# Demand Analysis

In this chapter, we shall study the law of demand and in the next the elasticity of demand. But before we analyse them, it is essential to understand the nature of the term 'demand' in economics.

## <<< Meaning of Demand

The demand for a commodity is its quantity which consumers are able and willing to buy at various prices during a given period of time. So, for a commodity to have demand, the consumer must possess willingness to buy it, the ability or means to buy it, and it must be related to per unit of time i.e. per day, per week, per month or per year. According to Prof. Bober, "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."

### Demand Functions

The demand function is an algebraic expression of the relationship between demand for a commodity and its various determinants that affect this quantity.

There are two types of demand functions:

**(i) Individual Demand Function.** An individual's demand function refers to the quantities of a commodity demanded at various prices, given his income, prices of related goods and tastes. It is expressed as

$$D = f(P)$$

**(ii) Market Demand Function.** An individual demand function is the basis of demand theory. But it is the market demand function that is main interest to managers. It refers to the total demand for a good or ser-

vice of all the buyers taken together. The market demand function may be expressed mathematically thus

$$Dx = f(Px, Py, M, T, A, U)$$

Where

Dx = Quantity demanded for commodity x

f = functional relation

Px = Price of commodity x

Pr = Prices of related commodities i.e. substitutes and complementaries

M = The money income of the consumer

T = The taste of the consumer

A = The advertisement effect

U = Unknown variables

By demand function, economists mean the entire functional relationship. This means the whole range of price quantity relationship and not just the quantity demanded at a given price per unit of time. The demand function expressed above is really just a listing of variables that affect the demand. The demand function must be made explicit and clear for use in managerial decision making. The industry must have reasonably good knowledge and information about its demand function to formulate effective long run planning decisions and short run operating decisions.

The basic assumption in demand schedule and demand curve has been the relationship between price and quantity of a commodity signifying a change in price to bring a change in quantity demanded with all other variables assumed constant and unchanged. In demand function this assumption is relaxed and it is held emphatically that besides change in price there are other variables which influence the demand for a particular commodity.

Classical economists were aware of the fact that the price is not the only factor which determines sales but that other factors, too, have an inportant effect on them. These other factors are the income of the consumer, their tastes, habits, preferences, etc. When these factors influence the demand the demand is said to shift. But their price-demand

relationship is not as important to the management as the shift in demand, which constitutes the demand function. Shifting of demand curve renders the demand analysis difficult. Therefore, demand fuction makes use of mathematical formulation to arrive at correct results. Recenty more sophisticated methods have been developed for the study like simultaneous equation and mathematical programming which helps in arriving at precise results.

## <<< TYPES OF DEMAND

Managerial decisions require the knowledge of various types of demand. We explain below a few important types.

### Demand for Consumers' Goods and Producers' Goods

Consumers' goods are those final goods which directly satisfy the wants of consumers. Such goods are bread, milk, pen, clothes, furniture, etc. Producers' goods are those goods which help in the production of other goods that satisfy the wants of the consumers directly or indirectly, such as machines, plants, agricultural and industrial raw material, etc. The demand for consumers' goods is known as direct or autonomous demand. The demand for producers' goods is derived demand because they are demanded not for final consumption but for the production of other goods.

Joel Dean gives the following reasons of the demand for producers' goods:

(1) Buyers are professionals, and hence more expert, price-wise and sensitive to substitutes.

(2) Their motives are purely economic: products are bought, not for themselves alone, but for their profit prospects.

(3) Demand, being derived from consumption demand, fluctuates differently and generally more violently.

The distintion between consumers' goods and producers' goods is based on the uses to which these goods are put. There are many goods such as electricity, coal, etc. which are used both as consumers' goods and producers' goods. Still, this distinction is useful for the appropriate demand analysis.

### Demand for Perishable and Durable Goods

Consumers' and producer's goods have been classified further into perishable and durable goods. In economics, perishable goods are the goods which are used up in a single act of consumption while durable goods are the goods which can be used time and again for a considerable period of time. In other words, perishable goods are consumed automatically while only services of durable goods are consumed. Thus, perishable goods include all types of services, foodstuffs, raw materials, etc. On the other hand, durable goods consist of buildings, machines, furnitures, etc. This distinction has great importance because in the demand analysis durable goods create more complex problems than non-durable goods. Non-durable goods are often sold to meet the current demand which is based on existing conditions. On the other hand, the sale of durable goods increases the stock of available goods whose services are consumed over a period of time. The demand for perishable goods is more elastic while the demand for non-durable goods is less elastic in the short-run and their demand tends to be more elastic in the long run. According to J.Dean, the demand for durable goods is more unstable in relation to the business conditions. Postponement, replacement, storage and expansions are inter-related problems which are included in the determination of demand for durable goods.

## Derived and Autonomous Demand

When the demand for a particular product is dependent upon the demand for some other goods, it is called derived demand. In many cases, derived demand of a product is due to its being a component part of the parent product. For example, demand for cement is dependent upon the demand for houses. The inputs or commodities demanded for further production have derived demand. The demand for raw materials, machines, etc. do not fulfil any direct consumption need of the buyer but they are needed for the production of goods having direct demand. Therefore, they fall in the category of derived demand. If demand for final product increases, the derived demand for related product also increases. If demand for the former falls, the demand for the latter also decreases.

On the other hand, when demand for a particular product is independent of the demand for other products, such a demand is called autonomous demand. The demand for consumer goods is autonomous. It is the one where a commodity is demanded because it is needed for direct consumption. For example, T.V., furniture, etc.

To distinguish between derived demand and autonomous demand is not an easy job. There is a thin line of demarcation between the two. In

fact, mostly demand is derived demand. For example, even the demand for a car by a household is derived from the demand for transport service. Thus, the distinction between the two is rather arbitrary and a matter of degree.

Derived demand is generally less price elastic that the autonomous demand. In the case of derived demand, the impact of price on demand gets diluted by other components in production whose prices are sticky.

## Industry and Company Demand

Industry demand refers to the total demand for the products of a particular industry, that is, the total demand for paper in the country. On the other hand, company demand denotes the demand for the products of a particular company (firm), that is, the demand for paper produced by Bellarpur Paper Mills. Industry demand covers the demand of all firms producing similar products which are close substitutes to each other irrespective of differences in trade names, such as Close-up, Colgate, Pepsodent, etc.

Industry demand is less price elastic than company demand. However, the structure of the market decides the degree of price-demand relationship of the company demand:

(*i*) In the case of perfect competition the degree of substitutability being perfect, the company demand for the product tends to be perfectly elastic.

(*ii*) In monopoly market, there is only one firm and the firm is itself an industry. In such a case, the company demand curve is the same as that of the industry demand curve.

(*iii*) In homogeneous oligopoly, business is highly transferable among rivals. The company demand curve remains uncertain because it depends upon what its rivals do. Usually, the sellers charge the same price to stay in the market.

(*vi*) In differentiated oligopoly, the company demand is less closely related to the industry demand. Sellers try to differentiate their products from each other. Hence, the price competition is lower than the homogeneous oligopoly market.

(*v*) If there is monopolistic competition, the company demand curve is more price elastic than the industry demand curve.

## Short-run Demand and Long-run Demand

In the case of perishable commodities such as vegetables, fruit, milk, etc., the change in quantity demanded to a change in price occurs quickly. For such commodities, there is a single demand curve with the usual negative slope. But in the case of durable commodities such as equipments, machines, clothes, and others, a change in price will not have its ultimate effect on the quantity demanded until the existing stock of the commodity is adjusted which may take a long time. A short-run demand curve shows the change in quantity demanded to a change in price, given the existing stock of the durable commodity and the supplies of its substitutes. On the other hand, the long-run demand curve shows the change in quantity demanded to a change in price after all adjustments have been made in the long-run. According to Joel Dean, "Short-run demand refers to existing demand with its immediate reaction to price changes, income fluctuation, etc., whereas long-run demand is that which will ultimately exist as a result of the changes in pricing, promotion or product improvement, after enough time is allowed to let the market adjust itself to the new situation."

## Joint Demand and Composite Demand

When two or more goods are jointly demanded at the same time to satisfy a single want it is called joint or complementary demand.

Joint demand refers to the relationship between two or more commodities or services when they are demanded together. There is joint demand for cars and petrol, pens and ink, tea and sugar, etc. Jointly demanded goods are complementary. A rise in the price of one leads to a fall in the demand for the other and vice-versa. For example , a rise in the price of cars will bring a fall in their demand together with the demand for petrol and lower its price, if the supply of petrol remains unchanged. On the contrary, a fall in the price of cars, as a result of a fall in the cost of production of cars, will increase their demand, and therefore increase the demand for petrol and raise its price, if available supplies of petrol are unchanged. A commodity is said to have composite demand when it can be put to several alternative uses. This is not only peculiar to commodities like leather, steel, coal, paper, etc. but also to factors of production like land, labour and capital. For example, coal is demanded by railways, by factories, by households, etc. There is competition among the different uses of a commodity in composite demand. Hence, each use of the commodity is the rival of the other uses. So it is also called rival demand. Any change in the demand for a commodity by a user will affect the supply of the other users which will change their prices.

# <<< An Individual's Demand Schedule and Curve

An individual consumer's demand refers to the quantities of a commodity demanded by him at various prices, other things remaining equal ($y,pr$ and $t$). An individual's demand for commodity is shown on the demand schedule and on the demand curve. A *demand schedule* is a list of prices and quantities and its graphic representation is a *demand curve*.

**Table 1**

**Individual Demand Schedule**

| Price (Rs.) | Quantity (Units) |
|:-----------:|:----------------:|
| 5 | 5 |
| 4 | 10 |
| 3 | 15 |
| 2 | 20 |
| 1 | 25 |

The demand schedule reveals that when the price is Rs 5, the quantity demanded is 5 units. If the price happens to be Rs 4, the quantity demanded is 10 units, and ultimately the price being Re.1, 25 units are demanded. In Figure 1. $DD_1$ is the demand curve drawn on the basis of the above demand schedule. The dotted points $P,Q,R,S$ and $T$ show the various price-quantity combinations. Marshall call them "demand points". The first combination is represented by the first dot and the remaining price-quantity combinations move to the right towards $D_1$.

