CHAPTER - 2

THEORY OF DEMAND AND SUPPLY

Unit 1

Law of Demand and Elasticity of Demand

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Learning Objectives

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

- understand the meaning of demand.
- understand what determines demand.
- get an insight into the law of demand.
- understand the difference between movement along the demand curve and shift of the demand curve.
- know various types of elasticity of demand.

Have you ever wondered why diamonds are very expensive although basically inessential, while water is important but cheap? Or why does land in Delhi or Mumbai command very high prices, while desert land in Rajasthan is virtually worthless? The answers to these and a thousand other questions can be found in the theory of demand and supply. This theory shows how consumer preferences determine consumer demand for commodities while business costs determine the supply of commodities. We shall take up the topic of demand in this Unit while supply will be discussed in Unit-3.

1.0 MEANING OF DEMAND

The concept ‘demand’ refers to the quantity of a good or service that consumers are willing and able to purchase at various prices during a given period of time. It is to be noted that demand, in Economics, is something more than desire to purchase though desire is one element of it. A beggar, for instance, may desire food, but due to lack of means to purchase it, his demand is not effective. Thus, effective demand for a thing depends on (i) desire (ii) means to purchase and (iii) willingness to use those means for that purchase. Unless demand is backed by purchasing power or ability to pay, it does not constitute demand. Two things are to be noted about quantity demanded. One is that quantity demanded is always expressed at a given price. At different prices different quantities of a commodity are generally demanded. The second thing is that quantity demanded is a flow. We are concerned not with a single isolated purchase, but with a continuous flow of purchases and we must therefore express demand as so much per period of time – one thousand dozens of oranges per day, seven thousand dozens oranges per week and so on.

In short “By demand, we mean the various quantities of a given commodity or service which consumers would buy in one market in a given period of time, at various prices, or at various incomes, or at various prices of related goods”.

1.1 WHAT DETERMINES DEMAND?

There are a number of factors which influence household demand for a commodity. Important among these are:

(i) **Price of the commodity**: *Ceteris paribus* i.e. other things being equal, the demand for a commodity is inversely related to its price. It implies that a rise in price of a commodity
brings about a fall in its purchase and vice-versa. This happens because of income and substitution effects.

(ii) **Price of related commodities** : Related commodities are of two types: (a) complementary goods and (ii) competing goods or substitutes. Complementary goods are those goods which are consumed together or simultaneously. For example, tea and sugar, automobiles and petrol, pen and ink are used together. When commodities are complements, a fall in the price of one (other things being equal) will cause the demand of the other to rise. For example, a fall in the price of petrol-driven cars would lead to a rise in the demand for petrol. Similarly, a fall in the price of pens, will cause a rise in the demand for ink. The reverse will be the case when the price of a complement rises.

Competing goods or substitutes are those goods which can be used with ease in place of one another. For example, tea and coffee, ink pen and ball pen, are substitutes for each other and can be used in place of one another easily. When goods are substitutes, a fall in the price of one (ceteris paribus) leads to a fall in the quantity demanded of its substitutes. For example, if the price of tea falls, people will try to substitute it for coffee and demand more of it and less of coffee i.e. the demand for tea will rise and that of coffee will fall.

(iii) **Level of income of the household** : Other things being equal, the demand for a commodity depends upon the money income of the household. In most cases, the larger the average money income of the household, the larger is the quantity demanded of a particular good. However, there are certain commodities for which quantities demanded decrease with an increase in money income. These goods are called inferior goods. Even in the case of other goods, the response of quantities demanded to changes in their prices is not of same proportions. If goods are such that they satisfy the basic necessities (food, clothing, shelter) of life, a change in their prices although will cause an increase in demand for these necessities this increase will be less than proportionate to the increase in income. This is because as people become richer, there is a relative decline in importance of food and other non-durable goods in the over all consumption pattern and a rise in importance of durable goods such as a TV, car, house etc.

(iv) **Tastes and preferences of consumers** : The demand for a commodity also depends upon tastes and preferences of consumers and changes in them over a period of time. Goods which are more in fashion command higher demand than goods which are out of fashion. Consumers may even discard a good even before it is fully utilised and prefer another good which is in fashion. For example, there is a greater demand for LCD/LED television and more and more people are discarding their normal television even though they could have still used it for some more years.

‘Demonstration effect’ plays an important role in determining the demand for a product. An individual’s demand for LCD/LED television may be affected by his seeing one in his neighbour’s or friend’s house, either because he likes what he sees or because he figures out that if his neighbour or friend can afford it, he too can. A person may develop a taste or preference for wine after tasting some, but he may also develop it after discovering that serving it enhances his prestige. In any case, people have tastes and preferences and these change, sometimes, due to external and sometimes, due to internal causes.
Other factors: Apart from the above factors, the demand for a commodity depends upon the following factors:

(a) Size of population: Generally, larger the size of population of a country or a region, greater is the demand for commodities in general.

(b) Composition of population: If there are more old people in a region, the demand for spectacles, walking sticks, etc. will be high. Similarly, if the population consists of more of children, demand for toys, baby foods, toffees, etc. will be more.

(c) Distribution of income: The wealth of a country may be so distributed that there are a few very rich people while the majority are very poor. Under such conditions, the propensity to consume of the country will be relatively less, for the propensity to consume of the rich people is less than that of the poor people. Consequently, the demand for consumer goods will be comparatively less. If the distribution of income is more equal, then the propensity to consume of the country as a whole will be relatively high indicating higher demand for goods.

Apart from above, factors such as class, group, education, marital status, consumer’s expectations with regard to future price and weather conditions, also play an important role in influencing household demand.

1.2 LAW OF DEMAND

The law of demand is one of the most important laws of economic theory. According to law of demand, other things being equal, if the price of a commodity falls, the quantity demanded of it will rise and if the price of a commodity rises, its quantity demanded will decline. Thus, there is an inverse relationship between price and quantity demanded, other things being same. The other things which are assumed to be equal or constant are the prices of related commodities, income of consumers, tastes and preferences of consumers, and such other factors which influence demand. If these factors which determine demand also undergo a change, then the inverse price-demand relationship may not hold good. For example, if incomes of consumers increase, then an increase in the price of a commodity, may not result in a decrease in the quantity demanded of it. Thus, the constancy of these other factors is an important assumption of the law of demand.

Definition of the law of Demand

Prof. Alfred Marshall defined the law thus: “The greater the amount to be sold, the smaller must be the price at which it is offered in order that it may find purchasers or in other words the amount demanded increases with a fall in price and diminishes with a rise in price”.

The law of demand may be illustrated with the help of a demand schedule and a demand curve.

1.2.0 Demand Schedule: To illustrate the relation between the quantity of a commodity demanded and its price, we may take a hypothetical data for prices and quantities of commodity X. A demand schedule is drawn upon the assumption that all the other influences remain unchanged. It thus attempts to isolate the influence exerted by the price of the good upon the amount sold.
Table 1: Demand schedule of an individual consumer

<table>
<thead>
<tr>
<th></th>
<th>Price (₹)</th>
<th>Quantity demanded (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>10</td>
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<td>B</td>
<td>4</td>
<td>15</td>
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<td>C</td>
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<tr>
<td>D</td>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>60</td>
</tr>
</tbody>
</table>

When price of commodity X is ₹ 5 per unit, a consumer purchases 10 units of the commodity. When the price falls to ₹ 4, he purchases 15 units of the commodity. Similarly, when the price further falls, the quantity demanded by him goes on rising until at price ₹ 1, the quantity demanded by him rises to 60 units. The above table depicts an inverse relationship between price and quantity demanded; as the price of the commodity X goes on rising, its demand goes on falling.

Demand curve: We can now plot the data from Table 1 on a graph with price on the vertical axis and quantity on the horizontal axis. In Fig. 1, we have shown such a graph and plotted the five points corresponding to each price-quantity combination shown in Table 1. Point A shows the same information as the first row of Table 1, that at ₹ 5 per unit, only 10 units of X will be demanded. Point E shows the same information as does the last row of the table, when the price is ₹ 1, the quantity demanded will be 60 units.

Fig. 1: Demand Curve

We now draw a smooth curve through these points. The curve is called the demand curve for commodity ‘X’. The curve shows the quantity of ‘X’ that a consumer would like to buy at each price; its downward slope indicates that the quantity of ‘X’ demanded increases as its price
falls. Thus the downward sloping demand curve is in accordance with the law of demand which, as stated above, describes an inverse price-demand relationship.

1.2.1 Market Demand Schedule: When we add up the various quantities demanded by the number of consumers in the market we can obtain the market demand schedule. How the summation is done is illustrated in Table 2. Suppose there are three individual buyers of the goods in the market. The Table 2 shows their individual demands at various prices.

