

THEORY OF DEMAND AND SUPPLY



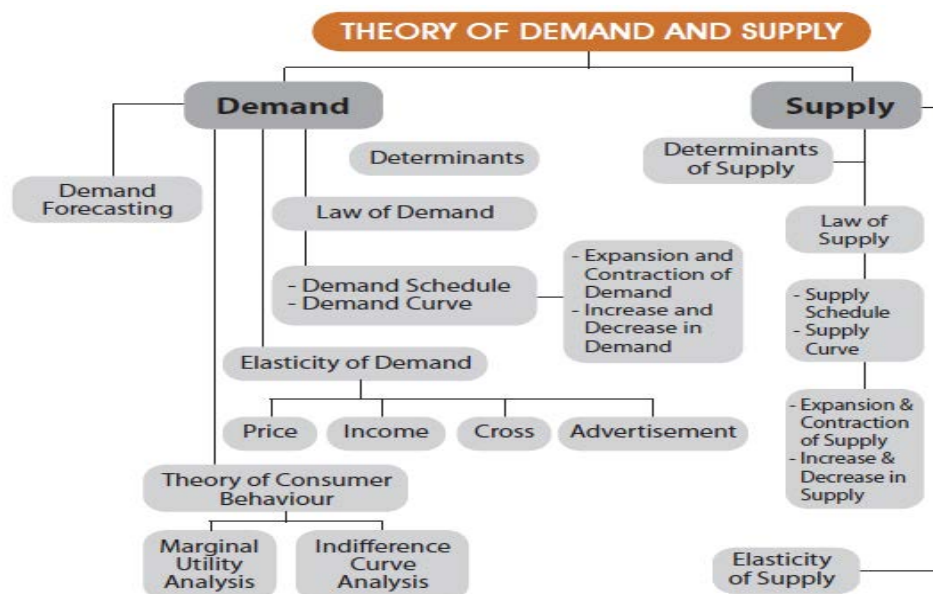
UNIT -1: LAW OF DEMAND AND ELASTICITY OF DEMAND

LEARNING OUTCOMES

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

- ◆ Explain the meaning of Demand.
- ◆ Describe what Determines Demand.
- ◆ Explain the law of Demand.
- ◆ Explain the difference between Movement along the Demand Curve and Shift of the Demand Curve.
- ◆ Define and measure elasticity.
- ◆ Apply the concepts of price, cross and income elasticities.
- ◆ Explain the determinants of elasticity.
- ◆ Explain the importance of demand forecasting in business.
- ◆ Describe the various forecasting techniques.

CHAPTER OVERVIEW



Consider the following hypothetical situation:

Aroma Tea Limited is considering diversifying its business. A meeting of the board of directors is called. While discussing the matter, Rajeev Aggarwal, the CEO of Aroma Tea Limited asks, Sanjeev Bhandari, the marketing head, "What do you think Sanjeev, should we enter into green tea business also? What does the market pulse say? Who all are there in this market? How will the demand for green tea affect the demand for our black tea? Is green tea a luxury good or is it a necessity now? What are the key determinants of the demand for green tea? Will coffee drinkers or soft drinkers shift to green tea? The answers to these questions will help us better understand how to price and position our brand in the market. "Before we rush into this line, I want a report on exactly why you believe green tea will be the star of our company in the coming five years?"

As an entrepreneur of a firm or as a manager of a company, you would often face situations in which you have to answer questions similar to the above. Why do prices change when events such as weather changes, wars, pandemics or new discoveries occur? Why is it that some producers are able to charge higher prices than others? The answers to these and a thousand other questions can be found in the theory of demand and supply.

The market system is governed by market mechanism. Demand and supply are the forces that make market economies work. These two together determine the price and quantity sold of a commodity or service. While buyers constitute the demand side of the market, sellers make the supply side of that market. Since business firms produce goods and services to be sold in the market, it is important for them to know how much of their products would be wanted by buyers during a given period of time. The buyers include consumers, businesses and even government. The quantity that the buyers buy at a given price determines the size of the market. As we are aware, as far as a firm is concerned, the size of the market is a significant determinant of its prospects.

When a market is competitive, its behaviour is suitably described by the demand and supply model. We understand that the terms demand and supply refer to the behaviour of buyers and sellers respectively as they interact each

other in markets. A thorough understanding of the demand and supply theory is therefore essential for any business firm. We shall study the theory of demand in this Unit. The theory of supply will be discussed in Unit-3.



1.0 MEANING OF DEMAND

The term 'demand' refers to the quantity of a good or service that buyers 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 the desire to purchase, though desire is one element of it. For example, people may desire much bigger houses, luxurious cars etc. But there are also constraints that they face such as prices of products and limited means to pay. Thus, wants or desires together with the real world constraints determine what they buy. The effective demand for a thing depends on (i) desire (ii) means to purchase and (iii) willingness to use those means for that purchase. Unless desire is backed by purchasing power or ability to pay and willingness to pay, it does not constitute demand. Effective demand alone would figure in economic analysis and business decisions.

Two things are to be noted about the quantity demanded.

- (i) The quantity demanded is always expressed at a given price. At different prices different quantities of a commodity are generally demanded.
- (ii) The 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' i.e., one thousand dozens of oranges per day, seven thousand dozens of 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 during a given period of time, at various prices, or at various incomes, or at various prices of related goods".



1.1 WHAT DETERMINES DEMAND?

Knowledge of the common determinants of demand for a product or service and the nature of relationship between demand and its determinants are essential for a business firm for estimating the market demand for its products. There are a number of factors which influence the demand for a commodity. All these factors are not equally important. Moreover, some of these factors cannot be easily measured or quantified. The important factors that determine demand are given below.

- (i) **Price of the commodity:** Obviously, the good's own price is a key determinant of its demand. *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 the price of a commodity brings about a fall in the quantity purchased and vice-versa. This happens because of income and substitution effects.
- (ii) **Price of related commodities:** Related commodities are of two types: (i) complementary goods and (ii) competing goods or substitutes.

