponents of marginal utility analysis ignored income effect of the price change by assuming the constancy of marginal utility of money. Thus, according to Tapas Majumdar, "the assumption of constant marginal utility of money obscured Marshall's insight into the truly composite character of the unduly simplified price-demand relationship".

They explained the changes in demand as a result of change in the price of a good on the basis of substitution effect on it. Thus, marginal utility analysis does not tell us about how much quantity demanded increases due to income effect and how much due to substitution effect as a result of the fall in price of a good J R Hicks rightly remarks, "that distinction between income effect and substitution effect of a price change is accordingly left by the cardinal theory as an empty box which is crying out to be filled. In the same way, Tapas Majumdar says, "The efficiency and precision with which the Hicks-Allen approach can distinguish between the income and subsitutuion effects of a price change really leaves the cardinal argument in a very poor state indeed.

(7) Marshall could not explain Giffen Paradox:

By not visualizing the price effect as a combination of substitution and income effects and ignoring the income effect of the price change, Marshall could not explain the Giffen Paradox. He treated it merely as an exception to his law of demand. In contrast to it, indifference curve analysis has been able to explain satisfactorily the Giffen good case.

According to indifference curve analysis, in case of a Giffen Paradox or the Giffen good negative income effect of the price change is more powerful than substitution effect so that when the price of a Giffen good falls the negative income effect outweighs the substitution effect with the result that quantity demanded of it falls.

Thus in case of a Giffen good, quantity demanded varies directly with the price and the Marshall's law of demand does not hold good. It is because of the constant marginal utility of money and therefore the neglect of the income effect of price change that Marshall could not explain why the quantity demanded of the Giffen

good falls when its price falls and rises when its price rises. This is a serious lacuna in Marshalllian's utility analysis of demand.

(8) Marginal utility analysis assumes too much and explains too little:

Marginal utility analysis is also criticised on the ground that it takes more assumptions and also more severe ones than those of ordinal utility analysis of indifference curve technique Marginal utility analysis assumes, among others, that utility is cardinally measurable and also that marginal utility of money remains constant. Hicks-Allen's indifference curve analysis does not take these assumptions and even then it is not only able to deduce all the theorems which cardinal utility analysis can but also deduces a more general theorem of demand.

In other words, indifference curve analysis explains not only that much as cardinal utility analysis does but even goes further and that too with fewer and less severe assumptions. Taking less severe assumption of ordinal utility and without assuming constant marginal utility of money, analysis is able to arrive at the condition of consumer's equilibrium, namely, equality o marginal rate of substitution (MRS) with the price ratio between the goods, which is similar to the proportionality rule of Marshall. Further, since indifference curve analysis does not assume constant marginal utility of money, it is able to derive a valid demand theorem in a more than one commodity case.

In other words indifference curve analysis dearly explains why in case o Giffen goods quality demanded increases with the rise in price and decreases with the fall in price. Indifference curve analysis explains even the case of ordinary inferior goods (other than Giffen goods) in a more analytical Inner.

It may be noted that even if the valid demand f derived for the Marshallian hypothesis, it would still be rejected because "better hypothesis" of indifference preference analysis was available which can enunciate more general demand theorem (covering the case of Giffen goods) with fewer, less severe and more realistic assumptions.

Because of the above drawbacks, cardinal utility analysis has been given up in modern economic theory and demand is analysed with new approaches to demand theory.

APPLICATION OF INDIFFERENCE CURVE ANALYSIS

The indifference curve analysis has also been used to explain producer's equilibrium, the problems of exchange, rationing, taxation, supply of labour, welfare economics and a host of other problems. Some of the important problems are explained below with the help of this technique.

(1) The Problem of Exchange:

With the help of indifference curve technique the problem of exchange between two individuals can be discussed. We take two consumers A and B who possess two goods X and Y in fixed quantities respectively. The problem is how can they exchange the goods possessed by each other. This can be solved by constructing an Edgeworth-Bowley box diagram on the basis of their preference maps and the given supplies of goods.

In the box diagram, Figure 12.28, O_a is the origin for consumer A and O_b the origin for consumer B (turn the diagram upside down for understanding). The vertical sides of the two axes, O_a and O_b, represent good Y and the horizontal sides, good X. The preference map of A is represented by the indifference curves I_1a, $I_2 a$ and $I_3 a$ and B's map by I_1b, I_2b and I_3b indifference curves. Suppose that in the beginning A possesses O_bY_b units of good Y and $O_b X_b$ units of good X. B is thus left with O_bY_b of Y and $O_b X_b$ of X. This position is represented by point E where the curve I_1a intersects I_1b.