<table>
<thead>
<tr>
<th>Price (₹)</th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>Total market demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10</td>
<td>8</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>12</td>
<td>18</td>
<td>45</td>
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<td>3</td>
<td>20</td>
<td>17</td>
<td>23</td>
<td>60</td>
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<tr>
<td>2</td>
<td>35</td>
<td>25</td>
<td>40</td>
<td>100</td>
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<tr>
<td>1</td>
<td>60</td>
<td>35</td>
<td>45</td>
<td>140</td>
</tr>
</tbody>
</table>

When we add quantities demanded at each price by consumers P, Q and R we get the total market demand. Thus, when price is ₹ 5 per unit, the market demand for commodity ‘X’ is 30 units (i.e. 10+8+12). When price falls to ₹ 4, the market demand is 45 units. At Re. 1, 140 units are demanded in the market. The market demand schedule also indicates inverse relationship between price and quantity demanded of ‘X’.

Market Demand Curve: If we plot the market demand schedule on a graph, we get the market demand curve. Figure 2 shows the market demand curve for commodity ‘X’. The market demand curve, like individual demand curve, slopes downwards to the right because it is nothing but the lateral summation of individual demand curves. Besides, as the price of the good falls, it is very likely that new buyers will enter the market which will further raise the quantity demanded of the good.
1.2.2 Rationale of the Law of Demand: Why does demand curve slope downwards?
Different economists have given different explanations for the operation of law of demand. These are given below.

(1) Law of diminishing marginal utility: According to Marshall people will buy more quantity at lower price because they want to equalize the marginal utility of the commodity and its price. So a rational consumer will not pay more for lesser satisfaction. He is induced to buy additional units in order to maximize his satisfaction or utility. The diminishing marginal utility and equalizing it with the price is the cause for the downward sloping demand curve.

(2) Substitution effect: Hicks and Allen have explained the law in terms of substitution effect and income effect. When the price of a commodity falls, it becomes relatively cheaper than other commodities. It induces consumers to substitute the commodity whose price has fallen for other commodities which have now become relatively expensive. The result is that the total demand for the commodity whose price has fallen increases. This is called substitution effect.

(3) Income effect: When the price of a commodity falls, the consumer can buy the same quantity of the commodity with lesser money or he can buy more of the same commodity with the same amount of money. In other words, as a result of fall in the price of the commodity, consumer’s real income or purchasing power increases. This increase in the real income induces him to buy more of that commodity. Thus, demand for that commodity (whose price has fallen) increases. This is called income effect. Due to the operation of income effect and substitution effect, price effect operates or law of demand holds.

(4) Arrival of new consumers: When the price of a commodity falls, more consumers start buying it because some of those who could not afford to buy it previously may now afford to buy it. This raises the number of consumers of a commodity at a lower price and hence the demand for the commodity in question.

(5) Different uses: Certain commodities have multiple uses. If their prices fall they will be used for varied purposes and demand for such commodities will increase. When the price of such commodities are high, rises they will be put to limited uses only. Thus, different uses of a commodity make the demand curve slope downwards reacting to changes in price.

1.2.3 Exceptions to the Law of Demand: According to the law of demand, more of a commodity will be demanded at lower prices than at higher prices, other things being equal. The law of demand is valid in most cases; however there are certain cases where this law does not hold good. The following are the important exceptions to the law of demand.

(i) Conspicuous goods: Articles of prestige value or snob appeal or articles of conspicuous consumption are demanded only by the rich people and these articles become more attractive if their prices go up. Such articles will not conform to the usual law of demand. This was found out by Veblen in his doctrine of “Conspicuous Consumption” and hence this effect is called Veblen effect or prestige goods effect. Veblen effect takes place as some consumers measure the utility of a commodity by its price i.e., if the commodity is expensive they think that it has got more utility. As such, they buy less of this commodity at low price and more of it at high price. Diamonds are often given as example of this case. Higher the price of diamonds, higher is the prestige value attached to them and hence higher is the demand for them.
(ii) **Giffen goods**: Sir Robert Giffen, an economist, was surprised to find out that as the price of bread increased, the British workers purchased more bread and not less of it. This was something against the law of demand. Why did this happen? The reason given for this is that when the price of bread went up, it caused such a large decline in the purchasing power of the poor people that they were forced to cut down the consumption of meat and other more expensive foods. Since bread, even when its price was higher than before, was still the cheapest food article, people consumed more of it and not less when its price went up.

Such goods which exhibit direct price-demand relationship are called ‘Giffen goods’. Generally those goods which are considered inferior by the consumers and which occupy a substantial place in consumer’s budget are called ‘Giffen goods’. Examples of such goods are coarse grains like bajra, low quality rice and wheat etc.

(iii) **Conspicuous necessities**: The demand for certain goods is affected by the demonstration effect of the consumption pattern of a social group to which an individual belongs. These goods, due to their constant usage, have become necessities of life. For example, in spite of the fact that the prices of television sets, refrigerators, coolers, cooking gas etc. have been continuously rising, their demand does not show any tendency to fall.

(iv) **Future expectations about prices**: It has been observed that when the prices are rising, households expecting that the prices in the future will be still higher, tend to buy larger quantities of the commodities. For example, when there is wide-spread drought, people expect that prices of foodgrains would rise in future. They demand greater quantities of foodgrains as their price rise. But it is to be noted that here it is not the law of demand which is invalidated but there is a change in one of the factors which was held constant while deriving the law of demand, namely change in the price expectations of the people.

(v) The law has been derived assuming consumers to be rational and knowledgeable about market-conditions. However, at times consumers tend to be irrational and make impulsive purchases without any rational calculations about price and usefulness of the product and in such contexts the law of demand fails.

(vi) **Demand for necessaries**: The law of demand does not apply much in the case of necessaries of life. Irrespective of price changes, people have to consume the minimum quantities of necessary commodities.

Similarly, in practice, a household may demand larger quantity of a commodity even at a higher price because it may be ignorant of the ruling price of the commodity. Under such circumstances, the law will not remain valid.

(vii) **Speculative goods**: In the speculative market, particularly in the market for stocks and shares, more will be demanded when the prices are rising and less will be demanded when prices decline.

The law of demand will also fail if there is any significant change in other factors on which demand of a commodity depends. If there is a change in income of the household, or in prices of the related commodities or in tastes and fashion etc., the inverse demand and price relation may not hold good.
1.3 EXPANSION AND CONTRACTION OF DEMAND

The demand schedule, demand curve and the law of demand all show that when the price of a commodity falls, its quantity demanded increases, other things being equal. When, as a result of decrease in price, the quantity demanded increases, in Economics, we say that there is an expansion of demand and when, as a result of increase in price, the quantity demanded decreases, we say that there is contraction of demand. For example, suppose the price of apples at any time is ₹ 100 per kilogram and a consumer buys one kilogram at that price. Now, if other things such as income, prices of other goods and tastes of the consumers remain same but the price of apples falls to ₹ 80 per kilogram and the consumer now buys two kilograms of apples, we say that there is a change in quantity demanded or there is an expansion of demand. On the contrary, if the price of apples rises to ₹ 150 per kilogram and consumer buys only half a kilogram, we say that there is a contraction of demand.

The phenomena of expansion and contraction of demand are shown in Figure 3. The figure shows that when price is OP quantity demanded is OM, given other things equal. If as a result of increase in price (OP’’), the quantity demanded falls to OL, we say that there is ‘a fall in quantity demanded’ or ‘contraction of demand’ or ‘an upward movement along the same curve’. Similarly, as a result of fall in price to OP’, the quantity demanded rises to ON, we say that there is ‘expansion of demand’ or ‘a rise in quantity demanded’ or ‘a downward movement on the same demand curve.’

![Fig. 3 : Expansion and Contraction of Demand](image-url)

1.4 INCREASE AND DECREASE IN DEMAND

Till now we have assumed that other determinants remain constant when we are analysing demand for a commodity. It should be noted that expansion and contraction of demand take place as a result of changes in the price while all other determinants of price viz. income, tastes, propensity to consume and price of related goods remain constant. These other factors remaining constant means that the position of the demand curve remains the same and the consumer moves downwards or upwards on it. What happens if there is a change in consumers’
tastes and preferences, income, the prices of the related goods or other factors on which demand depends? Let us consider the demand for commodity X:

Table 3 shows the possible effect of an increase in income of the consumer on the quantity demanded of commodity X.

**Table 3 : Two demand schedules for commodity X**

<table>
<thead>
<tr>
<th></th>
<th>Price (₹)</th>
<th>Quantity of 'X' demanded when average household income is ₹ 4,000 per month</th>
<th>Quantity of 'X' demanded when average household income is ₹ 5,000 per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>10</td>
<td>15</td>
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<tr>
<td>B</td>
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<td>40</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>60</td>
<td>65</td>
</tr>
</tbody>
</table>

These new data are plotted in Figure 4 as demand curve D’D’ along with the original demand curve DD. We say that the demand curve for X has shifted [in this case it has shifted to right]. The shift from DD to D’D’ indicates an increase in the desire to purchase ‘X’ at each possible price. For example, at the price of ₹ 4 per unit, 15 units are demanded when average household income is ₹ 4,000 per month. When the average household income rises to ₹ 5,000 per month, 20 units of X are demanded at price ₹ 4. A rise in income thus shifts the demand curve to the right, whereas a fall in income will have the opposite effect of shifting the demand curve to the left.
(i) **A rightward shift in the demand curve**: (when more is demanded at each price) can be caused by a rise in income, a rise in the price of a substitute, a fall in the price of a complement, a change in tastes in favour of this commodity, an increase in population, and a redistribution of income to groups who favor this commodity.