# <<< The Market Demand Schedule and Curve

In a market, there is not one consumer but many consumers of a commodity. The market demand of a commodity is depicted on a demand schedule and a demand curve. They show the sum total of various quantities demanded by all the individuals at various prices. Suppose there are two individuals $A$ and $B$ in a market who purchase the commodity. The demand schedule for the commodity is depicted in Table 2

The Table represents the market demand of orange at various prices. It is arrived at by adding the demand of consumers A and B. When the price is very high, Rs 5 per unit, the market demand for orange is 15 units. As the price falls, the demand increases. When the price is the lowest, Re. 1 per unit, the market demand is 75 units.
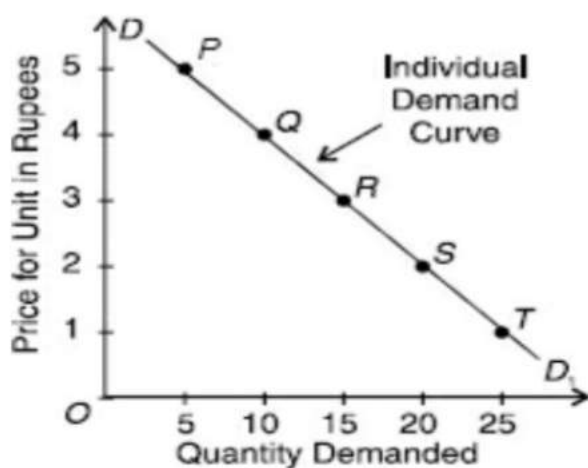


Fig. 1

### Table 2
### Market Demand Schedule

| Price (Rs.) | Quantity Demanded A+B | | Aggregate Demand |
|---|---|---|---|
| 5 | 5+10 | = | 15 |
| 4 | 10+20 | = | 30 |
| 3 | 15+30 | = | 45 |
| 2 | 20+40 | = | 60 |
| 1 | 25+50 | = | 75 |

From Table 2 we draw the market demand curve in Figure 2. $D_M$ is the market demand curve which is the horizontal summation of the two individual demand curves $D_A$ + $D_B$. The market demand for a commodity depends on all factors that determine an individual's demand.[1]
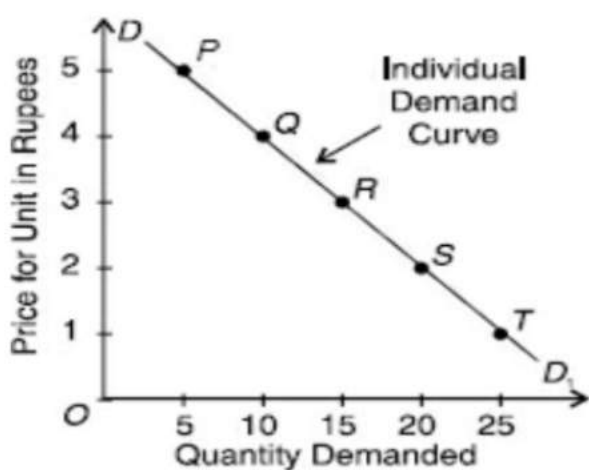


Fig. 1

But a better way of drawing a *market demand curve* is to add together sideways (lateral summation) of all the individual demand curves. In this case, the different quantities demanded by consumers at one price are represented on each individual demand curve and then a lateral summation is done, as shown in Figure 3. Suppose there are three individuals A, B and C in a market who buy OA, OB and OC quantities of the commodity at the price OP, as shown in Panels (A), (B) and (C) respectively in Figure 3. In the market, OQ quantity will be bought which is made up by adding together the

quantities *OA*, *OB* and *OC*. The market demand curve, $D_M$ is obtained by the lateral summation of the individual demand curves $D_A$, $D_B$ and $D_C$ in panel (D).
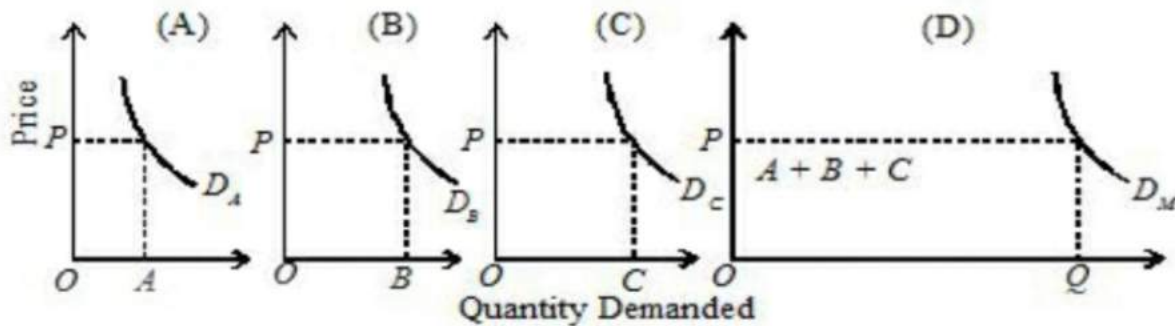


Fig. 3

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1. This is a detailed method. For a simple exposition, students may attempt the method given below.

## CHANGES IN DEMAND

Changes in demand take place in two ways: (1) increase and decrease in demand; and (2) extension and contraction in demand.

### (1) Increase and Decrease in Demand

An individual's demand curve is drawn on the assumption that factors such as prices of other commodities, income and tastes influencing his demand remain constant. What happens to an individual's demand curve if there is a change in any one of the factors affecting his demand, the other factors remaining constant? When any one of the factors changes, the entire demand curve shifts either to the right or to the left when the consumer buys more of the commodity at the same price, it is increase in demand. When his money income rises, other factors remaining constant, his demand curve for a commodity will shift to the right . This is shown in Figure 4. Before the rise in his income, the consumer is buying *OQ* quantity at *OP* price on the *DD* demand curve. With the increase in income, his demand curve shifts to the right as $D_1D_1$. He now buys more quantity $OQ_1$ at the same price *OP*. On the contrary, if his income falls, his demand curve will shift to the left. He will buy less of the commodity at the same price, as shown in Figure. 5. Before the fall in his income, the consumer is on the demand curve $D_1 D_1$ where he is buying $OQ_2$ of the commodity at *OP* price. He now buys less quantity $OQ_2$ at the given price *OP*. When the consumer buys less of the commodity at a given price, this is called the *decrease in demand*.
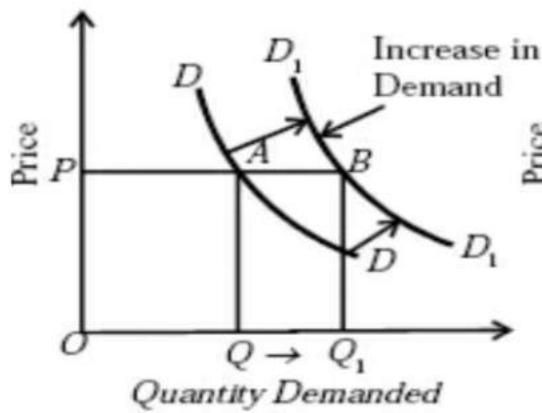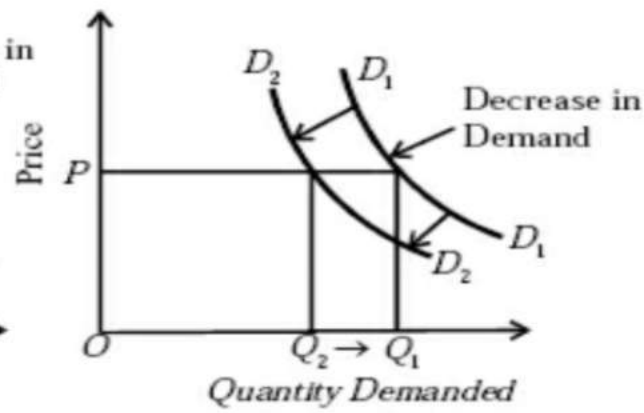
Fig. 4



Fig. 5

Demand curves are thus not stationary. Rather, they shift to the right or left due to a number of causes. There are changes in tastes, habits and customers of the consumers; changes in income and expenditure; changes in the prices of substitutes and complements; expectations about future in prices and incomes and changes in the age and composition of the population, etc.

## (2) Extension and Contraction in Demand

A *movement along a demand curve* takes place when there is a *change in the* quantity demanded due to a change in the *commodity's own price* and not due to any other factor. This is illustrated in Figure 6. which shows that when the price is $OP_1$, the quantity demanded is $OQ_1$. With the fall in price, there has been a downward movement along the same demand curve $D_1D_1$ from point A to B. This is known as extension in demnad. On the contrary, if we



Fig. 6

take B as the original price-demand point, then a rise in the price from $OP_2$ to $OP_1$ leads to a fall in the quantity demanded from $OQ_2$ to $OQ_1$. The consumer moves upwards along the same demand curve $D_1D_1$ from point B to A. This is known as *contraction in demand*.
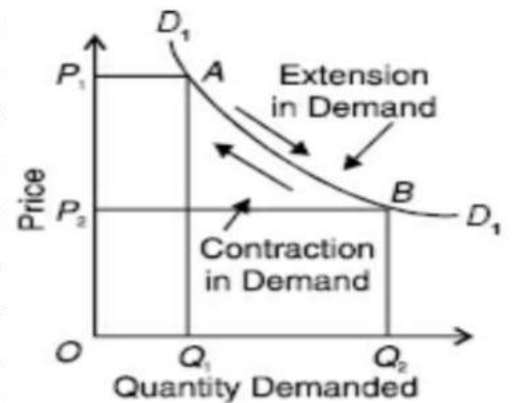
## <<< THE LAW OF DEMAND

The law of demand expresses a relationship between the quantity demanded and its price. It may be defined in Marshall's words as "the amount demanded increases with a fall in price, and diminishes with a rise in price". Thus it expresses an inverse relation between price and demand. The law refers to the direction in which quantity demanded changes with a change in price. On the figure, it is represented by the

slope of the demand curve which is normally negative throughout its length. The inverse price-demand relationship is based on *other things remaining equal*. This phrase points towards certain important assumptions on which this law is based.

## Its Assumptions

These assumptions are:

(*i*)    there is no change in the tastes and preferences of the consumer;

(*ii*)    the income of the consumer remains constant;

(*iii*)    there is no change in customs;

(*iv*)    the commodity to be used should not confer distinction on the consumer;

(*v*)    there should not be any substitutes of the commodity;

(*vi*)    there should not be any change in the prices of other products;

(*vii*)    there should not be any possibility of change in the price of the product being used;

(*viii*)    there should not be any change in the quality of the product; and

(*ix*)    the habits of the consumers should remain unchanged. Given these conditions, the law of demand operates. If there is change even in one of these conditions, it will stop operating,

Given these assumptions, the law of demand is explained in terms of Table 3 and Figure 7.

**Table 3.**

**Demand Schedule**

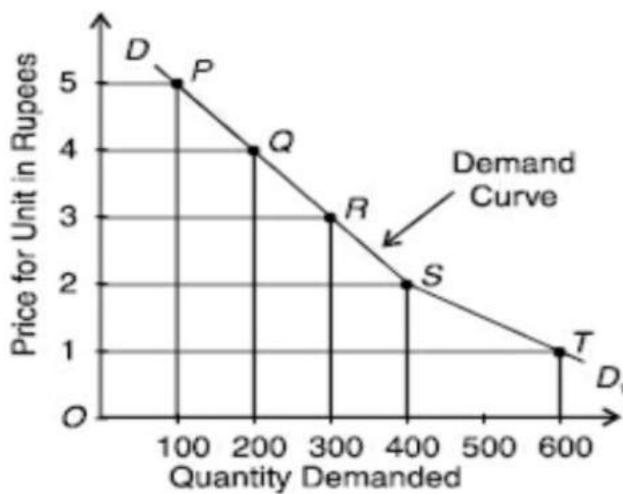| Price (Rs) | Quantity Demanded |
|---|---|
| 5 | 100 Units |
| 4 | 200 Units |
| 3 | 300 Units |
| 2 | 400 Units |
| 1 | 600 Units |

Fig. 7

The above table shows that when the price of say, orange, is Rs. 5 per unit, 100 units are demanded. If the price falls to Rs.4, the demand increases to 200 units. Similarly, when the price declines to Re.1, the demand increases to 600 units. On the contrary, as the price increases from Re. 1, the demand continues to decline from 600 units.