Complementary goods and services are those that are bought or consumed together or simultaneously. Examples are: tea and sugar, automobile and petrol and pen and ink. The increase in the demand for one causes an increase in the demand for the other. When two commodities are complements, a fall in the price of one (other things being equal) will cause the demand for 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, computers and computer

software are complementary goods. A fall in the price of computers will cause a rise in the demand for software. The reverse will be the case when the price of a complement rises. An increase in the price of a complementary good reduces the demand for the good in question. Thus, we find that, there is an inverse relation between the demand for a good and the price of its complement.

Two commodities are called competing goods or substitutes when they satisfy the same want and can be used with ease in place of one another. For example, tea and coffee, ink pen and ball pen, different brands of toothpaste etc. are substitutes for each other and can be used in place of one another easily. When goods are substitutes, if the price of a product being purchased goes up, buyers may switch to a cheaper substitute. This decreases the demand for the product at a given price, but increases the demand for the substitute. Similarly, a fall in the price of a product (*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. Therefore, there is direct or positive relation between the demand for a product and the price of its substitutes.

- (iii) **Disposable Income of the consumer:** The purchasing power of a buyer is determined by the level of his disposable income. Other things being equal, the demand for a commodity depends upon the disposable income of the potential purchasers. In general, increase in disposable income tends to increase the demand for particular types of goods and services at any given price. A decrease in disposable income generally lowers the quantity demanded at all possible prices.

The nature of relationship between disposable income and quantity demanded depends upon the nature of goods. A basic description of the nature of goods is useful in describing the effect of income on demand.

Normal goods are those that are demanded in increasing quantities as consumers' income increases. Most goods and services fall under the category of normal goods. Household furniture, clothing, automobiles, consumer durables and semi durables etc. fall in this category. When income is reduced (for example due to recession), demand for normal goods falls.

There are some commodities for which the quantity demanded rises only up to a certain level of income and decreases with an increase in money income beyond this level. These goods are called inferior goods.

Essential consumer goods such as food grains, fuel, cooking oil, necessary clothing etc. satisfy the basic necessities of life and are consumed by all individuals in a society. A change in consumers' income, although will cause an increase in demand for these necessities, but 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 the importance of food and other non durable goods in the overall consumption basket and a rise in the importance of durable goods such as a TV, car, house etc. Demand for luxury goods and prestige goods arise beyond a certain level of consumers' income and keep rising as income increases.

Business managers should be fully aware of the nature of goods which they produce (or the nature of need which their products satisfy) and the nature of relationship of quantities demanded with changes in buyers' incomes. For assessing the current as well as future demand for their products, they should also recognize the movements in the macro economic variables that affect buyers' incomes.

- (iv) **Tastes and preferences of buyers:** The demand for a commodity also depends upon the tastes and preferences of buyers and changes in them over a period of time. Goods which are modern or more in fashion command higher demand than goods which are of old design or are out of fashion. Consumers may perceive a product as obsolete and discard it before it is fully utilised and then prefer another good which is

currently in fashion. For example, there is greater demand for the latest digital devices and trendy clothing and we find that more and more people are discarding these goods currently in use even though they could have used it for some more years.

External effects on utility such as 'demonstration effect', 'bandwagon effect', Veblen effect and 'snob effect' do play important roles in determining the demand for a product. Demonstration effect, a term coined by James Duesenberry, refers to the desire of people to emulate the consumption behaviour of others. In other words, people buy or have things because they see that other people are able to have them. For example, an individual's demand for cell phone may be affected by his seeing a new model of cell phone 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 have it, he too can.

Bandwagon effect refers to the extent to which the demand for a commodity is increased due to the fact that others are also consuming the same commodity. It represents the desire of people to purchase a commodity in order to be fashionable or stylish or to conform to the people they wish to be associated with.

By 'snob effect' we refer to the extent to which the demand for a consumers' good is decreased owing to the fact that others are also consuming the same commodity. This represents the desire of people to be exclusive; to be different; to dissociate themselves from the "common herd." For example, when a product becomes common among all, some people decrease or altogether stop its consumption.

Highly priced goods are consumed by status seeking rich people to satisfy their need for conspicuous consumption. This is called 'Veblen effect' (named after the American economist Thorstein Veblen). For example, expensive cars and jewels. The distinction between the snob effect and the Veblen effect is that the former is a function of the consumption of others and the latter is a function of price. We conclude that people have tastes and preferences and these do change - sometimes, due to external and sometimes due to internal causes - and influence demand.

Knowledge regarding tastes and preferences is extremely valuable for the manufacturers and marketers as it would help them appropriately design new models of products and services and plan production to suit the changing tastes and needs of the customers.

(v) Consumers' Expectations

Consumers' expectations regarding future prices, income, supply conditions etc. influence current demand. If the consumers expect increase in future prices, increase in income and shortages in supply, more quantities will be demanded. If they expect a fall in price or fall in income they will postpone their purchases of nonessential commodities and therefore, the current demand for them will fall. Levels of consumer and business confidence about their future economic situations also affect spending and demand.

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, larger would be the number of buyers and the quantity demanded in the market would be higher at every price. The opposite is the case when population is less.
- (b) **Age Distribution of population:** If a larger proportion of people belong to older age groups relative to younger age groups, there will be increased demand for geriatric care services,

spectacles, walking sticks, etc and less demand for children's books. Similarly, if the population consists of more of children, demand for toys, baby foods, toffees, etc. will be more. Likewise, if there is migration from rural areas to urban areas, there will be decrease in demand for goods and services in rural areas.