(ii) **A leftward shift in the demand curve**: (when less is demanded at each price) can be caused by a fall in income, a fall in the price of a substitute, a rise in the price of a complement, a change in tastes against this commodity, a decrease in population, and a redistribution of income away from groups who favour this commodity.

### 1.5 MOVEMENTS ALONG DEMAND CURVE VS. SHIFT OF CURVE

It is important in Economics to make a distinction between a movement along a demand curve and a shift of the whole demand curve.

A movement along the demand curve indicates changes in the quantity demanded because of price changes, other factors remaining constant. A shift of the demand curve indicates that there is a change in demand at each possible price because one or more other factors, such as incomes, tastes or the price of some other goods, have changed.

Thus, when an economist speaks of an increase or a decrease in demand, he refers to a shift of the whole curve because one or more of the factors which were assumed to remain constant earlier have changed. When the economist speaks of change in quantity demanded he means movement along the same curve (i.e., expansion or contraction of demand) which has happened due to fall or rise in price of the commodity.

In short ‘change in demand’ represents shift of the demand curve to right or left resulting from changes in factors such as income, tastes, prices of other goods etc. and ‘change in quantity demanded’ represents movement upwards or downwards on the same demand curve resulting from a change in price of the commodity.
1.6 ELASTICITY OF DEMAND

Till now we were concerned with the direction of the changes in prices and quantities demanded. Now we will try to measure these changes, or to say, we will try to answer the question “by how much”?

Consider the following situations:

1. As a result of a fall in the price of radio from ₹ 500 to ₹ 400, the quantity demanded increases from 100 radios to 150 radios.

2. As a result of fall in the price of wheat from ₹ 20 per kilogram to ₹ 18 per kilogram, the quantity demanded increases from 500 kilograms to 520 kilograms.

3. As a result of fall in the price of salt from ₹ 9 per kilogram to ₹ 7.50, the quantity demanded increases from 1000 kilogram to 1005 kilograms.

What do you notice? You notice that as a result of a fall in the price of radios, the quantity demanded of radios increases. Same is the case with wheat and salt. Thus, we can say that demand for radios, wheat and salt all respond to price changes. Then, where is the difference? The difference lies in the degree of response of demand which can be found out by comparing percentage changes in prices and quantities demanded. Here lies the concept of elasticity.

Definition: Elasticity of demand is defined as the responsiveness of the quantity demanded of a good to changes in one of the variables on which demand depends or we can say that it is the percentage change in quantity demanded divided by the percentage in one of the variables on which demand depends.

These variables are price of the commodity, prices of the related commodities, income of the consumers and other factors on which demand depends. Thus we have price elasticity, cross elasticity, elasticity of substitution and income elasticity. It is to be noted that when we talk of elasticity of demand, unless and until otherwise mentioned, we talk of price elasticity of demand. In other words, it is price elasticity of demand which is usually referred to as elasticity of demand.

1.6.0 Price Elasticity: Price elasticity of demand expresses the response of quantity demanded of a good to a change in its price, given the consumer’s income, his tastes and prices of all other goods. In other words, it is measured as percentage change in quantity demanded divided by the percentage change in price, other things remaining equal. That is

\[
\text{Price Elasticity} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}} = \frac{\text{Change in quantity}}{\text{Original Quantity}} \times \frac{\text{Change in price}}{\text{Original Price}} \times 100
\]

OR

\[
\frac{\text{Change in quantity}}{\text{Original Quantity}} \times \frac{\text{Change in price}}{\text{Original Price}} \times 100
\]
In symbolic terms
\[ E_p = \frac{\Delta q}{q} \times \frac{p}{\Delta p} = \frac{\Delta q}{\Delta p} \times \frac{p}{q} \]

Where  
- \( E_p \) stands for price elasticity
- \( q \) stands for quantity
- \( p \) stands for price
- \( \Delta \) stands for a very small change.

Strictly speaking, the value of price elasticity varies from minus infinity to approach zero from the negative sign, because \( \frac{\Delta q}{\Delta p} \) has a negative sign. In other words, since price and quantity are inversely related (with a few exceptions) price elasticity is negative. But, for the sake of convenience, we ignore the negative sign and consider only the numerical value of the elasticity. Thus if a 1% change in price leads to 2% change in quantity demanded of good A and 4% change in quantity demanded of good B, then we get elasticity of A and B as 2 and 4 respectively, showing that demand for B is more elastic or responsive to price changes than that of A. Had we considered minus signs, we would have concluded that the demand for A is more elastic than that for B, which is not correct. Hence, by convention, we take the absolute value of price elasticity and draw conclusions.

A numerical example for price elasticity of demand:
The price of a commodity decreases from ₹6 to ₹4 and quantity demanded of the good increases from 10 units to 15 units. Find the coefficient of price elasticity.

Solution : Price elasticity =
(-) \( \frac{\Delta q}{\Delta p} \times \frac{p}{q} = \frac{5}{2} \times \frac{6}{10} = (-) 1.5 \)

Point elasticity: In point elasticity, we measure elasticity at a given point on a demand curve. Point elasticity makes use of derivative rather than finite changes in price and quantity. It may be defined as:

\[ \text{Point elasticity} = \frac{-d q}{d p} \times \frac{p}{q} \]

where \( \frac{dq}{dp} \) is the derivative of quantity with respect to price at a point on the demand curve, and \( p \) and \( q \) are the price and quantity at that point.

It is to be noted that elasticity is different at different points on the same demand curve. Given a straight line demand curve \( fT \), point elasticity at any point say \( R \) can be found by using the formula

\[ \frac{RT}{Rt} = \frac{\text{lower segment}}{\text{upper segment}} \]
Using the above formula we can get elasticity at various points on the demand curve.

\[ \Delta Q/\Delta P = \frac{Q_1 - Q_2}{P_1 - P_2} \]

Thus, we see that as we move from T towards t, elasticity goes on increasing. At the mid-point it is equal to one, at point t it is infinity and at T it is zero.

**Arc-elasticity**: When the price change is somewhat larger or when price elasticity is to be found between two prices [or two points on the demand curve say, A and B in figure 7], the question arises which price and quantity should be taken as base. This is because elasticities found by using original price and quantity figures as base will be different from the one derived by using new price and quantity figures. Therefore, in order to avoid confusion, generally mid-point method is used i.e. averages of the two prices and quantities are taken as (i.e. original and new) base. The arc elasticity can be found out by using the formula:

\[ E_p = \frac{q_1 - q_2}{q_1 + q_2} \times \frac{p_1 + p_2}{p_1 - p_2} \]
where $p_1, q_1$ are the original price and quantity and $p_2, q_2$ are the new ones.

Thus, if we have to find elasticity of radios between:

\[
\begin{align*}
p_1 &= ₹ 500 & q_1 &= 100 \\
p_2 &= ₹ 400 & q_2 &= 150
\end{align*}
\]

We will use the formula

\[
E_p = \frac{q_2 - q_1}{q_1 + q_2} \times \frac{p_1 + p_2}{p_1 - p_2}
\]

or \[E_p = \frac{50}{250} \times \frac{900}{100} \quad \text{or} \quad E_p = 1.8\]

**Interpretation of numerical values of elasticity of demand**

The numerical value of elasticity of demand can assume any value between zero and infinity.

Elasticity is zero, if there is no change at all in quantity demanded when price changes i.e. when quantity demanded does not respond to a price change.

Elasticity is one, or unitary, if the percentage change in quantity demanded is equal to the percentage change in price.

Elasticity is greater than one when the percentage change in quantity demanded is greater than the percentage change in price. In such a case, demand is said to be elastic.

Elasticity is less than one when the percentage change in quantity demanded is less than the percentage change in price. In such a case demand is said to be inelastic.

Elasticity is infinite, when a 'small price reduction raises the demand from zero to infinity. Under such a case, consumers will buy all that they can obtain of the commodity at some price. If there is a slight increase in price, they would not buy anything from the particular seller. This type of demand curve is found in a perfectly competitive market.