In the figure, point P of the demand curve $DD_1$ shows demand for 100 units at the Rs. 5. As the price falls to Rs. 4, Rs. 3, Rs. 2 and Re. 1, the demand rises to 200, 300, 400 and 600 units respectively. This is clear from points Q, R, S, and T. Thus, the demand curve $DD_1$ shows increase in demand of orange when its price falls. This indicates the inverse relation between price and demand.

## Causes of Downward Sloping Demand Curve

Why does a demand curve slope downward from left to right? The reasons for this also clarify the working of the law of demand. The following are the main reasons for the downward sloping demand curve.

(1) The law of demand is based on the *law of Diminishing Marginal Utility.* According to this law, when a consumer buys more units of a commodity, the marginal utility of that commodity continues to decline. Therefore, the consumer will buy more units of that commodity only when its price falls. When less units are available, utility will be high and the consumer will be prepared to pay more for the commodity. This proves that the demand will be more at a lower price and it will be less at a higher price. That is why the demand curve is downward sloping.

(2) Every commodity has certain consumers but when its price falls, new consumers start consuming it, as a result demand increases. On the contrary, with the increase in the price of the product, many consumers will either reduce or stop its consumption and the demand will be reduced. Thus, due to the *price effect* when consumers consume more or less of the commodity, the demand curve slopes downward.

**(3)** When the price of a commodity falls, the real income of the consumer increases because he has to spend less in order to buy the same quantity. On the contrary, with the rise in the price of the commodity, the real income of the consumer falls. This is called the *income effect*. Under the influence of this effect, with the fall in the price of the commodity the consumer buys more of it and also spends a portion of the increased income in buying other commodities. For instance, with the fall in the price of milk, he will buy more of it but at the same time, he will increase the demand for other commodities. On the other hand, with the increase in the price of milk he will reduce its demand. The income effect of a change in the price of an ordinary commodity being positive, the demand curve slopes downward.

**(4)** The other effect of change of the price of the commodity is the *substitution effect*. With the fall in the price of a commodity, the prices of its substitutes remaining the same, consumers will buy more of this commodity rather than the substitutes. As a result, its demand will increase. On the contrary, with the rise in the price of the commodity (under consideration) its demand will fall, given the prices of the substitutes. For instance, with the fall in the price of tea, the price of coffee being unchanged, the demand for tea will rise, and contrariwise, with the increase in the price of tea, its demand will fall.

**(5)** There are persons in *different income groups* in every society but the majority is in low income group. The downward sloping demand curve depends upon this group. Ordinary people buy more when price falls and less when price rises. The rich do not have any effect on the demand curve because they are capable of buying the same quantity even at a higher price.

**(6)** There are *different uses* of certain commodities and services that are responsible for the negative slope of the demand curve. With the increase in the price of such products, they will be used only for more important uses and their demand will fall. On the contrary, with the fall in price, they will be put to various uses and their demand will rise. For instance, with the increase in the electricity charges, power will be used primarily for domestic lighting, but if the charges are reduced, people will use power for cooking, fans, heaters, etc.

**(7)** *There is a tendency to satisfy unsatisfied wants.* Each person has some unsatisfied wants. When the price of a good such as apple falls, he wants to satisfy his unsatisfied wants which leads him to increase its demand. Because of this tendency of human beings, the demand curve slopes downwards to the right.

# Exceptions to the Law of Demand

In certain cases, the demand curve slopes up from left to right, i.e., it has a positive slope. Under certain circumstances, consumers buy more when the price of a commodity rises, and less when price falls, as shown by the *D* curve in Figure 8. Many causes are attributed to an upward sloping demand curve.

**(i) War.** If shortage is feared in anticipation of war, people may start buying for building stocks or for hoarding even when the price rises.

**(ii) Depression.** During a depression, the prices of commodities are very low and the demand for them is also less. This is because of the lack of purchasing power with consumers.



Fig. 8

**(iii) Giffen Paradox.** If a commodity happens to be a necessity of life like wheat and its price goes up, consumers are forced to curtail the consumption of more expensive foods like meat and fish, and wheat being still the cheapest food they will consume more of it. The Marshallian example is applicable to developed economies. In the case of an underdeveloped economy, with the fall in the price of an inferior commodity like maize, consumers will start consuming more of the superior commodity like wheat. As a result, the demand for maize will fall. This is what Marshall called the *Giffen Paradox* which makes the demand curve to have a positive slope.

**(iv) Demonstration Effect.** If consumers are affectd by the principle of conspicuous consumption or demonstration effect, they will like to buy more of those commodities which confer distinction on the possessor, when their prices rise. On the other hand, with the fall in the prices of such articles, their demand falls, as is the case with diamonds.

**(v) Ignorance Effect.** Consumers buy more at a higher price under the influence of the "ignorance effect", where a commodity may be mistaken for some other commodity, due to deceptive packing, label, etc.

**(vi) Speculation.** Marshall mentions speculation as one of the important exceptions to the downward sloping demand curve. According to him, the law of demand does not apply to the demand in a campaign between groups of speculators. When a group unloads a great quantity of a thing on to the market, the price falls and the other group begins buying

it. When it has raised the price of the thing, it arranges to sell a great deal quietly. Thus when price rises, demand also increases.

**(vii) Necessities of Life.** Normally, the law of demand does not apply on necessities of life such as food, cloth etc. Even the price of these goods increases, the consumer does not reduce their demand. Rather, he purchases them even the prices of these goods increase often by reducing the demand for comfortable goods. This is also a reason that the demand curve slopes upwards to the right.

## <<< INCOME DEMAND

We have so far studied price demand in its various aspects, keeping other things constant. Let us now study *income demand* which indicates the relationship between income and the quantity of commodity demanded. It relates to the various quanti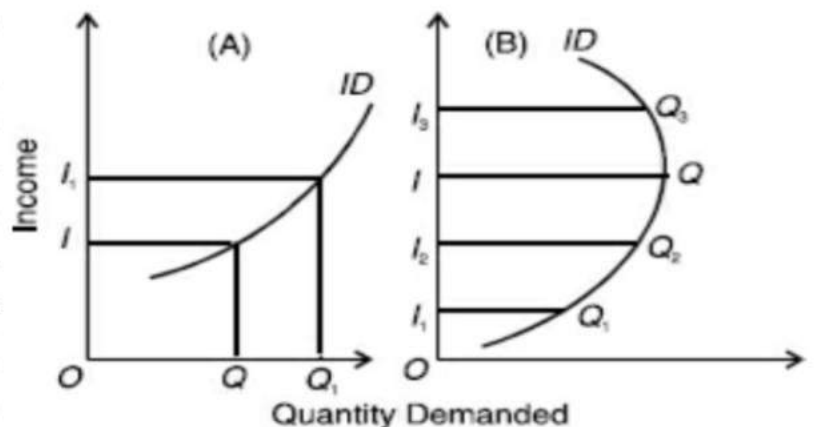ties of a commodity or service that will be bought by the consumer at various levels of income in a given period of time, other things being equal. Things that are assumed to remain equal are the price of the commodity in question, the prices of related commodities, and the tastes, perferences and habits of the consumer for it. The income-demand function for a commodity is written as $D = f(y)$. The income-demand relationship is usually direct. The demand for the commodity increases with the rise in income and decreases with the fall in income, as shown in Figure 9. When income is $OI$, the quantity demanded is $OQ$ and when income rises to $OI_1$ the quantity demanded also increases to $OQ_1$. The reverse case can also be shown likewise. Thus, the income demand curve $ID$ has a positive slope. But this slope is in the case of normal goods.
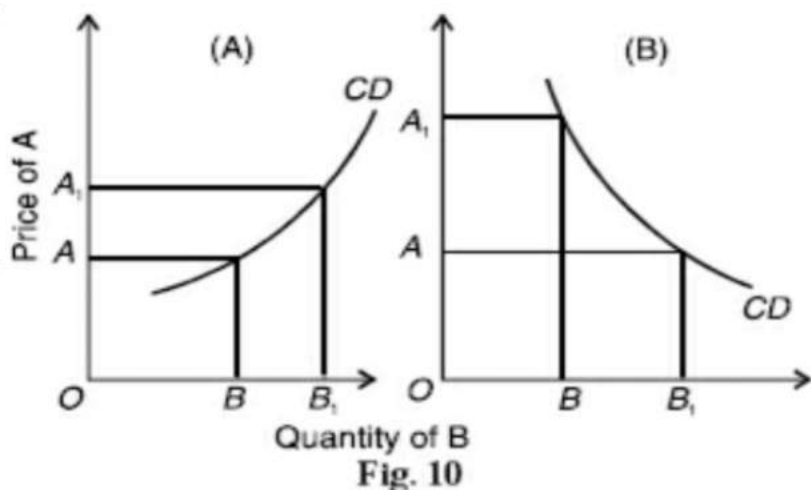
Let us take the case of a consumer who is in the habit of consuming an *inferior good.* So long as his income remains below a particular level of his minimum subsistence, he will continue to buy more of this inferior good even when his income increase by small increments. But when his income starts rising above that level, he reduces his demand for the inferior good. In Figure 9(B), $OI$ is the minimum subsistence level of income where he buys $IQ$ of the commodity. Upto this level, this commodity is

a normal good for him so that he increases its consumption when his income rises gradually from $OI_1$ to $OI_2$. As his income rises above $OI$, he starts buying less of the commodity. For instance, at $OI_3$ income level, he buys $I_3Q_3$ which is less than $IQ$. Thus, in the case of inferior foods, the income demand curve $ID$ is backward sloping.

## <<< CROSS DEMAND

Let us now take the case of *related goods* and how the change in the price of one affects the demand of the other. This is known as *cross demand* and is written as $D = f(pr)$. Related goods are of two types, substitutes and complementary. In the case of *substitute* or *competitive* goods, a rise in the price of one good $A$ raises the demand for the other good $B$, the price of $B$ remaining the same. The opposite holds in the case of a fall in the price of $A$ when the demand for $B$ falls. Figure 10 (A) illustrates it. When the price of good $A$ increases from $OA$ to $OA_1$ the quantity of good $B$ also increases from $OB$ to $OB_1$. The cross demand curve $CD$ for substitutes is posititively sloping. For with the rise in the price of $A$, the consumers will shift their demand to $B$ since the price of $B$ remains unchanged. It is also assumed here that the incomes, tastes, preferences, etc. of the consumers do not change.

In case the two goods are *complementary* or jointly demanded, a rise in the price of one good $A$ will bring a fall in the demand for good $B$. Conversely, a fall in the price of $A$ will raise the demand for $B$ . This is illustrated in Figure 10 (B) where when the price of $A$ falls from $OA_1$ to $OA$, the demand for $B$ increases from $OB$ to $OB_1$. The demand curve in the case of complementary goods is negatively sloping like the ordinary demand curve.

If, however, the two goods are *independent*, a change in the price of $A$ will have no effect on the demand for $B$. We seldom study the relation between two unrelated goods like wheat and chairs. Mostly as consumers, we are concerned with the price-demand relation of substitutes and complementary goods.