Fig. 12.28
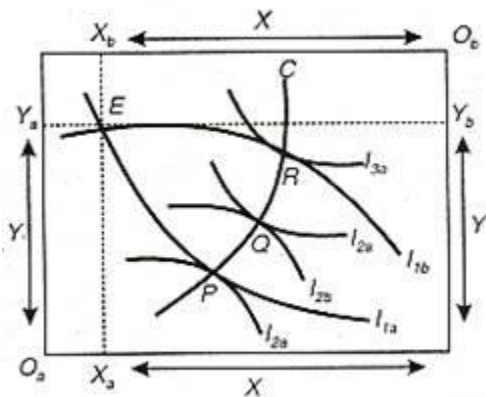
Suppose A would like to have more of X and S more of Y. Both will be better off, if they exchange each other's unwanted quantity of the good, i.e. if each is in a position to move to a higher indifference curve. But at what level will exchange take place? Both will exchange each other's good at a point where the marginal rate of substitution between the two goods equals their price ratios.

This condition of exchange will be satisfied at a point where the indifference curves of both the exchangers touch each other. In the above figure P, Q and R are the three conceivable points of exchange. A line CC passing through these points is the "contract curve" or the "conflict curve", which shows the various positions of exchange of X and Y that equalise the marginal rates of substitution of the two exchangers.

If exchange were to take place at point P then consumer S would be in an advantageous position because he is on the highest indifference curve I_3b. Individual A would, however, be at a disadvantage for he is on the lowest indifference curve I_1a. On the other side, at point R, consumer A would be the maximum gainer and S the loser. However, both will be at an equal position of advantage at Q. They can reach this level only by mutual agreement otherwise the point of exchange depends upon the bargaining power of each party. If A has better bargaining skill than S, he can push the latter to point R. Contrariwise, if B is more skillful in bargaining he can push A to point P.

(2) Effects of Subsidy on Consumers:

The indifference curve technique can be used to measure the effects of government subsidy on low income groups. We take a situation when the subsidy is not paid in money but the consumers are supplied cereals at concessional rates, the price-difference being paid by the government. This is actually being done by the various state governments in India. In Figure 12.29 income is measured on the vertical axis and cereals on the horizontal axis.

Fig. 12.29

Suppose the consumer's income is OM and his price-income line without subsidy is MN. When he is given subsidy by supplying cereals at a lower price, his price-

income line is MP (it is equivalent to a fall in the price of cereals). At this price-income line, he is in equilibrium at point E on curve I_1 where he buys OB of cereals by spending MS amount of money. The full market price of OB cereals is MD on the line MN where the curve l_o touches.

The government, therefore, pays SD amount of subsidy. But the consumer receives cereals at a lower price. He does not receive SD amount of subsidy in cash. If the money value of the subsidy were to be paid to him in cash, they would receive MR amount of money. The equivalent variation MR shows that in the absence of the subsidy, a cash payment would bring the consumer on the same indifference curve, which makes him as better off as the subsidy.

But the value of the subsidy MR to the consumer is smaller than the cost of the subsidy DS to the government. It reveals the fact that the consumer is happier if he is paid the subsidy in cash rather than in the E S form of subsidised cereals. In this case, the cost of subsidy to the exchequer will also be less. It points out to another interesting result. When the income of the consumer is raised by giving him cash subsidy, he will buy less cereals than before. In Figure 12.29 at the equilibrium point C, he buys OA of cereals which are less than OB when he was getting them at the subsidised price. This is what the government actually wants.

(3) The Problem of Rationing:

The indifference curve technique is used to explain the problem arising from various systems of rationing. Usually rationing consists of giving specific and equal quantities of goods to each individual (we ignore families because equal quantities are not possible in their case).

The other, rather liberal, scheme is to allow an individual more or less quantities of the rationed goods according to his taste. It can be shown with the help of indifference curve analysis that the latter scheme is definitely better and beneficial than the former.