- (c) **The level of National Income and its Distribution:** The level of national income is a crucial determinant of market demand. Higher the national income, higher will be the demand for all normal goods and services. The wealth of a country may be unevenly distributed so that there are a few very rich people while the majority is very poor. Under such conditions, the propensity to consume of the country will be relatively less, because 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.
- (d) **Consumer-credit facility and interest rates:** Availability of credit facilities induces people to purchase more than what their current incomes permit them. Credit facilities mostly determine the demand for investment and for durable goods which are expensive and require bulk payments at the time of purchase. Low rates of interest encourage people to borrow and therefore demand will be more.
- (e) **Government policies and regulations;** The governments influence demand through its taxation, purchases, expenditure, and subsidy policies. While taxes increase prices and decrease the quantity demanded, subsidies decrease the prices and increase the quantity demanded. For example taxes on luxurious goods and subsidies for solar panels. Similarly total bans, restrictions and higher taxes may be used by government to restrict the demand for socially undesirable goods and services. Government's policy on international trade also will affect the domestic demand for goods and services.

Apart from above, factors such as weather conditions, business conditions, stage of business cycle, wealth, levels of education, marital status, socioeconomic class, group membership, habits of the consumer, social customs and conventions, salesmanship and advertisements also play important roles in influencing demand.



1.2 THE DEMAND FUNCTION

As we know, a function is a symbolic statement of a relationship between the dependent and the independent variables.

The demand function states in equation form, the relationship between the demand for a product (the dependent variable) and its determinants (the independent or explanatory variables). Any other factors that are not explicitly listed in the demand function are assumed to be irrelevant or held constant. A simple demand function may be expressed as follows:

$$Q_x = f(P_x, Y, P_r, \dots)$$

Where Q_x is the quantity demanded of product X

P_x is the price of the commodity

Y is the money income of the consumer, and

P_r is the price of related goods

The demand function stated as above does not indicate the exact quantitative relationship between Q_x and P_x , M and P_r . For this, we need to write the demand function in a particular form with specified values of the explanatory variables appearing on the right-hand side. For example; we may write $Q_x = 45 + 2y + 1 P_r - 2 P_x$. In this unit, we will be studying demand as a function of only price, keeping everything else constant.



1.3 THE LAW OF DEMAND

Most of us have an implicit understanding of the law of demand. The law of demand is one of the most important laws of economic theory. The law states the nature of relationship between the quantity demanded of a product and its price. *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 states that other things being equal, when the price of a good rises the quantity demanded of the good will fall. Thus, there is an inverse relationship between price and quantity demanded, *ceteris paribus*. 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 all factors other than price which influence demand. (Refer section 1.1 above). 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.

The quantity demanded is the amount of a good or service that consumers are willing to buy at a given price, holding constant all the other factors that influence purchases. The quantity demanded of a good or service can exceed the quantity actually sold.

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

1.3.0 The Demand Schedule

A demand schedule is a table showing the quantities of a good that buyers would choose to purchase at different prices, per unit of time, with all other variables held constant. 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 ice-cream. 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 Buyer

| | Price per cup of ice-cream (in Rupees) | Quantity of ice-cream demanded (per week) (Cups) |
|---|---|--|
| A | 60 | 0 |
| B | 50 | 2 |

| | | |
|---|----|----|
| C | 40 | 4 |
| D | 30 | 6 |
| E | 20 | 8 |
| F | 10 | 10 |
| G | 0 | 12 |

Table 1 shows how many cups of ice-cream this particular buyer buys each week at different prices of ice-cream, holding constant everything else that influences how much of ice-cream this particular consumer wants to buy. If ice-cream is free (price = 0), she consumes 12 cups of ice-cream per week. As the price rises, she buys fewer and fewer cups of ice-cream. When the price reaches ₹ 60 per cup, she does not buy ice-cream at all. The above table depicts an inverse relationship between price and quantity of ice-cream demanded. We may note that the demand schedule obeys the law of demand: As the price of ice-cream increases, *ceteris paribus*, the quantity demanded falls.

1.3.1 The Demand Curve

A demand curve is a graphical presentation of the demand schedule. By convention, the vertical axis of the graph measures the price per unit of the good. The horizontal axis measures the quantity of the good, which is usually expressed in some physical measure per time period. By plotting each pair of values as a point on a graph and joining the resulting points, we get the individual's demand curve for a commodity. It shows the relationship between the quantities of a good that buyers are willing to buy and the price of the good. We can now plot the data from Table 1 on a graph.

In Fig. 1, we have shown such a graph and plotted the seven points corresponding to each price-quantity combination shown in Table 1. The demand curve hits the vertical axis at price ₹ 60 indicating that no quantity is demanded when the price is ₹ 60 (or higher). The demand curve hits the horizontal quantity axis at 12, the amount ice-cream that the consumer wants if the price is zero. Point A shows the same information as the first row of Table 1, and Point G shows the same information as does the last row of the table.

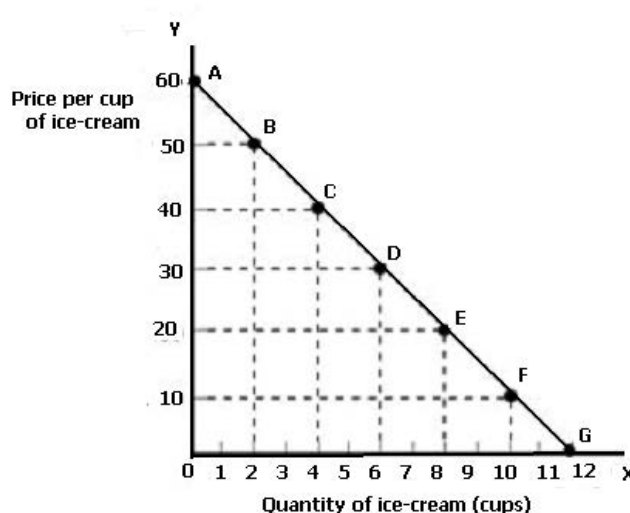


Fig. 1 : Demand Curve for Ice-cream

We now draw a smooth curve through these points. The curve is called the demand curve for ice-cream and shows the quantity of ice-cream that the consumer would like to buy at each price. The negative or downward slope indicates that the quantity demanded increases as the price falls. Consumers are usually ready to buy more if the price is lower. Briefly put, more of a good will be purchased at lower prices. Thus, the downward sloping demand curve is in accordance with the law of demand which, as stated above, describes an inverse price-demand relationship.