The demand for the product is mainly the attitude of consumers towards the product. The attitude of consumers gives rise to actions in buying different products at different prices. The demand for a product is determined by differnt factors. The main demand determinants are price, income, price of related goods and advertising. Therefore, demand is a multivariate relationship, i.e. it is determined by many factors simultaneously.

## (A) Determinants of Individual Demand

Let us discuss the variables which influence the individual demand.

### 1. Price of the Commodity

This is the basic factor influencing the demand. There is a close relationship between the quantity demanded and the price of the product. Normally a larger quantity is demanded at a lower price that at a higher price. There is inverse relationship between the price and quantity demanded. This is called the law of demand.

### 2. Income of the Consumer

The income of the consumer is another important variable which influences demand. The ability to buy a commodity depends upon the income of the consumer. When the income of the consumers increases, they buy more and when income falls they buy less. A rich consumer demands more and more goods because his purchasing power is high.

### 3. Tastes and Preferences

The demand for a product depends upon tastes and preferences of the consumers. If the consumers develop taste for a commodity they buy whatever may be the price. A favourable change in consumer preference will cause the demand to increase. Likewise an unfavourable change in consumer preferences will cause the demand to decrease.

### 4. Prices of Related Goods

The related goods are generally substitutes and complementary goods. The demand for a product is also influenced by the prices of substitutes

and complements. When a want can be satisfied by alternative similar goods they are called substitutes, such as coffee and tea. Whenever the price of one good and the demand for another are inversely related then the goods are said to be complementary, such as car and petrol.

## 5. Advertisement and Sales Propaganda

In modern times, the preferences of consumers can be altered by advertisement and sales propaganda. Advertisement helps in increasing demand by informing the potential consumers about the availability of the product, by showing the superiority of the product, and by influencing consumer choice against the rival products. The demand for products like detergents and cosmetics is mainly caused by advertisement.

## 6. Consumer's Expectation

A consumer's expectation about the future changes in price and income may also affect his demand. If a consumer expects a rise in prices he may buy large quantities of that particular commodity. Similarly, if he expects its prices to fall in future, he will tend to buy less at presnt. Similarly, expectation of rising income may induce him to increase his current consumption.

## (B) Determinants of Market Demand

Market demand for a product refers to the total demand of all the buyers taken together. How much quantity the consumers in general would buy at a given period of time constitutes the total market demand for the product. The following factors affect the market demand pattern of a commodity:

**1. Price of the Product.** The law of demand states that if other things remain the same when price falls, demand increases and vice-versa.

**2. Standard of Living and Spending Habits.** When people are accustomed to high standard of living their spending on comforts and luxuries also increase, that automatically increase the demand.

**3. Distribution of Income Pattern.** If the distribution pattern of income is fair and equal the market demand for essential items tends to be greater.

**4. The Scale of Preferences.** The market demand for a product is also affected by the scale of preference of buyers. If there is a shift in consumers' preference from $x$ to $y$, the demand for $y$ tends to increase.

**5. The Growth of Population.** The growth of population is also another important factor that affects the market demand. With the increase in population, people naturally demand more goods for their survival.

**6. Social Customs and Ceremonies**. Social customs and ceremonies are usually celebrated collectively. They involve extra expenditure on certain items and thereby increase the demand.

**7. Future Expectation.** People are not sure about their future, because future is uncertain. If the consumers expect a rise in prices of products, they buy more at present and preserve the same for the future, thereby the market demand would be affected.

**8. Tax Rate.** The tax rate also affects the demand. High tax rate would generally mean a low demand for the goods. At certain times the government restricts the consumption of a commodity and use the tax as a weapon. A highly taxed commodity will have a lower demand.

**9. Inventions and Innovations.** Inventions and innovations introduce new goods in the market. The consumers will have a strong tendency to purchase the new product. The preference over the new goods adversely affects the demand for the existing goods in the market.

**10. Weather Conditions.** Seasonal factors also affect the demand. The demand for certain items purely depends on climatic and weather conditions. For example, the growing demand for cold drinks during the summer season and the demand for sweaters during the winter season.

**11. Availability of Credit.** The purchasing power is influenced by the availability of credit. If there is availability of cheap credit, the consumers try to spend more on consumer durables thereby the demand for certain products increase.

**12. Pattern of Saving.** Demand is also influenced by the pattern of saving. If people begin to save more, their demand will decrease. It means the disposable income will be less to purchase the goods and services. On the contrary, if saving is less their demand will increase.

**13. Demonstration Effect.** Demonstration effect helps to increase human wants. In underdeveloped countries, there is a desire in the minds of the people to imitate other people for conspicuous consumption and that is why they are not able to save. This change in the saving habits of the people is due to "contact effect". The demonstration effect has a positive effect on the demand for comforts and luxury goods.

# THE ELASTICITY OF DEMAND

## <<< INTRODUCTION

This chapter studies in detail the concepts of elasticity of demand. Generally, elasticity of demand refers to price elasticity of demand which is often called *own* price elasticity of demand, though the notion of elasticity of demand also relates to income, cross and substitution elasticities of demand. We discuss in detrail each type of demand elasticity.

## << PRICE ELASTICITY OF DEMAND

### Meaning

The elasticity of demand is the degree of responsiveness of demand to change in price. In the words of Prof. Lipsey: "Elasticity of demand may be defined as the ratio of the percentage change in demand to the percentage change in price." Mrs. Robinson's definition is more clear: "The elasticity of demand at any price.... is the proportional change of amount purchased in response to a small change in price, divided by the proportional change of price." Thus, price elasticity of demand is the ratio of percentage change in amount demanded to a percentage change in price. It may be written as

$$E_p = \frac{Percentage\ change\ in\ amount\ demanded}{Percentage\ change\ in\ price}$$

If we use Δ (delta) for a change, *q* for amount demanded and *p* for price, the algebraic equation is

$$E_p = \frac{\frac{\Delta q}{q}}{\frac{\Delta p}{p}} = \frac{\Delta q}{q} \times \frac{p}{-\Delta p} = -\frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

*Ep, the coefficient* of price elasticity of demand is always negative because when price changes demand moves in the opposite direction. It is, however, customary to disregard the negative sign. If the percentages for quantity and prices are known the value of the coefficient $E_p$ can be calculated.

Price elasticity of demand may be unity, greater than unity, less than unity, zero or infinite. These five cases are explained with the aid of the following figures.

Price elasticity of demand is *unity* when the change in demand is exactly proportionate to the change in price. For example, a 20% change in price causes 20% change in demand, $E_p$ = 20%/20% =1. In the diagrams of Figure 1, $\Delta p$ represents change in price, $\Delta q$ change in demand, and *DD* the demand curve . Price elasticity on the first demand curve in Panel (A) is unity, for $\Delta q/\Delta p$ = 1.
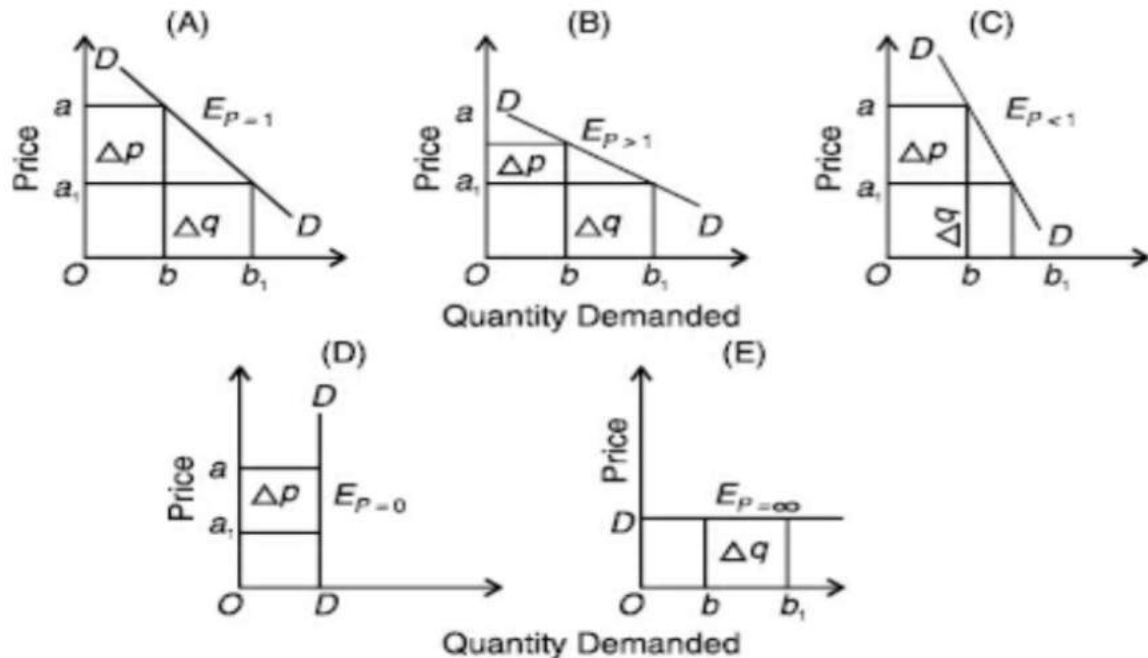


Fig. 1

When the change in demand is more than proportionate to the change in price, price elasticity of demand is *greater than unity*. If the change in demand is 40% when price changes by 20% then $E_p$ = 40%/20% = 2, in Panel (B),i.e. $\Delta q$ /$\Delta p$> 1. It is also known as *relatively elastic demand.*

If, however, the change in demand is less than proportionate to the change in price, price elasticity of demand is *less than unity*. When a 20% change in price causes 10% change in demand, then $E_p$ = 10%/20% =

1/2 =<1, in Panel (C), i.e. $\Delta q/\Delta p<1$. It is also known as *relatively inelastic demand.*

Zero elasticity of demand is one when whatever the change in price, there is absolutely no change in demand. Price elasticity of demand is perfectly inelastic in this case. A 20% rise or fall in price leads to no change in the amount demanded, $E_p = 0/20\% = 0$, in Panel (D), i.e.$0/\Delta p = 0$. It is *perfectly inelastic demand.*

Lastly, price elasticity of demand is *infinity* when as infinitesimal small change in price leads to an infinitely large change in the amount demanded. Visibly, no change in price causes an infinite change in de-mand, $E_p = \infty/0 =\infty$, in Panel (E), at *OD* price, the quantity demanded con-tinues to increase from $O_b$ to $O_{b1}$......$n$. It is *perfectly elastic demand.*

## Methods of Measuring Price Elasticity of Demand

There are four methods of measuring elasticity of demand. they are the percentage method, point method, arc method and expenditure method.

**(1) The Percentage Method.** The price elasticity of demand is mea-sured by its coefficient (*Ep*). This coefficient (*Ep*) measures the percent-age change in the quantity of a commodity demanded resulting from a given percentage change in its price. Thus

$$E_p = \frac{\% \ change \ in \ q}{\% \ change \ in \ p} = \frac{\Delta q / q}{\Delta p / p} = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

Where $q$ refers to quantity demanded, $p$ to price and $\Delta$ to change. If $E_p>1$, demand is elastic. If $E_p<1$, demand is inelastic, and if $E_p =1$, de-mand is unitary elastic.

With this formula, we can compute price elasticities of demand on the basis of a demand schedule.