Let us suppose that there are two goods rice and wheat that are rationed, the prices of the two goods are equal and that each consumer has the same money income. Thus, given the income and price-ratios of the two goods, MN is the price-income line. Rice is taken on vertical axis and wheat on the horizontal axis in Figure 12.30.
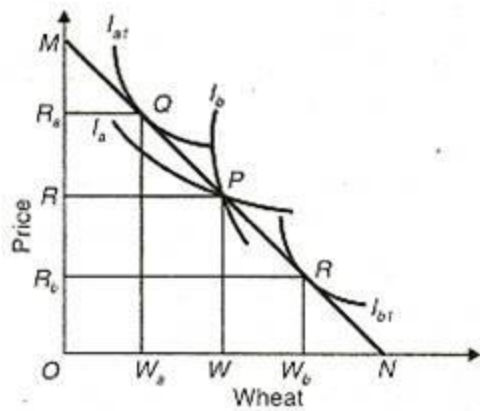
Fig. 12.30

According to the first system of rationing, both consumers A and B are given equal specific quantities of rice and wheat, OR + OW. Consumer A is on indifference curve I_a and B is on l_b. With the introduction of the liberal scheme each can have more or less of rice or wheat according to his taste. In this situation, A will move from P to Q on a higher indifference curve I_{a1}. Now he can have OR_b of rice + OW_a of wheat. Similarly, B will move from P to R on a higher indifference curve I_{b1} and can buy OR_b of rice + OW_b of wheat. With the introduction of the liberal scheme of rationing both the consumers derive greater satisfaction. The total quantity of goods sold is the same.

For when B buys more quantity of wheat WW_b, he purchases less quantity of rice RR_b and when A buys RR_b more of rice, he purchases WW less of wheat. Thus, the governmental aim of controlled distribution of goods is not disturbed at all rather there has been a better distribution of goods in accordance with individual tastes.

(4) Index Numbers: Measuring Cost of Living:

The indifferent curve analysis is used in measuring the cost of living or standard of living in terms of index numbers. We come to know with the help of index numbers whether the consumer is better off or worse off by comparing two time periods when the income of the consumer and prices of two goods change.

Suppose a consumer buys only two goods X and Y in two different time periods 0 and 1 and he spends his entire income on them in the two periods. It is also assumed that the consumer's tastes and quality of the two goods do not change.

Suppose the initial budget line is AB in the base period 0 and the consumer is in equilibrium at point P on the indifference curve I_o in Figure 12.31. The new budget

line in period 1 is CD which passes through point P, on the new indifference curve I_1. Both the combinations P and P_1 lie on the original budget line AB.
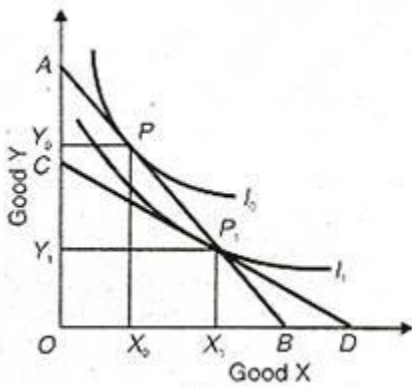

Fig. 12.31

Therefore, they have the same cost. But combination P is on the higher indifference curve I_Q than combination P_1. However, the consumer cannot have combination P at the new price (P,) in period 1. Thus he chooses combination P, on the lower indifference curve I_1 and is worse off in period 1 than in the base period 0. This shows that his standard of living has decreased in period 1 as compared with period 0.

(5) The Supply of Labour:

The supply curve of an individual worker can also be derived with the indifference curve technique. His offer to supply labour depends on his preference between income and leisure and on the wage rate. In Figure 12.32 hours of work and leisure are measured on the horizontal axis and income or money wage on the vertical axis. W_2L is the wage line or income-leisure line whose slope indicates wage rate (w) per hour. When the wage rate increases, the new wage line becomes W_3L and the wage rate per hour-also increases and similarly for the wage line $W_3 L$.

Fig. 12.32
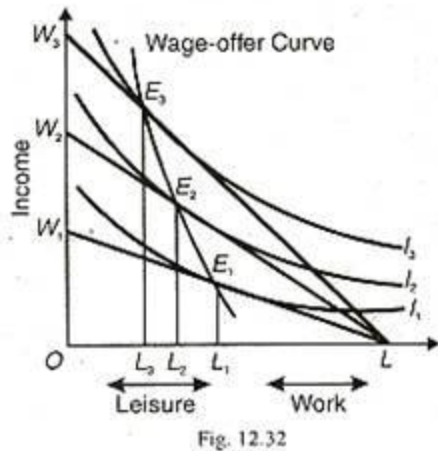
As the wage rate per hour increases, the wage line becomes steeper. When the worker is in equilibrium at the tangency point E_1 of wage line W_1L and indifference curve I_1, he earns E_1L_1 wage by working L_1L hours and enjoys OL_1 of leisure. Similarly, when his wage increases, to L_1, he works for longer hours $L_2 L$ and with $E_3 L_3$ wage increase, he works for still longer hours $L_3 L$ and enjoys lesser and lesser leisure than before. The line connecting the points E_1E_2 and E_3 is called the wage-offer curve.