The slope of a demand curve is $-\Delta P/\Delta Q$ (i.e the change along the vertical axis divided by the change along the horizontal axis). The negative sign of this slope is consistent with the law of demand.

The demand curve for a good does not have to be linear or a straight line; it can be curvilinear- meaning its slope may vary along the curve. If the change in quantity demanded does not follow a constant proportion, then the demand curve will be non linear. However, linear demand curves provide a convenient tool for analysis.

1.3.2 Market Demand Schedule

The market demand for a commodity gives the alternative amounts of the commodity demanded per time period, at various alternative prices, by all the buyers in the market. In other words, it is the total quantity that all the buyers of a commodity are willing to buy per unit of time at a given price, other things remaining constant. The market demand for a commodity thus depends on all the factors that determine the individual's demand and, in addition, on the number of buyers of the commodity in the market.

When we add up the various quantities demanded by different consumers in the market, we can obtain the market demand schedule. How the summation is done is illustrated in Table 2. Suppose there are only two individual buyers of good X in the market namely, A and B. The Table 2 shows their individual demand at various prices.

Table 2: Market Demand Schedule of Good X (per day)

| Price of Good X in (Rs) | Quantity demanded by | | |
|-------------------------|----------------------|---|---------------------|
| | A | B | Total Market Demand |
| 0 | 3 | 2 | 5 |
| 10 | 2 | 1 | 3 |
| 20 | 1 | 0 | 1 |
| 30 | 0 | 0 | 0 |

When we add the quantities demanded at each price by consumers A and B, we get the total market demand. Thus, when good X is free or price is zero per unit, the market demand for commodity 'X' is 5 units (i.e. 3+2). When price rises to Rs 10, the market demand is 3 units. At a price of Rs. 20, only one unit is demanded in the market. At price Rs 30, both A and B do not buy good X and therefore, market demand is zero. The market demand schedule also indicates inverse relationship between price and quantity demanded of 'X'.

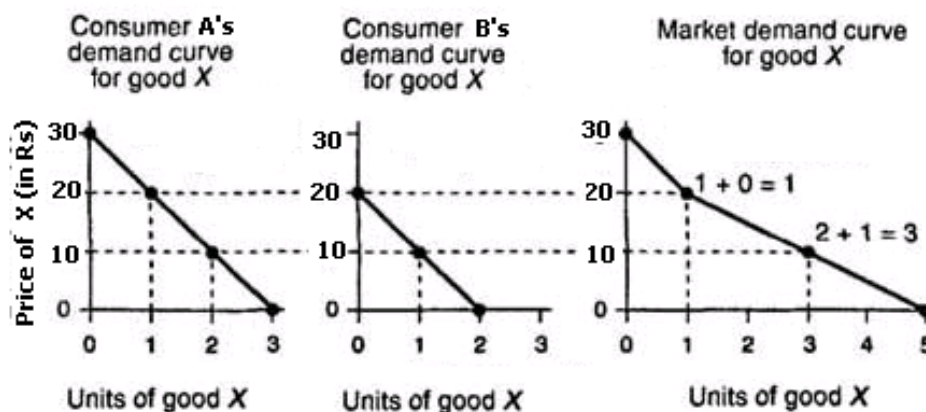


Fig. 2 : The Market Demand Curve for Good X

1.3.3 The Market Demand Curve

The market demand curve for good X represents the quantities of good X demanded by all buyers in the market for good X. The market demand curve is obtained by horizontal summation of all individual demand curves.

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 two consumers A and B have different individual demand curves corresponding to their different preferences for good X. The two individual demand curves are shown in Figure 2 along with the market demand curve for good X. When there are more than two consumers in the market for some good, the same principle continues to apply and the market demand curve would be the horizontal summation of all the market participants' individual demand curves. The market demand curve, like the individual demand curve, slopes downwards to the right because it is nothing but the lateral summation of individual demand curves.

In addition to the demand schedule and the demand curve, the buyers' demand for a good can also be expressed algebraically, using a demand equation. The demand equation relates the price of the good, denoted by P, to the quantity of the good demanded, denoted by Q.

The straight-line demand curve where we hold everything else constant is described by a linear demand function. We can write a demand function as follows:

$$Q = a - bP$$

Where 'a' is the vertical intercept and 'b' is the slope.

For example: For a demand function $Q = 100 - 2P$,

$$P = \frac{a}{b} - \frac{Q}{b} : P = 50 - \frac{Q}{2}$$

1.3.4 Rationale of the Law of Demand

Normally, the demand curves slope downwards. This means people buy more at lower prices. We shall now try to understand why do demand curves slope downwards? Put in other words, why do people buy more at lower prices? Different economists have given different explanations for the operation of the law of demand. These are given below :

- (1) **Price Effect of a fall in price:** The price effect which indicates the way the consumer's purchases of good X change, when its price changes, is the sum of its two components namely: substitution effect and income effect.
- (a) **Substitution effect:** Hicks and Allen have explained the law in terms of substitution effect and income effect. The substitution effect describes the change in demand for a product when its relative price changes. When the price of a commodity falls, the price ratio between items change and it becomes relatively cheaper than other commodities. Assuming that the prices of all other commodities remain constant, 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. When the price falls, the substitution effect is always positive; i.e it will always cause more to be demanded. The substitution effect will be stronger when:
- (a) the goods are closer substitutes
 - (b) there is lower cost of switching to the substitute good
 - (c) there is lower inconvenience while switching to the substitute good
- (b) **Income effect:** The increase in demand on account of an increase in real income is known as 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. A part or whole of the resulting increase in real income can now be used to buy more of the commodity in question, given that the good is normal. Therefore, the demand for that commodity (whose price has fallen) increases. However, there is one exception. In the case of inferior goods, the income effect works in the opposite direction to the substitution effect. In the case of inferior goods, the expansion in demand due to a price fall will take place only if the substitution effect outweighs the income effect.
- (2) **Utility maximising behaviour of Consumers:** A consumer is in equilibrium (i.e. maximises his satisfaction) when the marginal utility of the commodity and its price equalize. According to Marshall, the consumer has diminishing utility for each additional unit of a commodity and therefore, he will be willing to pay only less for each additional unit. A rational consumer will not pay more for lesser satisfaction. He is induced to buy additional units only when the prices are lower. The operation of diminishing marginal utility and the act of the consumer to equalize the utility of the commodity with its price result in a downward sloping demand curve.
- (3) **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 earlier may now be able 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 increases.
- (4) **Different uses:** Many commodities have multiple uses. When the price of such commodities are high (or rises) they will be put to limited uses only. If the prices of such commodities fall, they will be put to more number of uses and therefore their demand will increase. Thus, the increase in the number of uses

consequent to a fall in price make the buyer demand more of such commodities making the demand curve slope downwards. For example: Electricity