### Table.1 : Demand Schedule

| Combination | Price (Rs.) Per Kg. of X | Quantity Kgs.of X |
|---|---|---|
| A | 6 | 0 |
| B | 5 | 10 |
| C | 4 | 20 |

| | | |
|---|---|---|
| D | 3 | 30 |
| E | 2 | 40 |
| F | 1 | 50 |
| G | 0 | 60 |

Let us first take combinations B and D.

(*i*) Suppose the price of commodity X falls from Rs. 5 per kg. to Rs. 3 per kg. and its quantity demanded increases from 10 kgs.to 30 kgs. Then

$$E_p = \frac{\Delta q}{\Delta p} \times \frac{p}{q} = \frac{(30-10)}{(3-5)} \times \frac{5}{10} = \frac{20}{-2} \times \frac{5}{10} = -5 \text{ or} > 1.$$

This shows elastic demand or elasticity of demand *greater than* unitary.

**Note:** The formula can be understood like this:

$\Delta q = q_2 - q_1$ where $q_2$ is the new quantity (30 kgs.) and $q_1$ the original quantity (10 kgs.).

$\Delta P = p_2 - p_1$ where $p_2$ is the new price (Rs.3) and $p_1$ the original price (Rs.5).

In the formula, *p* refers to the original price ($p_1$) and *q* to original quantity ($q_1$). The opposite is the case in example (*ii*) below, where Rs. 3 becomes the original price and 30 kgs. as the original quantity.

(*ii*) Let us measure elasticity by moving in the reverse direction. Suppose the price of X rises from Rs. 3 per kg. to Rs. 5 per kg. and the quantity demanded decreases from 30 kgs. to 10 kgs. Then

$$E_p = \frac{\Delta q}{\Delta p} \times \frac{p}{q} = \frac{(10-30)}{(5-3)} \times \frac{3}{30} = \frac{-20}{2} \times \frac{3}{30} = -1$$

This shows *unitary* elasticity of demand.

Notice that the value of *Ep* in example (*ii*) differs from that in example (*i*) depending on *the direction in which we move. This difference in the elasticities is due to the use of a different base in computing percentage changes in each case.*

Now consider combinations D and F.

(*iii*)Suppose the price of commodity $X$ falls from Rs. 3 per kg to Re.1per kg. and its quantity demanded increases from 30 kgs. to 50 kgs. Then

$$E_p = \frac{\Delta q}{\Delta p} \times \frac{p}{q} = \frac{(50-30)}{(1-3)} \times \frac{3}{30} = \frac{20}{2} \times \frac{3}{30} = -1$$

This is again *unitary* elasticity.

(*iv*) Take the reverse order when the price rises from Re. 1 per kg. to Rs. 3 per kg. and the quantity demanded decreases from 50 kgs. to 30 kgs. Then

$$E_p = \frac{\Delta q}{\Delta p} \times \frac{p}{q} = \frac{(30-50)}{3-1} \times \frac{1}{50} = \frac{-20}{2} \times \frac{1}{50} = -\frac{1}{5} < 1$$

This shows *inelastic* demand or less than unitary.

The value of $E_p$ again differs in this example than that given in example (*iii*) for the reason stated above.

**(2) The Point Method.** Prof. Marshall devised a geometrical method for measuring elasticity at a point on the demand curve. Let *RS* be a straight line demand curve in Figure. 2. If the price falls from *PB* ( = *OA*) to *MD* ( = *OC*), the quantity demanded increases from *OB* to *OD*. Elasticity at point *P* on the RS demand curve according to the formula is:

$$E_p = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

Where $\Delta q$ represents change in quantity demanded, $\Delta p$ changes in price level while $p$ and $q$ are initial price and quantity levels.

From Figure 2.

From Figure 2.
$\Delta q = BD = QM$
$\Delta p = PQ$
$p = PB$
$q = OB$
Substituting these values in the elasticity formula:

$$E_p = \frac{QM}{PQ} \times \frac{PB}{OB}$$

Moreover, $\frac{QM}{PQ} \times \frac{BS}{PB}$

[$\angle PQM = \angle PBS$ being right angles and $PQM$ and $PBS$ are similar $\Delta_s$ ]

$$\therefore \frac{BS}{PB} \times \frac{PB}{OB} = \frac{BS}{OB}$$

Since, $\Delta PBS$ and $\Delta ROS$ are similar,

$$Ep \text{ at point } P = \frac{BS}{OB} = \frac{OA}{AR} = \frac{PS}{PR} = \frac{Lower\ Segment}{Upper\ Segment}$$
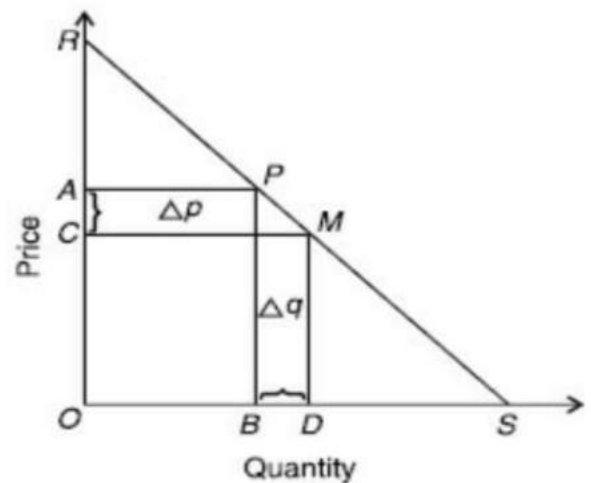


Fig. 2

With the help of the point method, it is easy to point out elasticity at any point along a demand curve. Suppose that the straight line demand curve DC in Figure. 3 is 6 centimeters. Five points L, M, N, P and Q are taken on this demand curve. The elasticity of demand at each point can be known with the help of the above method. Let point N be in the middle of the demand curve. So elasticity of demand at point.

$$N = \frac{CN\ (Lower\ Segment)}{ND\ (Upper\ Segment)} = \frac{3}{3} = 1\ (Unity)$$

Elasticity of demand at point

$$M = \frac{CM}{MD} = \frac{5}{1} = 5\ or > 1.$$

(Greater than Unity)
Elasticity of demand at point

$$L = \frac{CL}{LD} = \frac{6}{0} = \infty\ (infinity).$$

Elasticity of demand at Point

$$P = \frac{CP}{PD} = \frac{1}{5} = (Less\ than\ Unity).$$

Elasticity of demand at point

$$Q = \frac{CQ}{QD} = \frac{0}{6} = 0\ (Zero)$$

We arrive at the conclusion that at the mid-point on the demand curve, the elasticity of demand is unity. Moving up the demand curve from the mid-point, elasticity becomes greater. When the demand curve touches the Y-axis, elasticity is infinity. *Ipso facto*, any point below the mid point towards the X-axis will show elastic demand. Elasticity becomes zero when the demand curve touches the X -axis.

**(3) The Arc method.** We have studied the measurement of elasticity at a point on a demand curve. But when elasticity is measured between two points on the same demand curve, it is known as arc elasticity. In the words of Prof. Baumol, "Arc elasticity is a measure of the *average* responsiveness to price change exhibited by a demand curve over some finite stretch of the curve."

Fig. 3
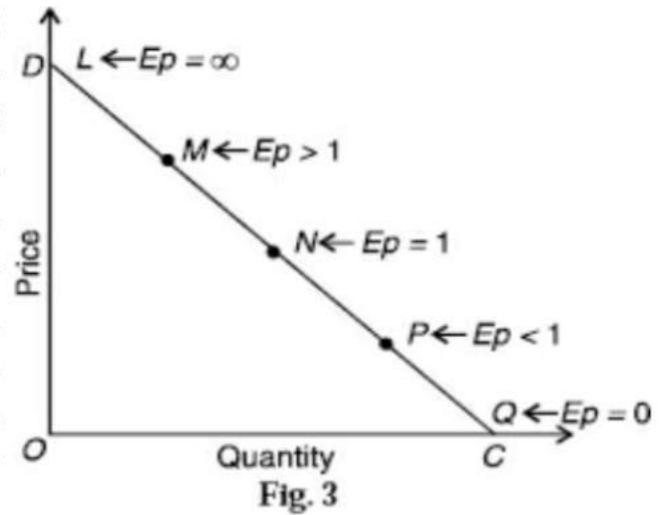
Any two points on a demand curve make an arc. The area between P and M on the DD curve in Figure. 4 is an arc which measures elasticity over a certain range of price and quantities. On any two points of a demand curve, the elasticity coefficients are likely to be different depending upon the method of computation. Consider the price-quantity combinations P and M as given in Table. 2.

### Table 2: Demand Schedule

| Point | Price (Rs) | Quantity (Kg) |
|-------|------------|---------------|
| P | 8 | 10 |
| M | 6 | 12 |

If we move from P to M, the elasticity of demand is

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{p}{q} = \frac{(12-10)}{(6-8)} \times \frac{8}{10} = \frac{2}{-2} \times \frac{8}{10} = \frac{4}{5}$$

If we move in the reverse direction from M to P, then

$$\frac{(10-20)}{(8-6)} \times \frac{6}{12} = \frac{-2}{2} \times \frac{6}{12} = -\frac{1}{2}$$

Thus the point method of measuring elasticity at two points on a demand curve gives different elasticity coefficients because we used a different base in computing the percentage change in each case.
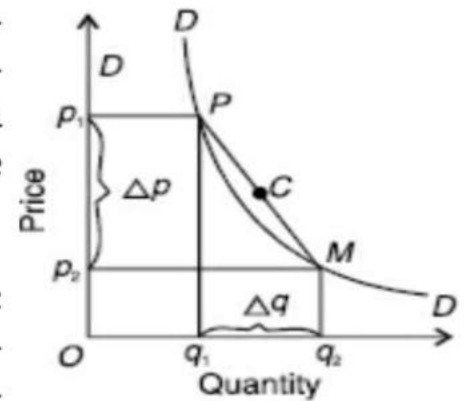
To avoid this discrepancy, elasticity for the arc (*PM* in Figure 4) is calculated by taking the average of the two prices $[(p_1 + p_2)^{1/2}]$ and the average of the two quantities $[(q_1 + q_2)^{1/2}]$. The formula for price elasticity of demand at the mid-point (C in Figure 4) of the arc on the demand curve is



Fig. 4

$$E_p = \frac{\dfrac{\Delta q}{(q_1 + q_2)^{1/2}}}{\dfrac{\Delta p}{(p_1 + p_2)^{1/2}}} = \frac{\Delta q}{(q_1 + q_2)^{1/2}} \times \frac{(p_1 + p_2)^{1/2}}{\Delta p} = \frac{\Delta q}{\Delta p} \times \frac{p_1 + p_2}{q_1 + q_2}$$

On the basis of this formula, we can measure arc elasticity of demand when there is a movement either from point *P* to *M* or from *M* to *P*.

From *P* to *M* at point *P*, $p_1 = 8$, $q_1 = 10$, and at point *M*, $p_2 = 6$, $q_2 = 12$.