![Fig. 8(a) : Demand curve of zero, unitary and infinite elasticity](image-url)
Table 4: Elasticity measures, meaning and nomenclature

<table>
<thead>
<tr>
<th>Numerical measure of elasticity</th>
<th>Verbal description</th>
<th>Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>Quantity demanded does not change as price changes</td>
<td>Perfectly (or completely) inelastic</td>
</tr>
<tr>
<td>Greater than zero, but less than one</td>
<td>Quantity demanded changes by a smaller percentage than does price</td>
<td>Inelastic</td>
</tr>
<tr>
<td>One</td>
<td>Quantity demanded changes by exactly the same percentage as does price</td>
<td>Unit elasticity</td>
</tr>
<tr>
<td>Greater than one, but less than infinity</td>
<td>Quantity demanded changes by a larger percentage than does price</td>
<td>Elastic</td>
</tr>
<tr>
<td>Infinity</td>
<td>Purchasers are prepared to buy all they can obtain at some price and none at all at an even slightly higher price</td>
<td>Perfectly (or infinitely) elastic</td>
</tr>
</tbody>
</table>

Now that we are able to classify goods according to their price elasticity, let us see whether the goods which we considered in our example on page 48, are price elastic or inelastic.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Commodity</th>
<th>Calculation of Elasticity</th>
<th>Nature of Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Radios</td>
<td>[\frac{(100-150)}{100+150} \times \frac{500+400}{500-400} = 1.8 &gt; 1]</td>
<td>Elastic</td>
</tr>
<tr>
<td>2.</td>
<td>Wheat</td>
<td>[\frac{500-520}{500+520} \times \frac{20+18}{20-18} = 0.37 &lt; 1]</td>
<td>Inelastic</td>
</tr>
<tr>
<td>3.</td>
<td>Common Salt</td>
<td>[\frac{1000-1005}{1000+1005} \times \frac{9+7.50}{9-7.50} = 0.02743 &lt; 1]</td>
<td>Inelastic</td>
</tr>
</tbody>
</table>

What do we note in the above hypothetical example? We note that demand for radios is quite elastic, while demand for wheat is quite inelastic and demand for salt is almost the same even after a reduction in price.

Generally, in real world situations also, we find that demand for goods like radios, TVs, refrigerators, fans, etc. is elastic; demand for goods like wheat and rice is inelastic; and demand for salt is highly inelastic or perfectly inelastic. Why do we find such a difference in the behaviour of consumers vis-a-vis different commodities? We shall explain later at length those factors which are responsible for the differences in elasticity of demand for various goods. First, we will consider another method of calculating price-elasticity which is called total outlay method.

**Total Outlay Method of Calculating Price Elasticity**: The price elasticity of demand for a commodity and the total expenditure or outlay made on it are greatly related to each other. By analysing the changes in total expenditure or outlay, we can know the price elasticity of demand for the good. However, it should be noted that by this method we can only say whether the demand for a good is elastic or inelastic; we can not find out the exact coefficient of price elasticity.

When, as a result of the change in price of a good, the total expenditure on the good remains the same, the price elasticity for the good is equal to unity. This is because total expenditure made on the good can remain the same only if the proportional change in quantity demanded is equal to the proportional change in price. Thus, if there is a 100% increase in price of a good and if the price elasticity is unitary, total expenditure of the buyer on the good will remain unchanged.

When, as a result of increase in price of a good, the total expenditure made on the good falls or when as a result of decrease in price, the total expenditure made on the good increases, we say that price elasticity of demand is greater than unity. In our example of radios, as a result of fall in price of radios from ₹ 500 to ₹ 400, the total expenditure on radios increases from
50,000 (500 x 100) to ₹ 60,000 (400 x 150), indicating elastic demand for radios. Similarly, had the price of radios increased from ₹ 400 to ₹ 500, the demand would have fallen from 150 radios to 100 radios indicating a fall in the total outlay from ₹ 60,000 to ₹ 50,000 showing elastic demand for radios.

When, as a result of increase in the price of a good, the total expenditure made on the good increases or when as a result of decrease in its price, the total expenditure made on the good falls, we say that price elasticity of demand is less than unity. In our example of wheat, as a result of fall in price of wheat from ₹ 20 per kg. to ₹ 18 per kg., the total outlay or expenditure falls from 10,000 (20 x 500) to ₹ 9360 (18 x 520) indicating inelastic demand for wheat. Similarly, we can show that as a result of increase in price of wheat from ₹ 18 to ₹ 20 per kg. the total outlay increase from ₹ 9360 to ₹ 10,000 indicating inelastic demand for wheat.

**Determinants of Price Elasticity of Demand**

In the above section we have explained what is price elasticity and how it is measured. Now an important question is: what are the factors which determine whether the demand for a good is elastic or inelastic? We will consider the following important determinants of price elasticity.

1. **Availability of substitutes**: One of the most important determinants of elasticity is the degree of availability of close substitutes. Some commodities like butter, cabbage, Maruti Car, Coca Cola, etc. have close substitutes. There are margarine, other green vegetables, Santro or other cars, Pepsi or any other cold drink respectively. A change in price of these commodities, the prices of the substitutes remaining constant, can be expected to cause quite substantial substitution – a fall in price leading consumers to buy more of the commodity in question and a rise in price leading consumers to buy more of the substitutes. Commodities such as salt, housing, and all vegetables taken together, have few, if any, satisfactory substitutes and a rise in their prices may cause a smaller fall in their quantity demanded. Thus, we can say that goods which typically have close or perfect substitutes have highly elastic demand curves. It should be noted that while as a group a good or service may have inelastic demand, but when we consider its various brands, we say that a particular brand has elastic demand. Thus, while demand for petrol is inelastic, the demand for Indian Oil’s petrol is elastic. Similarly, while there are no general substitutes for health care, there are substitutes for one doctor or for a nurse. Likewise, the demand for common salt is inelastic because good substitutes for common salt are not available.

2. **Position of a commodity in a consumer’s budget**: The greater the proportion of income spent on a commodity, generally the greater will be its elasticity of demand and vice-versa. The demand for goods like common salt, matches, buttons, etc. tend to be highly inelastic because a household spends only a fraction of their income on each of them. On the other hand, demand for goods like clothing, tends to be elastic since households generally spend a good part of their income on clothing.

3. **Nature of the need that a commodity satisfies**: In general, luxury goods are price elastic while necessities are price inelastic. Thus, while the demand for television is relatively elastic, the demand for food and housing, in general, is inelastic.

4. **Number of uses to which a commodity can be put**: The more the possible uses of a commodity the greater will be its price elasticity and vice versa. To illustrate, milk has
several uses. If its price falls, it can be used for a variety of purposes like preparation of curd, cream, ghee and sweets. But, if its price increases, its use will be restricted only to essential purposes like feeding the children and sick persons.

(5) **Time period**: The longer the time-period one has, the more completely one can adjust. A homely example of the effect can be seen in motoring habits. In response to a higher petrol price, one can, in the short run, make fewer trips by car. In the longer run, not only can one make fewer trips but he can purchase a car with a smaller engine capacity when the time comes for replacing the existing one. Hence one’s demand for petrol falls by more when one has made long term adjustment to higher prices.

(6) **Consumer habits**: If a consumer is a habitual consumer of a commodity, no matter how much its price change, the demand for the commodity will be inelastic.

(7) **Tied demand**: The demand for those goods which are tied to others is normally inelastic as against those whose demand is of autonomous nature.

(8) **Price range**: Goods which are in very high price range or in very low price range have inelastic demand, but those in the middle range have elastic demand.

**1.6.1 Income Elasticity of Demand**: Income elasticity of demand is the degree of responsiveness of quantity demanded of a good to a small change in the income of consumers. In symbolic form,

\[ E_i = \frac{\text{Percentage change in demand}}{\text{Percentage change in income}} \]

This can be given mathematically as follows:

\[ E_i = \frac{\Delta Q}{Q} \times \frac{\Delta Y}{Y} = \frac{\Delta Q}{Q} \times \frac{\Delta Y}{\Delta Y} \times \frac{Y}{Q} \]

\[ E_i = \text{Income elasticity of demand} \]
\[ \Delta Q = \text{Change in demand} \]
\[ Q = \text{Original demand} \]
\[ Y = \text{Original money income} \]
\[ \Delta Y = \text{Change in money income} \]

There is a useful relationship between income elasticity for a good and the proportion of income spent on it. The relationship between the two is described in the following three propositions:

1. If the proportion of income spent on a good remains the same as income increases, then income elasticity for the good is equal to one.

2. If the proportion of income spent on a good increases as income increases, then the income elasticity for the good is greater than one.
3. If the proportion of income spent on a good decreases as income rises, then income elasticity for the good is less than one.

Income elasticity of goods reveals a few very important features of demand for the goods in question. If income elasticity is zero, it signifies that the quantity demanded of the good is quite unresponsive to changes in income. When income elasticity is greater than zero or positive then an increase in income leads to an increase in quantity demanded of the good. This happens in case of most of the goods and such goods are called normal goods. On the other hand, goods having negative income elasticity are known as inferior goods and their demand falls as income increases. Another significant value of income elasticity is that of unity. When income elasticity of demand is equal to one, the proportion of income spent on goods remains the same as consumer’s income increases. This represents a useful dividing line. If the income elasticity for a good is greater than one, it shows that the good bulk larger in consumer’s expenditure as he becomes richer. Such goods are called luxury goods. On the other hand, if the income elasticity is less than one, it shows that the good is either relatively less important in consumer’s eye or, it is a necessity.