1.3.5 Exceptions to the Law of Demand

According to the law of demand, other things being equal, more of a commodity will be demanded at lower prices than at higher prices. 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 used by the rich people as status symbol for enhancing their social prestige or /and for displaying wealth. These articles will not conform to the usual law of demand as they become more attractive only if their prices are high or keep going up. 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 an example of this case. Higher the price of diamonds, higher is the prestige value attached to them and hence higher is the demand.

- (ii) **Giffen goods:** Sir Robert Giffen, a Scottish economist and statistician, 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 inferior, with no close substitutes available and which occupy a substantial place in consumers’ budget are called ‘Giffen goods’. All Giffen goods are inferior goods; but all inferior goods are not Giffen goods. Examples of Giffen 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, become necessities of life. For example, in spite of the fact that the prices of television sets, refrigerators, air-conditioners 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 even higher, tend to buy larger quantities of such commodities. For example, when there is wide-spread drought, people expect that prices of food grains would rise in future. They demand greater quantities of food grains even as their price rises. On the contrary, if prices are falling and people anticipate further fall, rather than buying more, they postpone their purchases. However, it is to be noted that here it is not the law of demand which is invalidated. 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) **Incomplete information and irrational behaviour:** The law has been derived assuming consumers to be rational and knowledgeable about market-conditions. However, at times, consumers have incomplete information and therefore make inconsistent decisions regarding purchases. 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.

Sometimes, consumers tend to be irrational and make impulsive purchases without any rational calculations about the price and usefulness of the product and in such contexts the law of demand fails.

- (vi) **Demand for necessities:** The law of demand does not apply much in the case of necessities of life. Irrespective of price changes, people have to consume the minimum quantities of necessary commodities.
- (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 the prices of related commodities or in tastes and fashion etc., the inverse demand and price relation may not hold good.



1.4 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 a contraction of demand. For example, suppose the price of apples is Rs 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 the same but the price of apples falls to Rs 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 Rs 150 per kilogram and the consumer then 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 , the quantity demanded is OM , given other things equal. When as a result of increase in price (OP_{II}), 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 demand curve'. Similarly, as a result of fall in price to OP_I , the quantity demanded rises to ON , we say that there is an 'expansion of demand' or 'a rise in quantity demanded' or 'a downward movement on the same demand curve.'

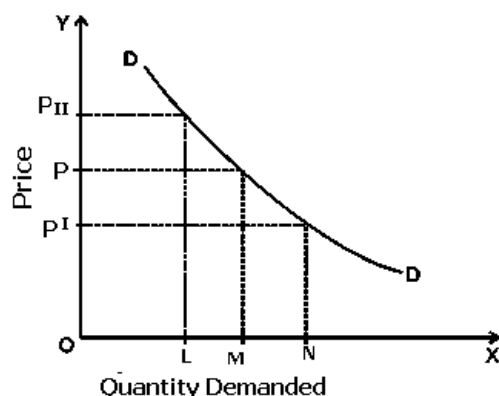


Fig. 3 : Expansion and Contraction of Demand

1.4.1 Increase and Decrease in Demand

Till now we have assumed that the other determinants of demand remain constant when we are analysing the 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. The 'other factors remaining constant' means that the position of the demand curve remains the same and the consumer moves downwards or upwards on it.

There are factors other than price (non-price factors) or conditions of demand which might cause either an increase or decrease in the quantity of a particular good or service that buyers are prepared to demand at a given price. 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? As an example, let us consider what happens to the demand for commodity X if the consumer's income increases:

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

| | Price (Rs) | Quantity of 'X' demanded when average household income is Rs 5,000 per month | Quantity of 'X' demanded when average household income is Rs 10,000 per month | |
|---|---------------|--|---|----|
| A | 5 | 10 | 15 | A1 |
| B | 4 | 15 | 20 | B1 |
| C | 3 | 20 | 25 | C1 |
| D | 2 | 35 | 40 | D1 |
| E | 1 | 60 | 65 | E1 |

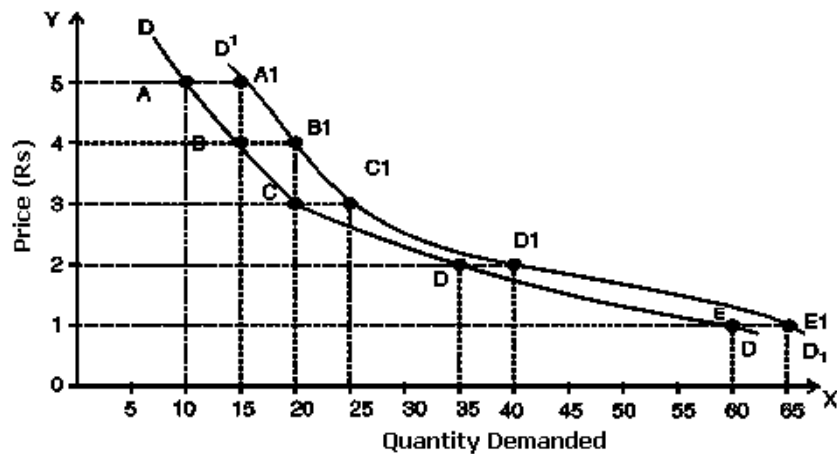


Fig. 4: Figure Showing Two Demand Curves at Different Incomes

The two sets of data are plotted in Figure 4 as DD pertaining to demand when average household income is Rs 5000/ and D'D' when income is Rs.10, 000/. We find that with increase in income, the demand curve for X has shifted [in this case it has shifted to the 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 Rs 4 per unit, 15 units are demanded when average household income is Rs 5,000 per month. When the average household income rises to Rs 10,000 per month, 20 units of X are demanded at price Rs 4. You can find similar increase in demand at each price. Since this increase would occur regardless of what the market price is, the result would be a shift to the right of the entire demand curve.