Applying these values, we get

$$E_p = \frac{\Delta q}{\Delta p} \times \frac{p_1 + p_2}{q_1 + q_2} = \frac{(12 - 10)}{6 - 8} \times \frac{(8 + 6)}{(10 + 12)} = \frac{2}{-2} \times \frac{14}{22} = -\frac{7}{11}$$

From *M* to *P* at point *M*, $P_1 = 6$, $q_1 = 12$ and at point, $p_2 = 8$, $q_2 = 10$.

Now we have $$E_p = \frac{(10 - 12)}{(8 - 6)} \times \frac{(6 + 8)}{(12 + 10)} = \frac{-2}{2} \times \frac{14}{22} = -\frac{7}{11}$$

Thus whether we move from *M* to *P* or *P* to *M* on the arc *PM* of the *DD* curve, the formula for arc elasticity of demand gives the same numerical value. The closer the two points *P* and *M* are, the more accurate is the measure of elasticity on the basis of this formula. If the two points which form the arc on the demand curve are so close that they almost merge into each other, the numerical value of arc elasticity equals the numerical value of point elasticity.

**(4) The Total Outlay Method.** Marshall evolved the total outlay, or total revenue or total expenditure method as a measure of elasticity. By comparing the total expenditure of a purchaser both before and after the change in price, it can be known whether his demand for a good is elastic, unity or less elastic. Total outlay is price multiplied by the quantity of

a good purchased: Total Outlay = Price × Quantity Demanded. This is explained with the help of the demand schedule in Table.3.

## Table. 3 : Total Outlay Method

| Price Rs. per Kg. | Quantity in Kgs. | TE in Rs | Ep |
|---|---|---|---|
| (1) | (2) | (1×2)=3 | (4) |
| 9 | 2 | 18 | |
| 8 | 3 | 24 | > 1 |
| 7 | 4 | 28 | |
| 6 | 5 | 30 | |
| 5 | 6 | 30 | = 1 |
| 4 | 7.5 | 30 | |
| 3 | 8 | 24 | |
| 2 | 9 | 18 | < 1 |
| 1 | 10 | 10 | |

(i) **Elastic Demand.** Demand is elastic, when with the fall in price the total expenditure increases and with the rise in price the total expenditure decreases. Table.3 shows that when the price falls from Rs. 9 to Rs. 8, the total expenditure increases from Rs. 18 to Rs. 24 and when price rises from Rs. 7 to Rs. 8, the total expenditure falls from Rs. 28 to Rs. 24. Demand is elastic($Ep > 1$) in this case.

(ii) **Unitary Elastic Demand.** When with the fall or rise in price, the total expenditure remains unchanged, the elasticity of demand is unity. This is shown in the table when with the fall in price from Rs. 6 to Rs. 5 or with the rise in price from Rs. 4 to Rs. 5, the total expenditure remains unchanged at Rs. 30, *i.e.*, $Ep = 1$.

(iii) **Less Elastic Demand.** Demand is less elastic if with the fall in price, the total expenditure falls and with the rise in price the total expenditure rises. In Table 3 when the price falls from Rs. 3 to Rs. 2, total expenditure falls from Rs. 24 to Rs 18, and when the price rises from Re. 1 to Rs. 2. the total expenditure also rises from Rs. 10 to Rs. 18. This is the case of inelastic or less elastic demand, $Ep < 1$..

Table 4 summarises these relationships :

## Total 4 : Total Outlay Method

| Price | TE | Ep |
|---|---|---|
| Falls | Rises | >1 |
| Rises | Falls | |
| Falls | Unchanged | =1 |
| Rises | Unchanged | |
| Falls | Falls | |
| Rises | Rises | <1 |

The measurement of elasticity of demand in terms of the total outlay method is explained in Fig. 5 where we divide the relationship between price elasticity of demand and total expenditure into three stages :

In the first stage, when the price falls from $OP_4$ to $OP_3$ and to $OP_2$ respectively, the total expenditure rises from $P_4 E$ to $P_3 D$ and $P_2 C$ respectively. On the other hand, when the price increases from $OP_2$ to $OP_3$ and $OP_4$, the total expenditure decreases from $P_2 C$ to $P_3 D$ and $P_4 E$ respectively.



Fig. 5

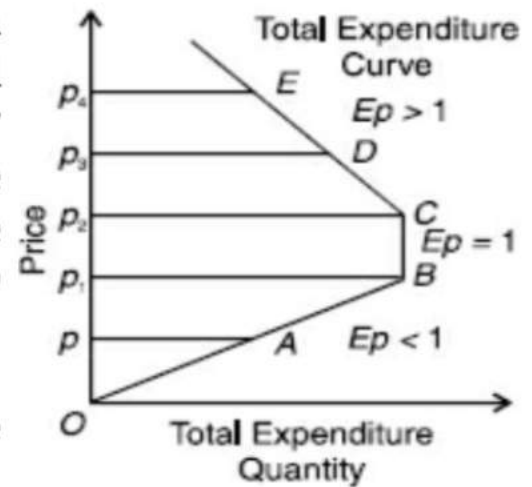Thus $EC$ segment of total expenditure curve shows elastic demand ($Ep>1$).

In the second stage, when the price falls from $OP_2$ to $OP_1$ or rises from $OP_1$ to $OP_2$, the total expenditure equals, $P_2C = P_1B$, and the elasticity of demand is equal to the unity ($Ep = 1$).

In the third stage, when the price falls from $Op_1$ to $Op$, the total expenditure also falls from $P_1 B$ to $PA$. Thus with the rise in price from $OP$ to $Op_1$, the total expenditure also increases from $PA$ to $P_1B$ and the elasticity of demand is less than unity ($Ep<1$).

## Factors Affecting Price Elasticity of Demand

Elasticity of demand for any commodity is determined or influenced by a number of factors which are discussed as under.

**(1) Nature of the Commodity.** The elasticity of demand for any commodity depends upon the category to which it belongs, i.e., whether it is a necessity, comfort, or luxury. The demand for necessaries *of life* or *conventional necessaries* is generally *less elastic*. For example, the demand for necessaries like food, salt, matches, etc. does not change much with rise or fall in their prices. Similar is the case with commodities which are required at the time of marriage, death ceremonies, etc.

The demand for *necessaries of efficiency* (such as milk, eggs, butter, etc.), and for *comforts* is *moderately elastic* because with the rise or fall in their prices, the demand for them decreases or increases moderately. On the other hand, the demand for *luxuries* is *more elastic* because with a small change in their prices there is a large change in their demand.

But the demand for *prestige goods*, like jewels, rare coins, rare stamps, paintings by Tagore or Picasso, etc. is inelastic because they possess unique utility for the buyers who are prepared to buy them at all costs.

**(2) Substitutes.** Commodities having substitutes have *more elastic demand* because with the change in the price of one commodity, the demand for its substitute is immediately affected. For example, if the price of coffee rises, the demand for coffee will decrease and that for tea will increase, and vice versa. But the demand for commodities having no good substitutes is *inelastic*.

**(3) Variety of Uses.** The demand for a commodity having composite demand or variety of uses is *more elastic*. Such commodities are coal, milk, steel, electricity, etc. For example, coal is used for cooking and heating , for power generation, in factories, in locomotives, etc. If there is a slight fall in the price of coal, its demand will increase from all quarters. On the other hand, a rise in its price will bring a considerable decrease in demand in less important uses (domestic) and in more important uses efforts will also be made to economise its use, as in railways and factories. Thus the overall effect will be a reduction in demand. A commodity which cannot be put to more than one use, has *less elastic* demand.

**(4) Joint Demand.** There are certain commodities which are jointly demanded, such as car and petrol, pen and ink, bread and jam, etc. The elasticity of demand of the second commodity depends upon the elasticity of demand of the major commodity. If the demand for cars is less elastic, the demand for petrol will also be less elastic. On the other hand, if the demand for, say, bread is elastic, the demand for jam will also be elastic.

**(5) Deferred Consumption.** Commodities whose consumption can be deferred have an elastic demand. This is the case with *durable* consumer goods, like cloth, bicycle, fan, etc. If the price of any of these articles rises, people will postpone their consumption. As a result, their demand will decrease, and vice versa.

**(6) Habits.** People who are habituated to the consumption of a particular commodity, like coffee, tea or cigarette of a particular brand, the demand for it will be *inelastic*. We find that the prices of coffee, tea and cigarettes increase almost every year but there has been little effect on their demand because people are in the habit of consuming them.

**(7) Income Groups.** The elasticity of demand also depends on the income group to which a person belongs. Persons who belong to the higher income group, their demand for commodities is *less elastic*. It is immate-

rial to a rich man whether the price of a commodity has fallen or risen, and hence his demand for the commodity will be unaffected. On the other hand, the demand of persons in lower income groups is generally *elastic*. A rise or fall in the prices of commodities will reduce or increase the demand on their part. But this does not apply in the case of necessities, the demand for which on the part of the poor is *less elastic*.

(8) **Proportion of Income Spent.** If the consumer spends a small proportion of his income on a commodity at a time, the demand for that commodity is *less elastic* because he does not bother much about small expenditure. Such commodities are shoe polish, pen, pencil, thread, needle, etc. But commodities which entail a large proportion of the income of the consumer, the demand of them is *elastic*, such as bicycle, watch, etc.

(9) **Level of Prices.** The level of prices also influences the elasticity of demand for commodities when the price level is high, the demand for commodities is *elastic*, and when the price level is low, the demand is *less elastic*.

(10) **Time Factor.** Time factor plays an important role in influencing the elasticity of demand for commodities. The shorter the time in which the consumer buys a commodity, the lesser will be the elasticity of demand for that product. On the other hand, the longer the time which the consumer takes in buying a commodity, the *higher* will be the elasticity of demand for that product. Prof. Stigler mentions three possible reasons for the long-period elasticity being higher than the short-period elasticity. In the long run, the consumer has a better knowledge of the price changes, takes time to readjust his budget, and might change his consumption pattern due to possible technological changes.

(11) **Brand.** The price of demand for a given brand of product may be elastic. If its price increases, people turn towards the other brands easily. This is substitution effect For example, if the price of the Hero bicycle increases, the consumer will buy the Atlas bicycle.

(12) **Recurring Demand.** Goods which have recurring demand, their prices are more elastic than the goods which are not demanded time and again.

(13) **Distribution of Income.** If a country has equal distribution of income and wealth, the demand for majority of goods is elastic because there are more middle class people whose purchasing power is almost equal.

The cross elasticity of demand is the relation between percentage change in the quantity demanded of a good to the percentage change in the price of a related good. The cross elasticity of demand between good X and Y

$$Eba = \frac{\text{Percentage change in quantity of } X}{\text{Percentage change in price of } Y}$$

$$= \frac{\frac{\Delta Q_x}{Q_x}}{\frac{\Delta P_y}{P_y}} = \frac{\Delta Q_x}{Q_x} \times \frac{P_y}{\Delta P_y} = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

Where, $Q_X$ = Quantity of good X, $P_Y$ = Price of good Y and $\Delta$ = change.

Given the price of X, this formula measures the change in the quantity demanded of X as a result of change in the price of Y.

The cross elasticity of demand for good X may be positive, negative or zero which depends on the nature of relation between the goods X and Y. This relation may be as substitutes, complementary or unrelated goods.