The supply curve of labour can be drawn from the locus of the equilibrium points E_1E_2 and But the wage-offer curve is not the supply curve of labour. Rather, it indicates the supply curve of labour. To derive the supply curve of labour from the wage-offer curve given in Figure 12.32, we draw the wage-hour schedule in Table 12.6.

Table 12.6: Wage-Hour Schedule:

Equilibrium Point	Wage Rate Per Hour	Hours Worked
E_1	$OW_1/OL = w_1$	L_1L
E_2	$OW_1/OL = w_2$	L_2L
E_3	$OW_1/OL - w_3$	L_3L

On the basis of the above schedule, the supply curve of labour is drawn in Figure 12.33 where the wage rate per hour is plotted on the vertical axis and hours worked (or supply of labour) on the horizontal axis. When the wage rate is W_1 labour supplied is OL_1. As the wage rate rises to $W_1$and labour supplied increases to OL_2 and OL_1 respectively. The wage-labour combination points E_1E_2 and E_3 trace out the supply of labour curve SS_1. The SS_1 curve is positively sloping upwards from

left to right which shows that when the wage rate increases, the worker works for more hours.
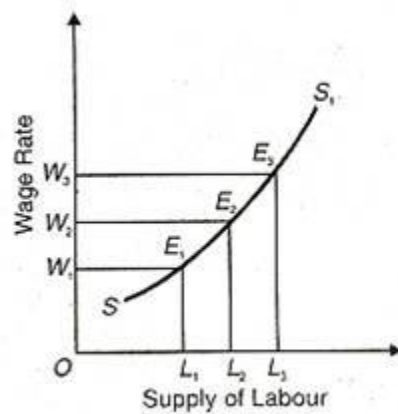

Fig. 12.33

This attitude of the worker is the result of two forces: one, the substitution effect, and two, the income effect of the wage increase. When the wage rate increases, the tendency to work longer hours increases on the part of the worker in order to earn more. It is as if leisure has become more expensive. So the worker has a tendency to substitute work for leisure. This is the substitution effect of the wage increase.

Further, when the wage rate increases, the worker becomes potentially better off, he has a feeling of satisfaction and gives preference to leisure over work. This is the income effect of the wage increase. In the figure, as the wage rate increases from W_1 to W_2, hours worked increase from OL_1 to OL_2 and to OL_1. This is because the substitution effect of wage increase is stronger than the income effect.

Backward-Sloping Supply Curve of Labour:

At some higher wage rate if the wage rate increases further, the worker may work for lesser hours and enjoy more leisure. This case is illustrated in Figure 12.34. When the income of the worker increases progressively from E_1L_1 to E_2L_2 and to E_3L_3, hours worked may decline at some level of income. At the equilibrium point E_1 hours worked are L_1L and they increase to L_2L at the equilibrium point E_2, when his income rises to E_2L_2, from E1L1. But further increase in income to $E_3 L_3$ leads to the reduction in hours worked to E_3L_3 from L_2L. The worker now increases his leisure hours from OL_2 to OL_3.

Fig. 12.34
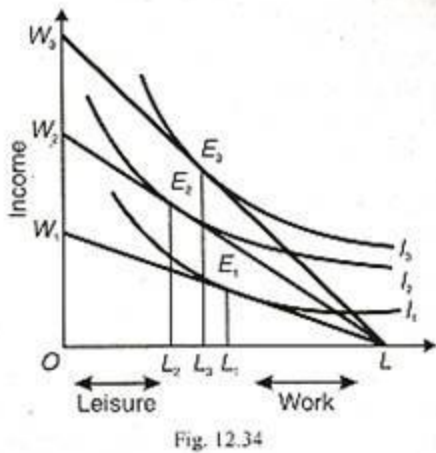
The corresponding supply curve of labour is drawn in Figure 12.35 which is backward slopping. Taking the substitution effect and the income effect of the wage increase up to the wage rate W_2, the substitution effect is stronger than the income effect. So the supply curve of this worker is positively sloped from S to E_2.