Alternatively, we can ask what price consumers would be willing to pay to purchase a given quantity, say 15 units of X. With greater income, they should be willing to pay a higher price of Rs 5 instead of 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.

Any change that increases the quantity demanded at every price shifts the demand curve to the right and is called an increase in demand. Any change that decreases the quantity demanded at every price shifts the demand curve to the left, and is called a decrease in demand.

Figure 5(a) and (b) illustrate increase and decrease in demand respectively. When there is an increase in demand, the demand curve shifts to the right and more quantity will be purchased at a given price (Q_1 instead of Q at price P). A decrease in demand causes the entire demand curve to shift to the left and we find that less quantity is bought at the same price P .

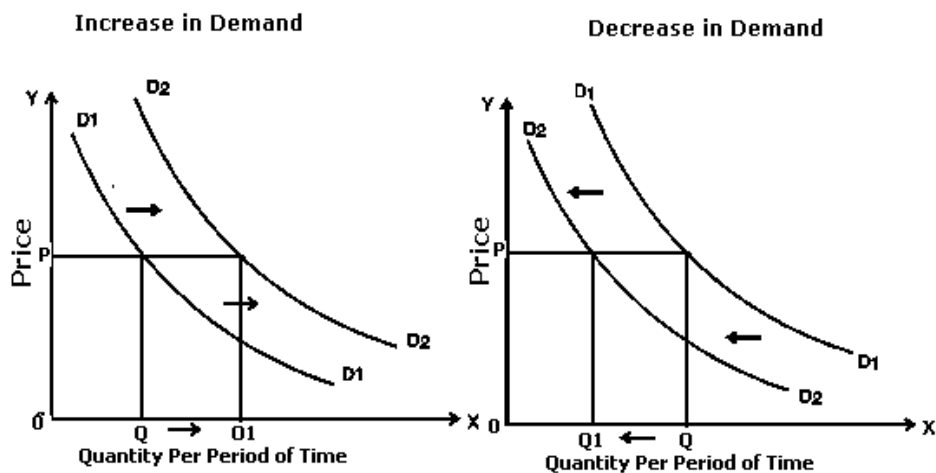


Fig. 5(a): Rightward shift in the demand Curve

Fig. 5(b): Leftward shift in the demand Curve

The table below summarises the effect of non - price determinants on demand

| | |
|---|---|
| Changes in determinants other than price that cause increase in demand (Rightward shift of demand curve when more is demanded at each price) | Changes in determinants other than price that cause Decrease in Demand (Leftward shift of demand curve when less is demanded at each price) |
| Rise in income in the case of normal goods | A fall in income in case of normal goods, and a rise in income in case of inferior goods |
| Increase in wealth in the case of normal goods | Decrease in wealth in case of normal goods, and an increase in wealth in case of inferior goods |
| Rise in the price of a substitute good | Fall in the price of a substitute good |
| Fall in the price of a complement | Rise in the price of a complement |
| An increase in the number of buyers | A decrease in the number of buyers |
| A change in tastes in favour of the commodity | A change in tastes against the commodity |
| A redistribution of income to groups of people who favour the commodity | Redistribution of income away from groups of people who favour the commodity. |
| An expectation that price will rise in the future | An expectation that price will fall in the future |
| Government policies encouraging consumption of the good . Eg. Grant of consumer subsidies | Government regulations discouraging consumption e.g. ban on cigarette smoking / ban on consumption. |

1.4.2 Movements along the Demand Curve vs. Shift of Demand Curve

It is important for the business decision-makers to understand the 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 economists speak 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 the price of the commodity.

When demand increases due to factors other than price, firms can sell more at the existing prices resulting in increased revenue. The objective of advertisements and all other sales promotion activities by any firm is to shift the demand curve to the right and to reduce the elasticity of demand. (The latter will be discussed in the next section). However, the additional demand is not free of cost as firms have to incur expenditure on advertisement and sales promotion devices.



1.5 ELASTICITY OF DEMAND

Till now we were concerned with the direction of the changes in prices and quantities demanded. From the point of view of a business firm, it is more important to know the extent of the relationship or the degree of responsiveness of demand to changes in its determinants.

Often, we would want to know how sensitive is the demand for a product to its price; for example, if price increases by 5 percent, how much will the quantities demanded change? Also, how much change in demand will be there if the average income rises by 5 percent? What effect will an advertising campaign have on sales? Economists use a number of different types of elasticities to answer questions like these so as to make demand predictions and to recommend changes in strategies.

Consider the following situations:

- (1) As a result of a fall in the price of headphones from Rs 500 to Rs 400, the quantity demanded increases from 100 headphones to 150 headphones.
- (2) As a result of fall in the price of wheat from Rs 20 per kilogram to Rs 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 Rs 9 per kilogram to Rs 7.50, the quantity demanded increases from 1000 kilogram to 1005 kilograms.

What do you notice? You notice that the demand for headphones, wheat and salt responds in the same direction to price changes. The difference lies in the degree of response of demand. The differences in responsiveness of

demand can be found out by comparing the percentage changes in prices and quantities demanded. Here lies the concept of elasticity.

The amount of a commodity purchased is a function of many variables such as price of the commodity, prices of the related commodities, income of the consumers and other factors on which demand depends. A change in one of these independent variables will cause a change in the dependent variable, namely, the amount purchased per unit of time. The elasticity of demand measures the relative responsiveness of the amount purchased per unit of time to a change in any one of these independent variables while keeping others constant. In general, the coefficient of elasticity is defined as the proportionate change in the dependent variable divided by the proportionate change in the independent variable.