## 1. Substitute Goods

If X and Y are substitute goods, a fall in the price of good Y will reduce the quantity demanded of good X. Similarly, an increase in the price of good Y will raise the demand for good X. Their cross elasticity is positive because, given the price of X, a change in the price of Y will lead to a change in the quantity demanded of X in the same direction as in the price of Y.

The cross elasticity of substitute goods is explained in Table 5.

| Table 5 : Cross Elasticity of Substitutes | | | | |
|---|---|---|---|---|
| Commodity | Before Change | | After Change | |
| | Price in Rs. Per K.G. | Quantity (K.G) | Price in Rs. Per (K.G.) | Quantity (K.G.) |

| X (Tea) | 20 | 400 | 20 | 500 |
|---|---|---|---|---|
| Y (Coffee) | 30 | 500 | 40 | 300 |

$$E_{xy} = \frac{\Delta Q_x}{\Delta P_Y} \times \frac{P_y}{Q_x} = \frac{500-400}{40-30} \times \frac{30}{400}$$

$$= \frac{100}{10} \times \frac{30}{400} = (+)\frac{3}{4} \text{ or } (+) 0.75.$$

It is clear from the above that the coefficient of cross elasticity of substitute goods such as tea (X) and coffee (Y) is positive (+0.75) when with the rise in price of coffee, the price of tea being constant, the demand for tea also increases.
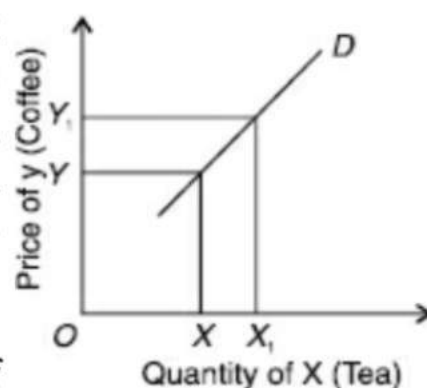


Fig. 6

This is shown in Fig. 6 where the quantity of good X (tea) is taken on X-axis and the quantity of good Y is plotted on Y-axis. When the price of Y increases from OY to $OY_1$, the quantity demanded of X rises from OX to $OX_1$. The slope of the demand curve downwards to the right shows positive elasticity of both the goods.

## 2. Complementary Goods

If two goods are complementary (jointly demanded), rise in the price of one leads to a fall in the demand for the other. Rise in the prices of cars will bring a fall in their demand together with the demand for petrol. Similarly, a fall in the prices of cars will raise the demand for petrol. Since price and demand vary in the opposite direction, the cross elasticity of demand is *negative*.

The cross elasticity of complementary goods is explained in Table 6.

**Table 6 : Cross Elasticity of Complementary**

| Table 6 : Cross Elasticity of Complementary | | |
|---|---|---|
| Goods | Before the Price Change | After the Price Change |

| | Price in Rs. Per K.G. | Quantity (K.G) | Price in Rs. Per (K.G.) | Quantity (K.G.) |
|---|---|---|---|---|
| X (Tea) | 150 | 40 | 150 | 30 |
| Y (Coffee) | 15 | 100 | 20 | 80 |

$$E_{xy} = \frac{\Delta Q_x}{\Delta P_Y} \times \frac{P_y}{Q_x} = \frac{30-40}{20-15} \times \frac{15}{40}$$

$$= \frac{-10}{5} \times \frac{15}{40} = \frac{-15}{20} = \frac{-3}{4} = (-)\,0.75.$$

In this case, the cross elasticity coefficient of complementary goods such as tea and sugar or car and petrol is negative.

This is explained in Fig.7 where with the rise in the price of Y (Sugar) from OY to $OY_1$, the demand for X (tea) falls from OX to $OX_1$. The slope of the demand curve downwards to the right indicates negative cross elasticity.
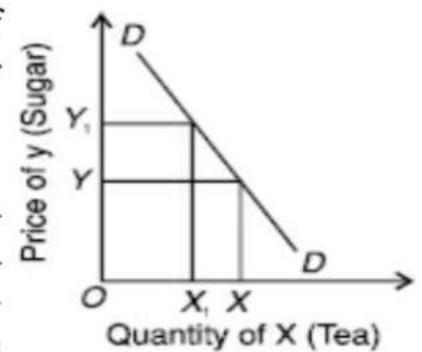


Fig. 7

## 3. Unrelated Goods

If the two goods are unrelated, a fall in the price of good Y has no effect whatsoever on the demand for good X. In such a case, the cross elasticity of demand is zero. For example, a fall in the price of tea has no effect on the quantity demanded of car. The cross elasticity of demand for unrelated goods is shown in Fig. 8. Even an increase in the price of good Y from OY to $OY_1$, the demand for good X remains the same as OD. Hence, the cross elasticity of demand for unrelated goods is zero.
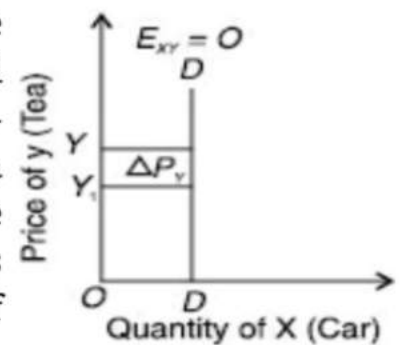


Fig. 8

## Some Conclusions

We may draw certain inferences from this analysis of the cross elastcity of demand.

(a) The cross elasticity between two goods, whether substitutes or complementaries, is only a one-way traffic. The cross elasticity between butter and jam may not be the same as the cross elasticity of jam to

butter. A 10% fall in the price of butter may cause a fall in the demand for jam by 5%. But a 10% fall in the price of jam may lower the demand for butter by 2%. It shows that in the first case the coefficient is 0.5 and in the second case 0.2. The superior the substitute whose price changes, the higher is the cross elasticity of demand.

This rule also applies in the case of complementary goods.If the price of car falls by 5%, the demand for petrol may go up by 15%, giving a high coefficient of 3. But a fall in the price of petrol by 5% may lead to a rise in the demand for cars by 1%, giving a low coefficient of 0.2.

(b) Cross elasticities for both substitutes and complementaries vary between zero and infinity. Generally, cross elasticity for substitutes is positive, but in exceptional circummstances it may also be negative.

(c) Commodities which are close *substitutes* have *high* cross elasticity and commodities with *low* cross elasticities are *poor substitutes* for each other. This distinction helps to define an industry. If some goods have high cross elasticity, it means that they are close substitutes. Firms producing them can be regarded as one industry. A good having a low cross elasticity in relation to other goods may be regarded a monopoly product and its manufacturing firm becomes an industry by determining the boundary of an industry. Thus cross elasticities are simply guidelines.

## Application of Cross Elasticity in management

The cross elasticity of demand has much practical importance in the solution of various business problems.

**1. In Production.** A firm wants to know the cross elasticity of demand for its goods while considering the effect of change in the price of its competitor's goods on the demand for its own goods. It is important for a firm to have a knowledge of it while making its production plan.

**2. In Demand Forecasting and Pricing.** Its knowledge helps the firm in estimating the potential impact of the pricing decisions of its competitors and associates on its sales so that it prepares its pricing strategies.

**3. In International Trade and Balance of Payments.** The utility of this concept is significant in the area of international trade and balance of payments. The government wants to know how the change in domestic prices affects the demand for imports.

Domestically produced goods being close substitutes if the cross elasticity of demand for imports is high and if the prices of domestic goods increase due to inflation, the demand for imports will increase substantially which will deteriorate the balance of payments position.

## <<< INCOME ELASTICITY OF DEMAND

The concept of income elasticity of demand ($E_y$) expresses the responsiveness of a consumer's demand (or expenditure or consumption) for any good to the change in his income. It may be defined as the ratio of percentage change in the quantity demanded of a commodity to the percentage change in income. Thus

$$E_y = \frac{Percentage\ change\ in\ quantity\ demanded}{Percentage\ change\ in\ income}$$

$$= \frac{\Delta Q / Q}{\Delta Y / Y} = \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

where $\Delta$ is change, $Q$ quantity demanded and $Y$ is income.

The coefficient $E_y$ may be positive, negative or zero depending upon the nature of a commodity. If an increase in income leads to an increased demand for a commodity, the income elasticity coefficient ($E_y$) is positive. A commodity whose income elasticity is positive is a normal good because more of it is purchased as the cousumer's income increases. On the other hand, if an increase in income leads to a fall in the demand for a commodity, its income elasticity coefficient ($E_y$) is negative. Such a commodity is called inferior good because less of it is purchased as income increases. If the quantity of a commodity purchased remains unchanged regardless of the change in income, the income elasticity of demand is zero ($E_y = 0$).

Normal goods are of three types : necessaries, luxuries and comforts. In the case of luxuries, the coefficient of income elasticity is positive but high, $E_y > 1$. Income elasticity of demand is high when the demand for a commodity rises more than proportionate to the increase in income. Assuming prices of all other goods as constant, if the income of the consumer increases by 5% and as a result his purchases of the commodity increase by 10%, then $E_y = 10/5 = 2(>1)$. Taking income on the vertical axis and the quantity demanded on the

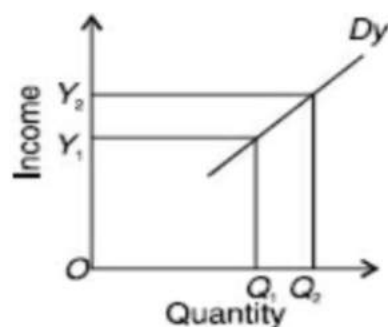

Fig. 9

horizontal axis, the increase in demand $Q_1 Q_2$ is more than the rise in income $Y_1 Y_2$, as shown in Figure 9. The curve $Dy$ shows a positive and elastic income demand.
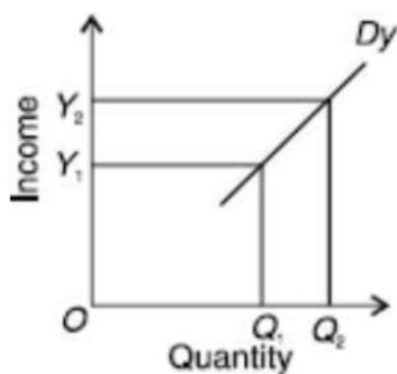


Fig. 10

In the case of *necessities*, the coefficient of income elasticity is *positive* but low, $E_y < 1$. Income elasticity of demand is low when the demand for a commodity rises less than proportionate to the rise in the income. If the proportion of income spent on a commodity increases by 2% when the consumer's income goes up by 5%, $E_y = 2/5(<1)$ Figure 10 shows a positive but inelastic income demand curve $Dy$ because the increase in demand $Q_1 Q_2$ is less than proportionate to the rise in income $Y_1 Y_2$.