Supply of Labour

Fig. 12.35
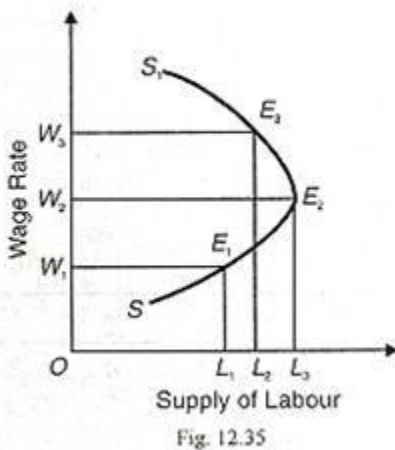
At the wage rate W_2 the substitution effect exactly equals the income effect and the SS_1 curve is vertical at point E_2. As the wage rate increases above W_2, the income effect is stronger than substitution effect and the supply curve is negatively sloped in the region E_2S_1 which shows that the worker gives preference to leisure over work. In the figure, when the wage rate increases to W_3 the worker reduces his hours worked from OL_2 to OL_3 and thus enjoys L_2L_3 of leisure.

(6) The Effect of Income Tax vs. Excise Duty:

The indifference curve technique helps in considering the welfare implications of income tax vs. excise duty or sales tax. Whether an income tax hurts the tax payer

more or an excise duty of an equal amount? Let us take a taxpayer who is required to pay, say Rs. 4000 annually either as income tax or as excise tax on a commodity X. It is further assumed that he will continue to buy the commodity even after the imposition of the duty when its price goes up.

In Figure 12.36 the money income of the taxpayer is shown along the vertical axis. He has OM of income and his original price-income line, before the tax is levied, is MN. He is in equilibrium at point B on the indifference curve I_1.

Fig. 12.36

For MA quantity of X, he spends AB. Now when the excise duty on commodity X is levied, its price rises so that his price-income line shifts to MN_1 where he is in equilibrium at point C on the I_1 curve. As a result of the tax, he buys ML quantity of X and spends LC on it. But at the original price, this quantity ML would have cost him LS. Thus SC is the amount of tax which he pay for it.

If an equal amount of tax is raised by the government through income tax instead, the taxpayer's income would be reduced by MT (=SC). He moves to a lower line TR on the indifference curve I_3, at point D. Since the indifference curve I_3 is higher than I_2 the income tax equivalent to an excise duty places the taxpayer in a favourable position.

(7) The Saving Plan of an Individual:

The indifference curve technique can also be used to study the saving plan of an individual. An individual's decision to save depends upon his present and future income, his tastes and preferences for present and future commodities, their expected prices, on the current and future rate of interest, and on the stock of his savings.

As a matter of fact, his decision to save is influenced by the intensity of his desire for present goods and future goods. It he wants to save more, he spends less on present goods, other things being equal. Thus saving is, in fact, a choice between present goods and future goods. This is illustrated in Figure 12.37 with the help of indifference curves.

Fig. 12.37
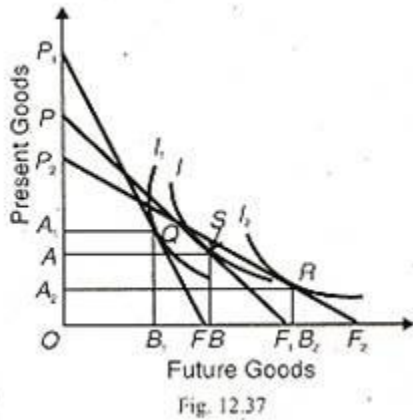
Let PF_1 be the original price-income line of the individual where he is in equilibrium at point S on the indifference curve I.

Given the price of the present and future goods, the income of the consumer, his tastes and preferences for the present and the future, and the rate of interest, he buys OA of the present goods and plans to save so much as to have OB of goods in the future.

Suppose there is a change in his preferences. What will be the effect of such a change on the consumer's saving plan? If his preference for the present goods increases, his price-income line will move to P_1F so that he is in equilibrium at point Q on I_1 He now buys OA, present goods and thus saves less for the future goods. As a result, the purchase of the future goods will fall from OB to OB_1. On the other hand, if in his estimation the value of future consumption increases, his price-income line will move to P_1F where he will be in equilibrium at point R on L curve. He will, therefore, save more and thus reduce his consumption of present goods to OA_2 in order to have OB_2 future goods. Similar effects can be traced if the rate of interest changes, other things remaining constant.