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. More precisely, elasticity of demand is the percentage change in quantity demanded divided by the percentage change in one of the variables on which demand depends.

We may find different measures of elasticity such as price elasticity, cross elasticity, income elasticity, advertisement elasticity and elasticity of substitution. 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.

1.5.1 Price Elasticity of Demand

Perhaps, the most important measure of elasticity of demand is the price elasticity of demand which measures the sensitivity of quantity demanded to 'own price' or the price of the good itself. The concept of price elasticity of demand is important for a firm for two reasons.

- Knowledge of the nature and degree of price elasticity allows firms to predict the impact of price changes on its sales.
- Price elasticity guides the firm's profit-maximizing pricing decisions.

Price elasticity of demand expresses the responsiveness 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 the percentage change in quantity demanded divided by the percentage change in price, other things remaining equal. The price elasticity of demand (also referred to as PED) tells us the percentage change in quantity demanded for each one percent (1%) change in price. That is,

$$\text{Price Elasticity} = E_p = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in Price}}$$

The percentage change in a variable is just the absolute change in the variable divided by the original level of the variable.

Therefore,

$$E_p = \frac{\frac{\text{Change in quantity}}{\text{Original Quantity}} \times 100}{\frac{\text{Change in Price}}{\text{Original Price}} \times 100}$$

$$\text{OR } E_p = \frac{\text{Change in quantity}}{\text{Original Quantity}} \times \frac{\text{Original Price}}{\text{Change in price}}$$

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 original quantity
 p stands for original price
 Δ stands for a change.

A negative sign on the elasticity of demand illustrates the law of demand: less quantity is demanded as the price rises. Notice that the change in quantity was due solely to the price change. The other factors that potentially could affect sales (income and the competitor's price) did not change

The greater the value of elasticity, the more sensitive quantity demanded is to price. Strictly speaking, the value of price elasticity varies from minus infinity to approach zero. This is 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.

While interpreting the coefficient of price elasticity, we consider only the magnitude of the price elasticity- i.e. its absolute size. For example, if $E_p = -1.22$, we say that the elasticity is 1.22 in magnitude. That is, 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:

Illustration 1

The price of a commodity decreases from Rs 6 to Rs 4 and quantity demanded of the good increases from 10 units to 15 units. Find the coefficient of price elasticity.

Solution

Price elasticity = $(-) \Delta q / \Delta p \times p/q = 5/2 \times 6/10 = (-) 1.5$

Illustration 2

A 5% fall in the price of a good leads to a 15% rise in its demand. Determine the elasticity and comment on its value.

Solution

$$\begin{aligned} \text{Price Elasticity} = E_p &= \frac{\% \text{ change in quantity demanded}}{\% \text{ change in Price}} \\ &= 15\% / 5\% = 3 \end{aligned}$$

Comment: The good in question has elastic demand

Illustration 3

The price of a good decreases from ₹ 100 to ₹ 60 per unit. If the price elasticity of demand for it is 1.5 and the original quantity demanded is 30 units, calculate the new quantity demanded.

Solution

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

Here

$$1.5 = \frac{\Delta q}{40} \times \frac{100}{30} = 18$$

Therefore new quantity demanded = 30 + 18 = 48 units

Illustration 4

The quantity demanded by a consumer at price Rs 9 per unit is 800 units. Its price falls by 25% and quantity demanded rises by 160 units. Calculate its price elasticity of demand.

Solution

Change in quantity demanded = 160

Therefore, % change in quantity demanded = 20%

% change in price = 25%

$$E_d = \frac{\% \text{ change in } q}{\% \text{ change in } p}$$

$$\therefore E_d = \frac{20}{25} = 0.8$$

Illustration 5

A consumer buys 80 units of a good at a price of Rs 4 per unit. Suppose price elasticity of demand is - 4. At what price will he buy 60 units?

Solution

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

Or

$$4 = \frac{20}{x - 4} \times \frac{4}{80}$$

Or

$$4 = \frac{1}{x - 4}$$

∴

$$x = 4.2 \text{ per unit}$$

1.5.2 Point Elasticity

The point elasticity of demand is the price elasticity of demand at a particular point on the demand curve. The concept of point elasticity is used for measuring price elasticity where the change in price is infinitesimal. Price elasticity is a key element in applying marginal analysis to determine optimal prices. Since marginal analysis works by evaluating “small” changes taken with respect to an initial decision, it is useful to measure elasticity with respect to an infinitesimally small change in price.

Point elasticity makes use of derivative rather than finite changes in price and quantity. It may be defined as:

$$E_p = \frac{-dq}{dp} \times \frac{p}{q}$$

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. Economists generally use the word “elasticity” to refer to point elasticity.

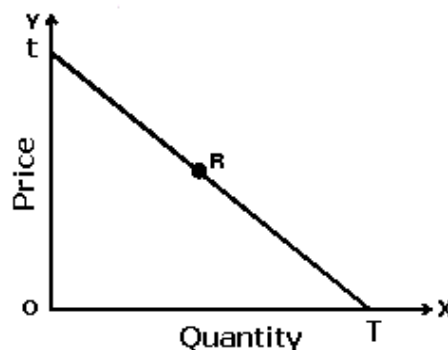


Fig 6: Point Elasticity

Point elasticity is, therefore, the product of price quantity ratio at a particular point on the demand curve and the reciprocal of the slope of the demand line.

1.5.3 Measurement of Elasticity on a Linear Demand Curve – Geometric Method

By definition, the price elasticity of demand is the change in quantity associated with a change in price ($\Delta Q/\Delta P$) times the ratio of price to quantity (P/Q). Therefore, the price elasticity of demand depends not only on the slope of the demand curve but also on the price and quantity. The elasticity, therefore, varies along the curve as price and quantity change. The slope of a linear demand curve is constant. However, the elasticity at different points on a linear demand curve would be different. When price is high price is high and quantity is small, the elasticity is high. The elasticity becomes smaller as we move down the curve.