In the case of *comforts*, the coefficient of income elasticity is *unity* ($E_y = 1$) when the demand for a commodity rises in the same proportion as the increase in income. For example, a 5% increase in income leads to 5% rise in demand, $E_y = 5/5 = 1$. The curve $Dy$ in Figure 11 shows unitary income elasticity of demand. The increase in quantity demanded $Q_1 Q_2$ exactly equals the increase in income $Y_1 Y_2$.
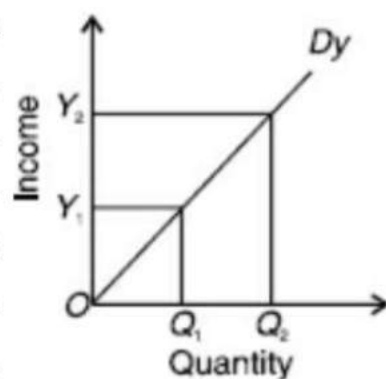


Fig. 11

The coefficient of income elasticity of demand in the case of *inferior goods* is negative. In the case of an inferior goods, the consumer will reduce his purchases of it, when his income increases. If a 5% increase in income leads to 2% reduction in demand, $E_y = -2/5 (<0)$. Figure 12 shows the $Dy$ curve for an inferior goods which bends upwards from $A$ to $B$ when the quantity demanded decreases by $Q_1 Q_2$ with the rise in income by $Y_1 Y_2$.

If with increase in income, the quantity demanded remains unchanged, the coefficient of income elasticity, $E_y = 0$. If, say, with 5% increase in income, there is no change in the quantity demanded, then $E_y = 0/5 = 0$. Figure 13 shows a vertical income demand curve $Dy$ with zero elasticity.

Fig. 12



Fig. 13
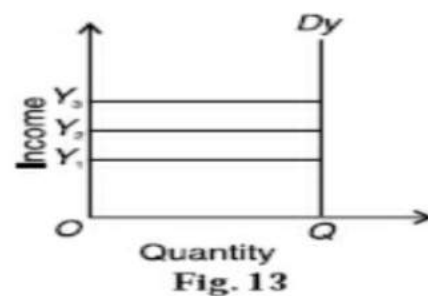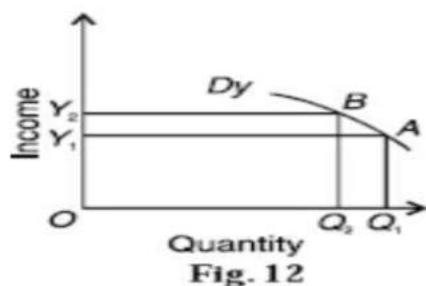
# Determinants of Income Elasticity of Demand

There are certain factors which determine the income elasticity of demand.

**1. The Nature of Commodity.** Commodities are generally grouped into necessities, comforts and luxuries. We have seen above that in the case of necessities, $E_y < 1$, in the case of comforts, $E_y = 1$, and in the case of luxuries, $E_y > 1$.

**2. Income Level.** This grouping of commodities depends upon the income level of a country. A car may be a necessity in a high-income country and a luxury in a poor low-income country.

**3. Time Period.** Income elasticity of demand depends on the time period. Over the long-run, the consumption patterns of the prople may change with changes in income with the result that a luxury today may become a necessity after the lapse of a few years.

**4. Demonstration Effect.** The demonstration effect also plays an important role in changing the tastes, preferences and choices of the people and hence the income elasticity of demand for different types of goods.

**5. Frequency.** The frequency of increase in income also determines income elasticity of demand for goods. If the frequency is greater, income elasticity will be high because there will be a general tendency to buy comforts and luxuries.

## Use of Income Elasticity in Business Decisions

The income elasticity of a product has great significance in long-term planning and in the solution of strategic problems, particularly during trade cycles.

**1. Planning of the Firm's Growth.** The knowledge of income elasticity of demand is very important for both the firms and the government. Firms whose demand function is income elastic, the scope of their growth is generally wide in an expanding economy but they are very insecure during recession. So such firms must consider their all economic activities and their potential growth rate in future. On the contrary, firms whose products are less income elastic, they will neither obtain more profit with the expansion of the economy nor will they incur specific loss during recession in the economy. Such firms consider it necessary to bring variety in different products or in a different industry. For example, agricultural products are less income elastic while industrial products are income elastic. Moreover, since the coefficient of income elasticity of inferior goods is negative, the sale of such products will decline with economic growth.

**2. In Formulation of Farm Policy.** Farmers' products are less income elastic because they can not generally bring variety in their products like income elastic products. Hence, in the coming years the danger of such agricultural problems is likely to remain particularly in developing countries. Therefore, the Government of India has considered it necessary to continue and increase various agricultural subsidies.

**3. In Forecasting Demands.** The concept of income elasticity can be used in forecasting future demand provided the firm knows the growth rate of income and income elasticity of demand for the good. It is often believed that the demand for goods and services increases with the rise in GNP that depends on the marginal propensity to consume. But it may be proved true in the context of aggregate national demand while it is not necessary to be true for a particular good. For this, the income of the related income class should be used. It is also useful for avoiding the problem of over-poduction or under-production.

**4. In Formulating Marketing Strategies.** The income elasticity of demand of potential buyer class for products affects the number, na-

ture and location of sales centres, nature and level of advertising and the policies related to other sales promotion activities. For instance, the sales centres of ice-creams will be located in the prosperous town areas where the people have sufficient income and their incomes are likely to increase sufficiently in future. Here, the expected rise in demand in the context of increased income has been discussed. But this rise will be compensated in more or less quantity by the expected fall in demand with the increase in price.

## <<< IMPORTANCE OF ELASTICITY OF DEMAND IN MANAGEMENT

The elasticity of demand is of great importance in managerial decision making. It is more significant in the following areas :

**1. In the Determination of Output Level.** For making production profitable, it is essential that the quantity of goods and services should be produced corresponding to the demand for that product. Since the changes in demand is due to the change in price, the knowledge of elasticity of demand is necessary for determining the output level.

**2. In the Determination of Price.** The elasticity of demand for a product is the basis of its price determination. The ratio in which the demand for a product will fall with the rise in its price and vice versa can be known with the knowledge of elasticity of demand. If the demand for a product is inelastic, the producer can charge high price for it, whereas for an elastic demand product he will charge low price. Thus, the knowledge of elasticity of demand is essential for management in order to earn maximum profit.

**3. In Price Discrimination by Monopolist.** Under monopoly discrimination the problem of pricing the same commodity in two different markets also depends on the elasticity of demand in each market. In the market with elastic demand for his commodity, the discriminating monopolist fixes a low price and in the market with less elastic demand, he charges a high price.

**4. In Price Determination of Factors of Production.** The concept of elasticity fof demand is of great importance for determining prices of various factors of porduction. Factors of production are paid according to their elasticity of demand. In other words, if the demand of a factor is inelastic, its price will be high and if it is elastic, its price will be low.

**5. In Demand Forecasting.** The elasticity of demand is the basis of demand forecasting. The knowledge of income elasticity is essential for demand forecasting of producible goods in future. Long-term production planning and management depend more on the income elasticity because management can know the effect of changing income levels on the demand for his product.

**6. In Dumping.** A firm enters foreign markets for dumping his product on the basis of elasticity of demand to face foreign competition.

**7. In the Determination of Prices of Joint Products.** The concept of the elasticity of demand is of much use in the pricing of joint products, like wool and mutton, wheat and straw, cotton and cotton seeds, etc. In such cases, separate cost of production of each product is not known. Therefore, the price of each is fixed on the basis of its elasticity of demand. That is why products like wool, wheat and cotton having an inelastic demand are priced very high as compared to their byproducts like mutton, straw and cotton seeds which have an elastic demand.

**8. In the Determination of Government Policies.** The knowledge of elasticity of demand is also helpful for the government in determining its policies. Before imposing statutory price control on a product, the government must consider the elasticity of demand for that product. The government decision to declare public utilities those industries whose products have inelastic demand and are in danger of being controlled by monopolist interests depends upon the elasticity of demand for their products.

**9. Helpful in Adopting the Policy of Protection.** The government considers the elasticity of demand of the products of those industries which apply for the grant of a subsidy or protection. Subsidy or protection is given to only those industries whose products have an elastic demand. As a consequence, they are unable to face foreign competition unless their prices are lowered through subsidy or by raising the prices of imported goods by imposing heavy duties on them.

**10. In the Determination of Gains from International Trade.** The gains from international trade depend, among others, on the elasticity of demand. A country will gain from internationl trade if it exports

goods with less elasticity of demand and import those goods for which its demand is elastic. In the first case, it will be in a position to charge a high price for its products and in the latter case it will be paying less for the goods obtained from the other country. Thus, it gains both ways and shall be able to increase the volume of its exports and imports.

## Application of Elasticity in Managerial Decisions

Now we shall consider the application of concepts of elasticity. Economists measure how responsive or sensitive consumers are to change in the price or income or a change in the price of some other product. Managerial economists measure the degree of elasticity by the elasticity co-efficient. Managerial decisions aim at the best alternative. Managerial decisions are of two types: programmed decisions and non-programmed decisions. But the decision making process may be required in four areas of work: location decision, growth decision, financial decision and operating decision. The price-quantity relationship comes under operating decision.

## Managerial Decision and Income Elasticity

Income elasticity measures the ratio of percentage change in quantity demanded to percentage change in income. A positive income elasticity suggests a more than proportionate increase in expenditure with an increase in income. If income elasticity is negative it implies that the commodity is inferior. Among the several income concepts, the most commonly used term is the personal disposable income per head. The other income concepts important for durable goods are that of transitory income i.e., fluctuation in the short run income and discretionary income i.e., that part of the income which is left over after deductions.

Economic development will be closely associated with increase in the sales of quality goods. An efficient businessman is really interested in knowing whether the sale of his goods will lead to economic development. The relationship between demand and income changes is not always positive. It depends on the permanent change in income. If the income elasticity is greater than one, the sales of his goods will increase more quickly than general economic development. If the income elasticity is greater than zero but less than one, sales of the goods will increase but at a lower rate than economic development.

## Managerial Decision and Industry Elasticity

From the managerial point of view, it is thought useful to explain industry elasticity. We know from the law of demand that when the price of a commodity falls, the quantity demanded increases and vice versa. The relation of price to sales is known in economics as the demand. The relation of price to demand or sales has been a major interest of economist for a long time. If we like to have a good knowledge of their relations, it gives better results to management. The industry elasticity means that there is a change in complete industry sales with a change in the general level of prices for the industry. The industry demand has elasticity due to competition from other industries.

## Managerial Decision And Expectation Elasticity

Expectation elasticity indicates the responsiveness of sales to buyers guesses about the future values of demand determinants. In most companies, a knowledge of condition in the immediate future is essential for evolving a suitable production policy. Formulating suitable production policy is necessary to avoid the problem of over production or the problem of short supply. Once the demand potential is assessed it will be easier for the company to engage in long term planning. Like the future price of a commodity or of its substitute, future income of buyers, prospects of easy availability or otherwise in the future or future outlays, price and income expectations are the most important among them.

## Managerial Decision and Market Share Elasticity

As regards a particular firm, the market share elasticity is most important. This is influenced by rival's changes in prices and promotional efforts both qualitative and quantitative. A thorough knowledge of market share elasticity will help the managerial economist to the profitable results of the concern. The market share elasticity indicates that there has been a change in company's wide sales to the price differential between the company's price and the industry-wide price level.

## Managerial Decision and Promotional Elasticity

Many of the firms spend huge amounts every year on advertising their products to boost up sales. There is a direct relationship between the extent of advertisement and volume of sales. The promotional elasticity of demand is also called the advertising elasticity of demand. It measures the responsiveness of demand to change in advertising. The reason for finding out the advertisement elasticity of demand by the company manager is to determine the effects of advertisement on sales.