REVEALED PREFERENCE APPROACH

Choice Reveals Preference:

Prof. Samuelson's theory of demand is based on the revealed preference axiom or hypothesis which states that choice reveals preference. Keeping this fact into view, a consumer buys a combination of two goods either because he likes this combination in relation to others or this is cheaper than others. Suppose the consumer buys combination A rather than combination B. C or D. It means that he reveals his preference for combination A. He can do this for two reasons. First, combination A may be cheaper than the other combinations B, C, D. Seconds combination A may be dearer than others and even then he likes it more than other combinations. In such a situation, it can be said that A is revealed preferred to B, C, D or B, C, D are revealed inferior to A. This is explained in Figure 14.1.
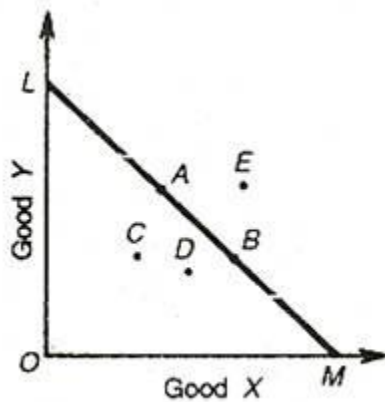

Figure 14.1

Given the income and prices of the two goods X and Y. LM is the price-income line of the consumer. The triangle OLM is the area of choice for the consumer which shows the various combinations of X and Y on the given price- income situation LM. In other words, the consumer can choose any combination between A and B on the line LM or between C and D below this line.

If he chooses A, it is revealed preferred to B. Combinations C and D are revealed inferior to A because they are below the price-income line LM. But combination E is beyond the reach of the consumer being dearer for him because it lies above his price-income line LM. Therefore, A is revealed preferred to other combinations within and on the triangle OLM.

The Law of Demand:

Prof. Samuelson establishes the law of demand directly on the basis of his revealed preference hypothesis without the use of indifference curves and the restrictive assumptions associated with them.

Its Assumptions:

Samuelson's law of demand is based on the following assumptions:

(1) The consumer's tastes do not change.

(2) His choice for a combination reveals his preference for that.

(3) The consumer chooses only one combination at a given price-income line, i.e., any change in relative prices will always lead to some change in what he purchases.

(4) He prefers a combination of more goods to less in any situation.

(5) The consumer's choice is based on strong ordering.

(6) It assumes consistency of consumer behaviour. If A is preferred to B in one situation, B cannot be preferred to A in the other situation. This is the two-term consistency, according to Hicks which must satisfy two conditions on a straight line curve: (a) If A is left to B, B must be right of A. (b) If A is right of B, B must be left of A.

(7) This theory is based on the assumption of transitivity. Transitivity, however, refers to three-term consistency. If A is preferred to B, and B to C, then the consumer must prefer A to C. This assumption is necessary for the revealed preference theory if the consumer is to make a consistent choice from given alternative situations.

(8) Income elasticity of demand is positive i.e., more commodity is demanded when income increases, and less when income falls.

Fundamental Theorem or Demand Theorem:

Given these assumptions, Samuelson states his "Fundamental Theorem of Consumption Theory," also known as demand theorem, thus: "Any good (simple or composite) that is known always to increase in demand when money income alone rises must definitely shrink in demand when its price alone rises." It means

that when income elasticity of demand is positive, price elasticity of demand is negative. This can be shown both in the case of a rise and a fall in the price of a good.

Rise in Price:

First, we take a rise in the price of, say, good X. To prove this Fundamental Theorem, let us divide it into two stages. Firstly, take a consumer who spends his entire income on two goods X and Y. LM is his original price-income line where the consumer is observed to have chosen the combination represented by R in Figure 14.2. The triangle OLM is the consumer's area of choice for the different combinations of V and Y available to him, as given by his price-income line LM. By choosing only the combination R. the consumer is revealed to have preferred this combination to all others in or on the triangle OLM.
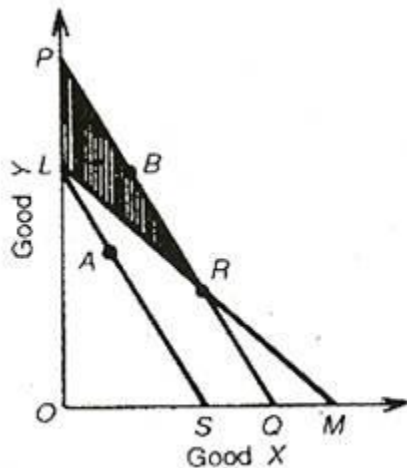

Figure 14.2

This is because he cannot have more of X when its price has risen. The consumer will, therefore, reject all combinations below R and choose either combination R or ay other combination, say, B in the shaded area LRP on the segment PR of the price-income line PQ. If he chooses the combination R, he will buy the same quantities of X and Y which he was buying before the rise in the price of X. On the other hand, if he chooses the combination B, he will buy less of X and more of Y than before.