The following examples will make the above concepts clear:

(a) The income of a household rises by 10%, the demand for wheat rises by 5%.
(b) The income of a household rises by 10%, the demand for T.V. rises by 20%.
(c) The incomes of a household rises by 5%, the demand for bajra falls by 2%.
(d) The income of a household rises by 7%, the demand for commodity X rises by 7%.
(e) The income of a household rises by 5%, the demand for buttons does not change at all.

Using formula for income elasticity,

\[
i.e. \ E_i = \frac{\text{Percentage change in demand}}{\text{Percentage change on income}}
\]

we will find income-elasticity for various goods. The results are as follows:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Commodity</th>
<th>Income-elasticity for the household</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Wheat</td>
<td>(\frac{5%}{10%}=0.5) ((E_i&lt;1))</td>
<td>since (0&lt;0.5&lt;1), wheat is a normal good and fulfills a necessity.</td>
</tr>
<tr>
<td>b</td>
<td>T.V.</td>
<td>(\frac{20%}{10%}=2) ((E_i&gt;1))</td>
<td>since (2&gt;1), T.V. is a luxurious commodity.</td>
</tr>
<tr>
<td>c</td>
<td>Bajra</td>
<td>(\frac{-2%}{5%}=-0.4) ((E_i&lt;0))</td>
<td>since (-0.4&lt;0), Bajra is an inferior commodity in the eyes of the household.</td>
</tr>
<tr>
<td>d</td>
<td>X</td>
<td>(\frac{7%}{7%}=1) ((E_i=1))</td>
<td>since income elasticity is 1, X has unitary income elasticity.</td>
</tr>
<tr>
<td>e</td>
<td>Buttons</td>
<td>(\frac{0%}{5%}=0) ((E_i=0))</td>
<td>buttons have zero income-elasticity.</td>
</tr>
</tbody>
</table>
It is to be noted that the words ‘luxury’, ‘necessity’, inferior good do not signify strict dictionary meanings here. In economic theory, we distinguish them in the manner shown above.

1.6.2 Cross Elasticity:

*Price of Related Goods and Demand:*

The demand for a particular commodity may change due to changes in the prices of related goods. These related goods may be either complementary goods or substitute goods. This type of relationship is studied under ‘Cross Demand’. Cross demand refers to the quantities of a commodity or service which will be purchased with reference to changes in price, not of that particular commodity, but of other inter-related commodities, other things remaining the same. It may be defined as the quantities of a commodity that consumers buy per unit of time at different prices of a ‘related article’, ‘other things remaining the same’. The assumption ‘other things remaining the same’ means that the income of the consumer and also the price of the commodity in question will remain constant.

*Substitute Products*

In the case of substitute commodities, the cross demand curve slopes upwards (i.e. is positive) showing that more quantities of a commodity, will be demanded whenever there is a rise in price of a substitute commodity. In figure 9 quantity demanded of Tea is given on the X axis. Y axis represents the price of coffee which is a substitute for tea. When the price of coffee increases, the demand for coffee becomes less due to the operation of the law of demand. But the consumers will substitute tea in the place of coffee. The price of tea is assumed to be constant. So, whenever there is an increase in the price of one commodity, the demand for the substitute commodity will increase.

![Fig. 9: Substitutes](image-url)
**Complementary Goods**

In the case of complementary goods, as shown in the figure below, a change in the price of a good will have an opposite reaction on the demand for the other commodity which is closely related or complementary. For instance, an increase in demand for pen will necessarily increase the demand for ink. The same is the case with complementary goods such as bread and butter; horse and carriages, etc. Whenever there is a fall in the demand for fountain pens due to a rise in prices of fountain pens, the demand for ink will fall down, not because the price of ink has gone up, but because the price of fountain pen has gone up. So, we find that there is an inverse relationship between price of a commodity and the demand for its complementary good (other things remaining the same).

![Fig. 10 : Complementary Goods](image)

A change in the demand for one good in response to a change in the price of another good represents cross elasticity of demand of the former good for the latter good.

Symbolically, (mathematically)

\[
E_c = \frac{\Delta q_x}{q_x} \times \frac{\Delta p_y}{p_y}
\]

\[
E_c = \frac{\Delta q_x}{\Delta p_y} \times \frac{p_y}{q_x}
\]

Where  
- \(E_c\) stands for cross elasticity.  
- \(q_x\) stands for original quantity demanded of X.  
- \(\Delta q_x\) stands for change in quantity demanded of X  
- \(p_y\) stands for the original price of good Y.  
- \(\Delta p_y\) stands for a small change in the price of Y.

If two goods are perfect substitutes for each other, the cross elasticity between them is infinite and if two goods are totally unrelated, cross elasticity between them is zero.
If two goods are substitutes (like tea and coffee), the cross elasticity between them is positive, that is, in response to a rise in price of one good the demand for the other good rises. On the other hand, when two goods are complementary (tea and sugar) to each other, the cross elasticity between them is negative so that a rise in the price of one leads to a fall in the quantity demanded of the other. However, one need not base the classification of goods on the basis of the above definitions. While the goods between which cross elasticity is positive can be called substitutes, the goods between which cross elasticity is negative are not always complementary. This is because negative cross elasticity is also found when the income effect of the price change is very strong.

1.7 DEMAND DISTINCTIONS

Certain important demand distinctions are as follows:

a. Producer’s goods and Consumer’s goods
b. Durable goods and Non-durable goods
c. Derived demand and Autonomous demand
d. Industry demand and Company demand
e. Short-run demand and Long-run demand

a. **Producer’s goods and Consumer’s goods**

Producer’s goods are those which are used for the production of other goods—either consumer goods or producer goods themselves. Examples of such goods are machines, locomotives, ships etc. Consumer’s goods are those which are used for final consumption. Examples of consumer’s goods are readymade clothes, prepared food, residential houses, etc.

b. **Durable goods and Non-durable goods**

Consumer’s goods may be further sub-divided into durable and non-durable goods. Non-durable consumer goods are those which cannot be consumed more than once; for example bread, milk etc. These will meet only the current demand. On the other hand, durable consumer goods are those which can be consumed more than once over a period of time, example, car, refrigerator, ready-made shirt, and umbrella. The demand for durable goods is likely to be derived demand.

c. **Derived demand and Autonomous demand**

When a product is demanded consequent on the purchase of a parent product, its demand is called derived demand. For example, the demand for cement is derived demand, being directly related to building activity. If the demand for a product is independent of the demand for other goods, then it is called autonomous demand. But this distinction is purely arbitrary and it is very difficult to find out which product is entirely independent of other products.

d. **Industry demand and Company demand**

The term industry demand is used to denote the total demand for the products of a particular industry, e.g. the total demand for steel in the country. On the other hand, the term company demand denotes the demand for the products of a particular company, e.g. demand for steel produced by the Tata Iron and Steel Company.
e. Short-run demand and Long-run demand

Short run demand refers to demand with its immediate reaction to price changes, income fluctuations, etc., whereas long-run demand is that which will ultimately exist as a result of changes in pricing, promotion or product improvement, after enough time is allowed to let the market adjust to the new situation. For example, if electricity rates are reduced, in the short run, the existing users will make greater use of electric appliances. In the long run, more and more people will be induced to use electric appliances.

SUMMARY

- Demand means desire or wish to buy and consume a commodity or service backed by adequate willingness and ability to buy.
- The main determinants of demand are price of the commodity, price of related goods, level of the income, taste and preference, size of population, distribution of income etc.
- The law of demand states that people will buy more at lower prices and less at higher prices, other things being equal.
- A demand schedule is a list that shows various prices and the corresponding quantities of demanded. The demand schedule are of two types; individual demand schedule and market demand schedule.
- According to Marshall, the demand curve slopes downwards due to the operation of the law of diminishing marginal utility. However, according to Hicks and Allen it is due to income effect and substitution effect.
- The demand curve usually slopes downwards; but exceptionally slopes upwards under certain circumstances as in the case of conspicuous goods, Giffen goods, conspicuous necessities, future expectations about prices, demand for necessaries and speculative goods.
- Other things being equal, when the price rises and the quantity demanded decreases, it is contraction of demand. On the contrary, when the price falls and the quantity demanded increases it is extension of demand.
- The demand curve will shift to the right when there is a rise in income (unless the good is an inferior one), a rise in the price of a substitute, a fall in the price of a complement, a rise in population and a change in tastes in favour of commodity. The opposite changes will shift the demand curve to the left.
- Elasticity of demand refers to the degree of sensitiveness or responsiveness of demand to a change in any one of its determinants. Elasticity of demand is classified mainly into three kinds. They are price elasticity of demand, income elasticity of demand and cross elasticity of demand.
- Price elasticity of demand refers to the percentage change in quantity demanded of a commodity as a result of a percentage change in price of that commodity.
- Income elasticity of demand is the percentage change in quantity demanded of a commodity as a result of a percentage change in income of the consumer.
- The cross elasticity of demand is the percentage change in the quantity demanded of commodity X as a result of a percentage change in the price of some related commodity Y.
CHAPTER – 2

THEORY OF DEMAND AND SUPPLY

Unit 2

Theory of Consumer Behaviour

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Learning Objectives

At the end of this unit you will be able to:

- know the meaning of utility
- understand how consumers try to maximize their satisfaction by spending on different goods.

The demand for a commodity depends on the utility of that commodity to a consumer. If a consumer gets more utility from a commodity, he would be willing to pay a higher price and vice-versa.

2.0 NATURE OF HUMAN WANTS

All desires, tastes and motives of human beings are called wants in Economics. Wants may arise due to elementary and psychological causes. Since the resources are limited, we have to choose between the urgent wants and the not so urgent wants.

All wants of human beings exhibit some characteristic features.

1. Wants are unlimited
2. Every want is satiable
3. Wants are competitive
4. Wants are complementary
5. Wants are alternative
6. Wants vary with time, place, and person
7. Some wants recur again
8. Wants are influenced by advertisement
9. Wants become habits and customs

Classification of wants:

In Economics, wants are classified into three categories, viz., necessaries, comforts and luxuries.

Necessaries:
Necessaries are those which are essential for living. Man cannot do well with the barest necessaries of life alone. He requires some more necessaries to keep him fit for taking up productive activities. These are called necessaries of efficiency. There are other types of necessaries called conventional necessaries. By custom and tradition, people require some wants to be satisfied.

Comforts:
Comforts refer to those goods and services which are not essential for living, but which are required for a happy living. They lie between ‘necessaries’ and ‘luxuries’.

Luxuries:
Luxuries are those wants which are superfluous and expensive. They are not essential for living, however, they may add efficiency to the consumer.
What is Utility?

Utility is the want satisfying power of a commodity. It is a subjective entity and varies from person to person. It should be noted that utility is not the same thing as usefulness. Even harmful things like liquor, may be said to have utility from the economic stand point because people want them. Thus, in Economics, the concept of utility is ethically neutral.

Utility is the anticipated satisfaction by the consumer, and satisfaction is the actual satisfaction derived.

Utility hypothesis forms the basis of the theory of consumer behaviour. From time to time, different theories have been advanced to explain consumer behaviour and thus to explain his demand for the product. Two important theories are (i) Marginal Utility Analysis propounded by Marshall, and (ii) Indifference Curve Analysis propounded by Hicks and Allen.

2.1 MARGINAL UTILITY ANALYSIS

This theory which is formulated by Alfred Marshall, a British economist, seeks to explain how a consumer spends his income on different goods and services so as to attain maximum satisfaction. This theory is based on certain assumptions. But before stating the assumptions, let us understand the meaning of total utility and marginal utility.

**Total utility** : It is the sum of utility derived from different units of a commodity consumed by a consumer. In other words, Total utility = the sum total of all marginal utility.

**Marginal utility** : It is the additional utility derived from the consumption of an additional unit of a commodity. In short, Marginal utility = the addition made to the total utility by the addition of consumption of one more unit of a commodity.

Total Utility is otherwise known as “Full Satiety”. Marginal Utility is also known as Marginal Satiety.

2.1.0 Assumptions of Marginal Utility Analysis

(1) **The Cardinal Measurability of Utility** : According to this theory, utility is a cardinal concept i.e., utility is a measurable and quantifiable entity. Thus, a person can say that he derives utility equal to 10 units from the consumption of 1 unit of commodity A and 5 from the consumption of 1 unit of commodity B. Since, he can express his satisfaction quantitatively, he can easily compare different commodities and express which commodity gives him greater utility or satisfaction and by how much. According to this theory, money is the measuring rod of utility. 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 which he derives from the good.

(2) **Constancy of the Marginal Utility of Money** : The marginal utility of money remains constant throughout when the individual is spending money on a good. This assumption, although not realistic, has been made in order to facilitate the measurement of utility of commodities in terms of money.

(3) **The Hypothesis of Independent Utility** : The total utility which a person gets from the whole collection of goods purchased by him is simply the sum total of the separate utilities of the goods. The theory ignores complementarity between goods.
2.1.1 The Law of Diminishing Marginal Utility

One of the important laws under Marginal Utility analysis is the Law of Diminishing Marginal Utility.

The law of diminishing marginal utility is based on an important fact that while total wants of a person are virtually unlimited, each single want is satiable i.e., each want is capable of being satisfied. Since each want is satiable, as a consumer consumes more and more units of a good, the intensity of his want for the good goes on decreasing and a point is reached where the consumer no longer wants it.

Marshall who was the exponent of the marginal utility analysis stated the law as follows :

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

In other words, as a consumer increases the consumption of any one commodity keeping constant the consumption of all other commodities, the marginal utility of the variable commodity must eventually decline”.

This law describes a very fundamental tendency of human nature. In simple words it says that as a consumer takes more units of a good, the extra satisfaction that he derives from an extra unit of a good goes on falling. It is to be noted that it is the marginal utility and not the total utility which declines with the increase in the consumption of a good.

Table 5 : Total and marginal utility schedule

<table>
<thead>
<tr>
<th>Quantity of chocolate bar consumed</th>
<th>Total utility</th>
<th>Marginal utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>65</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>83</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>89</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>93</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>96</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>98</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>99</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>95</td>
<td>-4</td>
</tr>
</tbody>
</table>

Let us illustrate the law with the help of an example. Consider Table 5, in which we have presented the total utility and marginal utility derived by a person from chocolates consumed. When one chocolate is taken per day, the total utility derived by the person is 30 utils (unit of utility) and the marginal utility derived is also 30 utils. With the consumption of 2nd chocolate per day the total utility rises to 50 but marginal utility falls to 20. We see that as the consumption of chocolates increases to 10 chocolates, marginal utility from the additional chocolates goes on diminishing (i.e., the total utility goes on increasing at a diminishing rate). However, when the chocolate consumed increases to 11, instead of giving positive marginal utility, the eleventh chocolate gives negative marginal utility because it may cause him sickness.
Graphically we can represent the relationship between total utility and marginal utility (fig. 11). From Table 5, we can conclude the three important relationships between total utility and marginal utility

1. When total utility rises, the marginal utility diminishes.
2. When total utility is maximum, the marginal utility is zero.
3. When total utility is diminishing, the marginal utility is negative.

![Fig. 11: Marginal utility of chocolates consumed](chart)

As will be seen from the figure, the marginal utility curve goes on declining throughout. The diminishing marginal utility curve applies almost to all commodities. A few exceptions however, have been pointed out by some economists. According to them, this law does not apply to money, music and hobbies. While this may be true in initial stages, beyond a certain limit these will also be subjected to diminishing utility.

The Law of diminishing marginal utility helps us to understand how a consumer reaches equilibrium in case of a single good. It states that as the quantity of a good with consumer increases, marginal utility of the good decreases. In other words, the marginal utility curve is downward sloping. Now, a consumer will go on buying a good till the marginal utility of the good becomes equal to the market price. In other words, the consumer will be in equilibrium (will be deriving maximum satisfaction) in respect of the quantity of the good where marginal utility of the good is equal to its price. Here his satisfaction will be maximum.

What happens when there is a change in the price of the good? When the price of the good falls, the equality between marginal utility and price is disturbed. The consumer will consume more of the good so as to restore the equality between marginal utility and price. When he consumes more of the good, the marginal utility from the good will fall. He will continue consuming more till the marginal utility becomes equal to the lower price. On the other hand, when price of the good increases he will buy less so as to equate the marginal utility to the
higher price. We can say that the downward sloping demand curve is directly derived from marginal utility curve.*

Limitations of the Law

The law of diminishing marginal utility is applicable only under certain assumptions.

(i) **Homogenous units**: The different units consumed should be identical in all respects. The habit, taste, temperament and income of the consumer also should remain unchanged.

(ii) **Standard units of Consumption**: The different units consumed should consist of standard units. If a thirsty man is given water by successive spoonfuls, the utility of the second spoonful of water may conceivably be greater than the utility of the first.

(iii) **Continuous Consumption**: There should be no time gap or interval between the consumption of one unit and another unit i.e. there should be continuous consumption.

(iv) **The Law fails in the case of prestigious goods**: The law may not apply to articles like gold, cash where a greater quantity may increase the lust for it.

(v) **Case of related goods**: The shape of the utility curve may be affected by the presence or absence of articles which are substitutes or complements. The utility obtained from tea may be seriously affected if no sugar is available.

2.1.2 Consumer’s Surplus

The concept of consumer’s surplus was evolved by Alfred Marshall. This concept occupies an important place not only in economic theory but also in economic policies of government and in decision-making of monopolists.