In the second stage, if the packet of extra money LP given to the consumer is taken back, he will be to the left of R at point A on the price-income line LS where he

will buy less of X, if the income elasticity of demand for X is positive. Since with the rise in the price of X, its demand has fallen (when the consumer is at point A), it is proved when income elasticity is positive, price elasticity is negative.

With the rise in the price of X, the consumer buys less of X. So price elasticity of demands negative because price and demand move in the opposite directions. But with the rise in the price of X, the real income of the consumer falls and buys less of X. Therefore, his income elasticity of demand is positive because both income and demand move in the same direction.

Fall in Price:

The demand theorem can also be proved when the price of good X falls. It can be defined thus: "Any good (simple or composite) that is known always to decrease demand when money income alone falls must definitely expand in demand when its price alone falls." This is explained in Figure 14.3. LM is the original price-income line on which the consumer reveals his preference at point R. With the fall in the price of X, the price of Y remaining constant, his new price-income line is LS. The consumer reveals his preference on this line at, say, combination A which shows that he buys more of X than before. The movement from point R to A is the price effect as a result of fall in the price of X which has led to increase in its demand.
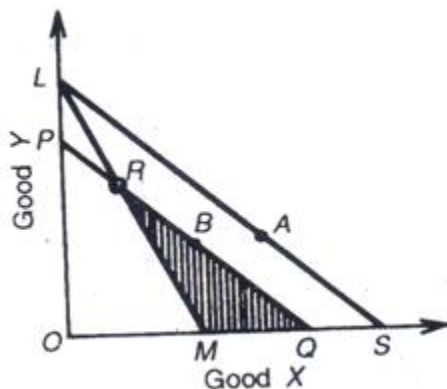

Figure 14.3

Suppose the increase in the real income of the consumer as a result of fall in the price of X is taken away from him in the form of LP quantity of Y. Now PQ becomes his new price-income line which is parallel to LS and passes through R. The new triangle OPQ becomes his area of choice. Since the consumer was

revealing his preference at point R on the line LM, all points lying above R on the segment RP of line PQ will be inconsistent with his choice.

This is because on the RP segment he will have less of good X when its price has fallen. But this is not possible. The consumer will, therefore, reject all combinations above R. He will either choose combination R or any other combination, say, B on the segment RQ of the line PQ in the shaded area MRQ. If he chooses the combination R, he will buy the same quantities of X and Y which he was buying before the fall in the price of X. And if he chooses the combination B, he will buy more of X and less of Y than before. The movement from R to B is the substitution effect of a fall in the price of X.

If the money taken from the consumer in the form of LP is returned to him, he will be at the old combination A on the price-income line LS where he will buy more of X with the fall in its price. The movement from B to A is the income effect. So the demand theorem is again proved that positive income elasticity means negative price elasticity of demand.

It is to be noted that Samuelson's explanation of the substitution effect is different from that of the indifference curve analysis. In the case of indifference curve analysis, the consumer moves from one combination to another on the same indifference curve and his real income remains constant. But in the revealed preference theory, indifference curves are not assumed and the substitution effect is a movement along the price-income line arising from changing relative prices.

Superiority of Revealed Preference Theory:

The revealed preference approach is superior to the Hicksian ordinal utility approach to consumer behaviour.

(i) It does not involve any psychological introspective information about the behaviour of the consumer. Rather, it presents a behaviouristic analysis based on observed consumer behaviour in the market. This approach has helped, according to Samuelson, to divest the theory of demand of the "last vestiges" of the psychological analysis. Thus the revealed preference hypothesis is more realistic, objective and scientific than the earlier demand theorems.

 (ii) It avoids the "continuity" assumption of the utility and indifference curve approaches. An indifference curve is a continuous curve on which the consumer can have any combination of the two goods. Samuelson believes that there is discontinuity because the consumer can have only one combination.

(iii) The Hicksian demand analysis is based on the assumption that the consumer always behaves rationally to maximise his satisfaction from a given income. Samuelson's demand theorem is superior because it completely dispenses with the assumption that the consumer always maximises his satisfaction, and makes no use of the dubious hypothesis like the Law of Diminishing Marginal Utility of the Marshallian analysis or the Law of Diminishing Marginal Rate of Substitution of the Hicksian approach.