It has been seen that consumers generally are ready to pay more for certain goods than what they actually pay for them. This extra satisfaction which consumers get from their purchase of goods is called by Marshall as consumer’s surplus.

*Marshall defined the concept of consumer’s surplus as the “excess of the price which a consumer would be willing to pay rather than go without a thing over that which he actually does pay”, is called consumer’s surplus.”

Thus consumer’s surplus = What a consumer is ready to pay - What he actually pays.

The concept of consumer’s surplus is derived from the law of diminishing marginal utility. As we know from the law of diminishing marginal utility, the more of a thing we have, the lesser marginal utility it has. In other words, as we purchase more of a good, its marginal utility goes on diminishing. The consumer is in equilibrium when marginal utility is equal to given price i.e., he purchases that many number of units of a good at which marginal utility is equal to price (It is assumed that perfect competition prevails in the market). Since the price is the same for all units of the good he purchases, he gets extra utility for all units consumed by him except for the one at the margin. This extra utility or extra surplus for the consumer is called consumer’s surplus.

It is often argued that this concept is a theoretical toy. The surplus satisfaction cannot be measured precisely. In case of very essential goods of life, utility is very high but prices paid for them are low giving rise to infinite surplus satisfaction. Further, it is difficult to measure the marginal utilities of different units of a commodity consumed by a person.

Consider Table 6 in which we have illustrated the measurement of consumer’s surplus in case of commodity X. The price of X is assumed to be ₹ 20.

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* The case of more than one good can be explained through the law of Equi-Marginal utility which says that the consumer will be in equilibrium when he is spending money on goods and services in such a way that the marginal utility of each good is proportional to its price.
Table 6: Measurement of Consumer’s Surplus

<table>
<thead>
<tr>
<th>No. of units</th>
<th>Marginal Utility</th>
<th>Price (₹)</th>
<th>Consumer’s Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>18</td>
<td>20</td>
<td>–</td>
</tr>
</tbody>
</table>

We see from the above table that when consumer’s consumption increases from 1 to 2 units, his marginal utility falls from ₹ 30 to ₹ 28. His marginal utility goes on diminishing as he increases his consumption of good X. Since marginal utility for a unit of good indicates the price the consumer is willing to pay for that unit, and since price is assumed to be fixed at ₹ 20, the consumer enjoys a surplus on every unit of purchase till the 6th unit. Thus, when the consumer is purchasing 1 unit of X, the marginal utility is worth ₹ 30 and price fixed is ₹ 20, thus he is deriving a surplus of ₹ 10. Similarly, when he purchases 2 units of X, he enjoys a surplus of ₹ 8 [₹ 28 – ₹ 20]. This continues and he enjoys consumer’s surplus equal to ₹ 6, 4, 2 respectively from 3rd, 4th and 5th unit. When he buys 6 units, he is in equilibrium because his marginal utility is equal to the market price or he is willing to pay a sum equal to the actual market price and therefore, he enjoys no surplus. Thus, given the price of ₹ 20 per unit, the total surplus which the consumer will get, is ₹ 10 + 8 + 6 + 4 + 2 + 0 = 30.

The concept of consumer’s surplus can also be illustrated graphically. Consider figure 12. On the X-axis we measure the amount of the commodity and on the Y-axis the marginal utility and the price of the commodity. MU is the marginal utility curve which slopes downwards, indicating that as the consumer buys more units of the commodity, its marginal utility falls. Marginal utility shows the price which a person is willing to pay for the different units rather than go without them. If OP is the price that prevails in the market, then the consumer will be in equilibrium when he buys OQ units of the commodity, since at OQ units, marginal utility is equal to the given price OP. The last unit, i.e., Qth unit does not yield any consumer’s surplus because here price paid is equal to the marginal utility of the Qth unit. But for units before Qth unit, marginal utility is greater than price and thus these units fetch consumer’s surplus to the consumer.

In Figure 12, the total utility is equal to the area under the marginal utility curve up to point Q i.e. ODRQ. But, given the price equal to OP, the consumer
THEORY OF DEMAND AND SUPPLY

actually pays OPRQ. The consumer derives extra utility equal to DPR which is nothing but consumer’s surplus.

Limitations:

(1) Consumer’s surplus cannot be measured precisely - because it is difficult to measure the marginal utilities of different units of a commodity consumed by a person.

(2) In the case of necessaries, the marginal utilities of the earlier units are infinitely large. In such case the consumer’s surplus is always infinite.

(3) The consumer’s surplus derived from a commodity is affected by the availability of substitutes.

(4) There is no simple rule for deriving the utility scale of articles which are used for their prestige value (e.g., diamonds).

(5) Consumer’s surplus cannot be measured in terms of money because the marginal utility of money changes as purchases are made and the consumer’s stock of money diminishes. (Marshall assumed that the marginal utility of money remains constant. But this assumption is unrealistic).

(6) The concept can be accepted only if it is assumed that utility can be measured in terms of money or otherwise. Many modern economists believe that this cannot be done.

2.2 INDIFFERENCE CURVE ANALYSIS

In the last section, we discussed marginal utility analysis of demand. A very popular alternative and more realistic method of explaining consumer’s demand is the Indifference Curve Analysis. This approach to consumer behaviour is based on consumer preferences. It believes that human satisfaction, being a psychological phenomenon, cannot be measured quantitatively in monetary terms as was attempted in Marshall’s utility analysis. In this approach, it is felt that it is much easier and scientifically more sound to order preferences than to measure them in terms of money.

The consumer preference approach is, therefore, an ordinal concept based on ordering of preferences compared with Marshall’s approach of cardinality.

2.2.0 Assumptions Underlying Indifference Curve Approach

(i) The consumer is rational and possesses full information about all the relevant aspects of economic environment in which he lives.

(ii) The consumer is capable of ranking all conceivable combinations of goods according to the satisfaction they yield. Thus, if he is given various combinations say A, B, C, D and E he can rank them as first preference, second preference and so on. If a consumer happens to prefer A to B, he can not tell quantitatively how much he prefers A to B.

(iii) If the consumer prefers combination A to B, and B to C, then he must prefer combination A to C. In other words, he has a consistent consumption pattern.

(iv) If combination A has more commodities than combination B, then A must be preferred to B.
2.2.1 **Indifference Curves:** What are Indifference Curves? Ordinal analysis of demand (here we will discuss the one given by Hicks and Allen) is based on indifference curves. An *indifference curve is a curve which represents all those combinations of two goods which give same satisfaction to the consumer. Since all the combinations on an indifference curve give equal satisfaction to the consumer, the consumer is indifferent among them. In other words, since all the combinations provide the same level of satisfaction the consumer prefers them equally and does not mind which combination he gets.*

To understand indifference curves, let us consider the example of a consumer who has one unit of food and 12 units of clothing. Now, we ask the consumer how many units of clothing he is prepared to give up to get an additional unit of food, so that his level of satisfaction does not change. Suppose the consumer says that he is ready to give up 6 units of clothing to get an additional unit of food. We will have then two combinations of food and clothing giving equal satisfaction to consumer: Combination A which has 1 unit of food and 12 units of clothing, and combination B which has 2 units of food and 6 units of clothing. Similarly, by asking the consumer further how much of clothing he will be prepared to forgo for successive increments in his stock of food so that his level of satisfaction remains unaltered, we get various combinations as given below:

**Table 7: Indifference Schedule**

<table>
<thead>
<tr>
<th>Combination</th>
<th>Food</th>
<th>Clothing</th>
<th>MRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Now, if we draw the above schedule we will get the following figure.

In Figure 13, an indifference curve IC is drawn by plotting the various combinations of the indifference schedule. The quantity of food is measured on the X axis and the quantity of clothing on the Y axis. As in indifference schedule, the combinations lying on an indifference curve will give the consumer the same level of satisfaction. The indifference curve is also called *Iso-Utility curve.*
2.2.2 Indifference Map: An Indifference map represents a collection of many indifference curves where each curve represents a certain level of satisfaction. In short, a set of indifference curves is called an indifference map.

An indifference map depicts the complete picture of consumer’s tastes and preferences. In Figure 14, an indifference map of a consumer is shown which consists of three indifference curves. We have taken good X on X-axis and good Y on Y-axis. It should be noted that while the consumer is indifferent among the combinations lying on the same indifference curve, he certainly prefers the combinations on the higher indifference curve to the combinations lying on a lower indifference curve because a higher indifference curve signifies a higher level of satisfaction. Thus, while all combinations of IC₁ give him the same satisfaction, all combinations lying on IC₂ give him greater satisfaction than those lying on IC₁.
2.2.3. Marginal Rate of Substitution: Marginal Rate of Substitution (MRS) is the rate at which the consumer is prepared to exchange goods X and Y. Consider Table-7. In the beginning the consumer is consuming 1 unit of food and 12 units of clothing. Subsequently, he gives up 6 units of clothing to get an extra unit of food, his level of satisfaction remaining the same. The MRS here is 6. Likewise when he moves from B to C and from C to D in his indifference schedule, the MRS are 2 and 1 respectively. Thus, we can define MRS of X for Y as the amount of Y whose loss can just be compensated by a unit gain of X in such a manner that the level of satisfaction remains the same. We notice that MRS is falling i.e., as the consumer has more and more units of food, he is prepared to give up less and less units of clothing. There are two reasons for this.

1. The want for a particular good is satiable so that when a consumer has more of it, his intensity of want for it decreases. Thus, when the consumer in our example, has more units of food, his intensity of desire for additional units of food decreases.

2. Most goods are imperfect substitutes of one another. If they could substitute one another perfectly. MRS would remain constant.

2.2.4 Properties of Indifference Curves: The following are the main characteristics or properties of indifference curves:

(i) Indifference curves slope downward to the right: This property implies that when the amount of one good in the combination is increased, the amount of the other good is reduced. This is essential if the level of satisfaction is to remain the same on an indifference curve.

(ii) Indifference curves are always convex to the origin: It has been observed that as more and more of one commodity (X) is substituted for another (Y), the consumer is willing to part with less and less of the commodity being substituted (i.e. Y). This is called diminishing marginal rate of substitution. Thus, in our example of food and clothing, as a consumer has more and more units of food, he is prepared to forego less and less units of clothing. This happens mainly because the want for a particular good is satiable and as a person has more and more of a good, his intensity of want for that good goes on diminishing. This diminishing marginal rate of substitution gives convex shape to the indifference curves. However, there are two extreme situations. When two goods are perfect substitutes of each other, the indifference curve is a straight line on which MRS is constant. And when two goods are perfect complementary goods (e.g. gasoline and water in a car), the indifference curve will consist of two straight line with a right angle bent which is convex to the origin, or in other words, it will be L shaped.

(iii) Indifference curves can never intersect each other: No two indifference curves will intersect each other although it is not necessary that they are parallel to each other. In case of intersection the relationship becomes logically absurd because it would show that higher and lower levels are equal which is not possible. This property will be clear from Figure 15.
Fig. 15: Intersecting Indifference Curves

In figure 15, IC₁ and IC₂ intersect at A. Since A and B lie on IC₁, they give same satisfaction to the consumer. Similarly, since A and C lie on IC₂, they give same satisfaction to the consumer. This implies that combination B and C are equal in terms of satisfaction. But a glance will show that this is an absurd conclusion because certainly combination C is better than combination B because it contains more units of commodities X and Y. Thus we see that no two indifference curves can touch or cut each other.

(iv) A higher indifference curve represents a higher level of satisfaction than the lower indifference curve: This is because combinations lying on a higher indifference curve contain more of either one or both goods and more goods are preferred to less of them.

(v) Indifference curve will not touch either axes

Another characteristic feature of indifference curve is that it will not touch the X axis or Y axis. This is born out of our assumption that the consumer is considering different combination of two commodities. If an indifference curve touches the Y axis at a point P as shown in the figure 16, it means that the consumer is satisfied with OP units of y commodity and zero units of x commodity. This is contrary to our assumption that the consumer wants both commodities although in smaller or larger quantities. Therefore an indifference curve will not touch either the X axis or Y axis.

Fig. 16: Indifference Curve
2.2.5 Budget Line: A higher indifference curve shows a higher level of satisfaction than a lower one. Therefore, a consumer, in his attempt to maximise satisfaction will try to reach the highest possible indifference curve. But in his pursuit of buying more and more goods and thus obtaining more and more satisfaction, he has to work under two constraints: first, he has to pay the prices for the goods and, second, he has a limited money income with which to purchase the goods.

These constraints are explained by the budget line or price line. In simple words, a budget line shows all those combinations of two goods which the consumer can buy spending his given money income on the two goods at their given prices. All those combinations which are within the reach of the consumer (assuming that he spends all his money income) will lie on the budget line.

![Fig. 17: Price Line](image)

It should be noted that any point outside the given price line, say H, will be beyond the reach of the consumer and any combination lying within the line, say K, shows under spending by the consumer.

2.2.6 Consumer's Equilibrium: Having explained indifference curves and budget line, we are in a position to explain how a consumer reaches equilibrium position. A consumer is in equilibrium when he is deriving maximum possible satisfaction from the goods and therefore is in no position to rearrange his purchases of goods. We assume that:

(i) the consumer has a given indifference map which shows his scale of preferences for various combinations of two goods X and Y.
(ii) he has a fixed money income which he has to spend wholly on goods X and Y.
(iii) prices of goods X and Y are given and are fixed.
(iv) All goods are homogeneous and divisible.
(v) The consumer acts ‘rationally’ and maximizes his satisfaction.
Fig. 18 : Consumer’s Equilibrium

To show which combination of two goods X and Y the consumer will buy to be in equilibrium we bring his indifference map and budget line together.

We know by now, that the indifference map depicts the consumer’s preference scale between various combinations of two goods and the budget line shows various combinations which he can afford to buy with his given money income and prices of the two goods. Consider Figure 18, in which IC₁, IC₂, IC₃, IC₄ and IC₅ are shown together with budget line PL for good X and good Y. Every combination on the budget line PL costs the same. Thus combinations R, S, Q, T and H cost the same to the consumer. The consumer’s aim is to maximise his satisfaction and for this, he will try to reach highest indifference curve.

Since there is a budget constraint, he will be forced to remain on the given budget line, that is he will have to choose combinations from among only those which lie on the given price line.

Which combination will he choose? Suppose he chooses R. We see that R lies on a lower indifference curve IC₁, when he can very well afford S, Q or T lying on higher indifference curve. Similar is the case for other combinations on IC₁, like H. Again, suppose he chooses combination S (or T) lying on IC₂. But here again we see that the consumer can still reach a higher level of satisfaction remaining within his budget constraints i.e., he can afford to have combination Q lying on IC₃ because it lies on his budget line. Now, what if he chooses combination Q? We find that this is the best choice because this combination lies not only on his budget line but also puts him on the highest possible indifference curve i.e., IC₃. The consumer can very well wish to reach IC₄ or IC₅ but these indifference curves are beyond his reach given his money income. Thus, the consumer will be at equilibrium at point Q on IC₃. What do we notice at point Q? We notice that at this point, his budget line PL is tangent to the indifference curve IC₃. In this equilibrium position (at Q), the consumer will buy OM of X and ON of Y.

At the tangency point Q, the slopes of the price line PL and the indifference curve IC₃ are equal. The slope of the indifference curve shows the marginal rate of substitution of X for Y.
(MRS\text{xy}) which is equal to \( \frac{\text{MU}_x}{\text{MU}_y} \) while the slope of the price line indicates the ratio between the prices of two goods i.e., \( \frac{P_x}{P_y} \).

At equilibrium point \( Q \),

\[
\text{MRS}_{xy} = \frac{\text{MU}_x}{\text{MU}_y} = \frac{P_x}{P_y}
\]

Thus, we can say that the consumer is in equilibrium position when price line is tangent to the indifference curve or when the marginal rate of substitution of goods X and Y is equal to the ratio between the prices of the two goods.

The indifference curve analysis is superior to utility analysis: (i) it dispenses with the assumption of measurability of utility (ii) it studies more than one commodity at a time (iii) it does not assume constancy of money (iv) it segregates income effect from substitution effect.

**SUMMARY**

- The existence of human wants is the basis for all economic activities in the society. All desires, tastes and motives of human beings are called wants in Economics.
- In Economics wants are classified into necessaries, comforts and luxuries.
- Utility refers to the want satisfying power of goods and services. It is not absolute but relative. It is a subjective concept and it depends upon the mental attitude of people.
- There are two important theories of utility, the cardinal utility analysis and ordinal utility analysis.
- The law of diminishing marginal utility states that as a consumer increases the consumption of a commodity, every successive unit of the commodity gives lesser and lesser satisfaction to the consumer.
- Consumer surplus is the difference between what a consumer is willing to pay for one unit of a commodity and what he actually pays for it.
- The indifference curve theory, which is an ordinal theory shows the household’s preference between alternative bundles of goods by means of indifference curves.
- Marginal rate of substitution is the rate at which the consumer is prepared to exchange goods X and Y.
- The important properties of an Indifference curve are: indifference curve slopes downwards to the right, it is always convex to the origin, two ICs never intersect each other, it will never touch the axes and higher the indifference curve higher is the level of satisfaction.
- Budget line or price line shows all those combinations of two goods which the consumer can buy spending his given money income on the two goods at their given prices.
- A consumer is said to be in equilibrium when he is deriving maximum possible satisfaction from the goods and is in no position to rearrange his purchase of goods.
- The consumer attains equilibrium at the point where the budget line is tangent to the indifference curve and \( \frac{\text{MU}_x}{P_x} = \frac{\text{MU}_y}{P_y} = \frac{\text{MU}_z}{P_z} \).