(iv) In the first stage of Samuelson's demand theorem the 'over compensation effect' is more realistic as an explanation of consumer behaviour than the Hicksian substitution effect. It permits the consumer to shift to a higher price-income situation in case of rise in the price of X and vice versa. Thus it is an improvement over Hicks' substitution effect. Similarly, the second stage of the Samuelsonian Theorem explains the Hicksian 'income effect in a much simpler way. Hicks himself admits the superiority of Samuelson's theory when he writes that as a clear alternative to the indifference technique its presentation is the newest and important contribution of Samuelson to the theory of demand.

(v) This theory provides the basis for welfare economics in terms of observable behaviour based on consistent choice.

Defects of the Revealed Preference Theory:

There are, however, certain weaknesses in Samuelson's revealed preference theory.

1. Neglects Indifference:

It neglects "indifference" in the consumer behaviour altogether. It is, of course, true that the consumer does not reveal his indifference in a single-valued demand function in or on the budget line when he chooses a particular set of goods at point R on the budget line LM. But it is possible that there are points like A and B on every side of a given point R, shown within the circle in Figure 14.4, towards which the consumer is indifferent. If this criticism by Armstrong is accepted, then Samuelson's fundamental theorem breaks down. Suppose the price of X rises.

As a result, his new budget line is LS. Now give the consumer some extra money to enable him to buy the same combination R on the line PQ. In this new price-income situation, suppose he chooses point B below R towards which he is indifferent. This is based on Armstrong's assumption that the consumer is indifferent between points around the chosen point.

But the choice of B on the PQ line means that the consumer buys more of X when its price has risen.

This breaks down the Samuelson theorem because with the rise in the price of X, its demand has expanded instead of shrinking.

2. Not Possible to Separate Substitution Effect:

Samuelson's Fundamental Theorem is conditional and not universal. It is based on the postulate that positive income elasticities imply negative price elasticities. Since the price effect consists of the income and substitution effects, it is not possible to isolate the substitution effect from the income effect on the level of observation. If the income effect is not positive, price elasticity of demand is indeterminate. On the other hand, if the income elasticity of demand is positive, the substitution effect following a change in price cannot be established. Thus, the substitution effect cannot be distinguished from the income effect in the Samuelsonian Theorem.

3. Excludes Giffen Paradox:

Samuelson's revealed preference hypothesis excludes the study of the Giffen Paradox, for it considers only positive income elasticity of demand. Like the Marshallian Law of Demand, the Samuelsonian Theorem fails to distinguish between negative income effect of a Giffen good combined with a weak substitution effect and a negative income effect with a powerful substitution effect. Samuelson's Fundamental Theorem is, therefore, inferior to and less integrated than the Hicksian price effect which provides an all inclusive explanation of the income effect, the substitution effect and of Giffen's Paradox.

4. Consumer does not choose only one Combination:

The assumption that the consumer chooses only one combination on a given price-income situation is incorrect. It implies that the consumer chooses something of everything of both the goods. But it is seldom that anybody purchases something of everything.

5. Choice does not reveal Preference:

The assumption that "choice reveals preference" has also been criticised. Choice always does not reveal preference. Choice requires rational consumer behaviour. Since a consumer does not act rationally at all times, his choice of a particular set

of goods may not reveal his preference for that. Thus the theorem is not based on observed consumer behaviour in the market.

6. Fails to derive Market Demand Curve:

The revealed preference approach is applicable only to an individual consumer. Negatively inclined demand curves can be drawn for each consumer with the help of this approach by assuming 'other things remaining the same.' But this technique fails to help in drawing market demand schedules.

7. Not Valid for Game Theory:

According to Tapas Majumdar, the revealed preferences hypothesis "is invalid for situations where the individual choosers are known to be capable of employing strategies of a game theory type."

8. Fails in Risky or Uncertain Situations:

The revealed preference theory fails to analysis consumer's behaviour in choices involving risk or uncertainty. If there are three situations, A, B, and C, the consumer prefers A to B and C to A. Out of these, A is certain but chances of occurring B or C are 50-50. In such a situation, the consumer's preference for C over A cannot be said to be based on his observed market behaviour.

Conclusion:

It appears from the above discussion that the revealed preference approach is in no way an improvement over the indifference curve analysis of Hicks and Allen. It is unable to isolate the substitution effect from the income effect, neglects Giffen's Paradox and fails to study market demand analysis. But the fact is that in a single-valued demand function, the indifferent behaviour is replaced by the observed market behaviour of the consumer. This makes the revealed preference theory somewhat more realistic than the indifference curve technique.