Given a straight line demand curve tT , (Fig.6 above) 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.

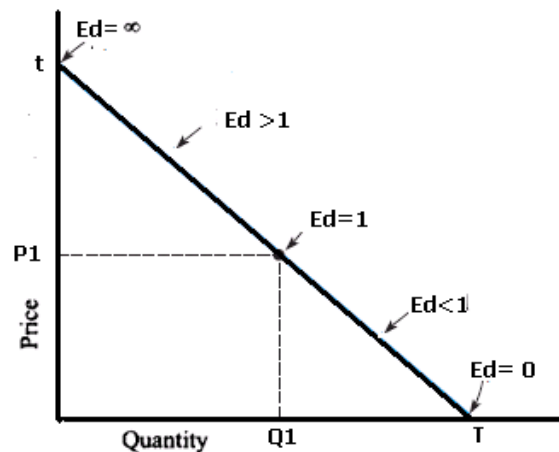


Fig .7: Elasticity at Different Points on the Demand Curve

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.

1.5.4 Arc-Elasticity

Often we may be required to calculate price elasticity over some portion of the demand curve rather than at a single point. In other words, the elasticity may be calculated over a range of prices. When price and quantity changes are discrete and large we have to measure elasticity over an arc of the demand curve.

When price elasticity is to be found between two prices (or two points on the demand curve say, A and B in figure 8) the question arises as to 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, rather than choose the initial or the final price and quantity, the mid-point method is used i.e. the averages of the two prices and quantities are taken as (i.e. original and new) base. The midpoint formula is an approximation to the actual percentage change in a variable, but it has the advantage of consistent elasticity values when price moves in either directions.

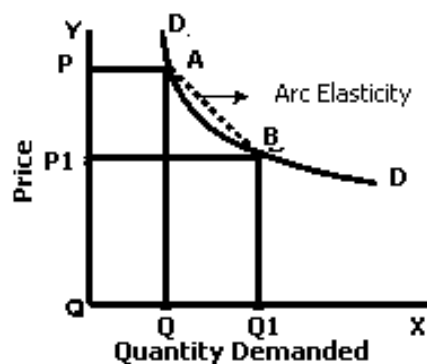


Fig. 8: Arc Elasticity

The arc elasticity can be found out by using the formula: We drop the minus sign and use the absolute value.

$$E_p = \frac{\frac{Q_2 - Q_1}{(Q_2 + Q_1)/2}}{\frac{P_2 - P_1}{(P_2 + P_1)/2}}$$

$$E_p = \frac{Q_2 - Q_1}{Q_2 + Q_1} \times \frac{P_2 + P_1}{P_2 - P_1}$$

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 demand for headphones between:

$$P_1 = \text{Rs. } 500 \quad Q_1 = 100$$

$$P_2 = \text{Rs. } 400 \quad Q_2 = 150$$

We will use the formula

$$E_p = \frac{Q_2 - Q_1}{Q_2 + Q_1} \times \frac{P_2 + P_1}{P_2 - P_1}$$

Or

$$E_p = \frac{50}{250} \times \frac{900}{100}$$

or

$$E_p = 1.8$$

The arc elasticity will always lie somewhere (but not necessarily in the middle) between the point elasticities calculated at the lower and the higher prices.

1.5.5 Interpretation of the Numerical Values of Elasticity of Demand

Economists have found it useful to divide the demand behaviour into different categories, based on values of price elasticity. Since we draw demand curves with price on the vertical axis and quantity on the horizontal axis, $\Delta Q / \Delta P = (1/\text{slope of curve})$. As a result, for any price and quantity combination, the steeper the slope of the curve, the less elastic is demand.

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

Elasticity is zero, ($E_p = 0$) if there is no change at all in the quantity demanded when price changes i.e. when the quantity demanded does not respond at all to a price change. In other words, any change in price leaves the quantity demanded unchanged and consumers will buy a fixed quantity of a good regardless of its price. Perfectly inelastic demand is as an extreme case of price insensitivity and is therefore only a theoretical category with less practical significance. The vertical demand curve in figure 8(a) represents perfectly or completely inelastic demand,

Elasticity is one, or unitary, ($E_p = 1$) if the percentage change in quantity demanded is equal to the percentage change in price. Figure 8 (b) shows special case of unit-elastic demand, where the demand curve is a rectangular hyperbola.

Elasticity is greater than one ($E_p > 1$) 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. [Figure 8 (d)]. In other words, the quantity demanded is relatively sensitive to price changes. When drawn, the elastic demand line is fairly flat.

Elasticity is less than one ($E_p < 1$) 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.[Figure 8 (e)]In this situation, when price falls the buyers are unable or unwilling to significantly contract demand. In other words, the quantity demanded is relatively insensitive to price changes. When drawn, the inelastic demand line is fairly steep.

Elasticity is infinite, ($E_p = \infty$) when a 'small price reduction raises the demand from zero to infinity. The demand curve is horizontal at the price level (where the demand curve touches the vertical axis).As long as the price stays at one particular level any quantity might be demanded. Moving back and forth along this line, we find that there is a change in the quantity demanded but no change in the price. If there is a slight increase in price, they would not buy anything from the particular seller. That is, even the smallest price rise would cause quantity demanded to fall to zero. Roughly speaking, when you divide a number by zero, you get infinity, denoted by the symbol ∞ . So a horizontal demand curve implies an infinite price elasticity of demand. This type of demand curve is found in a perfectly competitive market. The horizontal demand curve in figure 8 (c) represents perfectly or infinitely elastic demand,

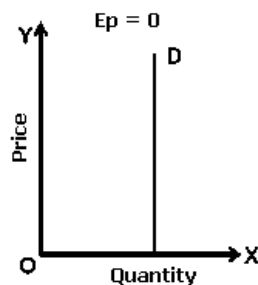


Fig. 8(a)

Demand curve of zero elasticity

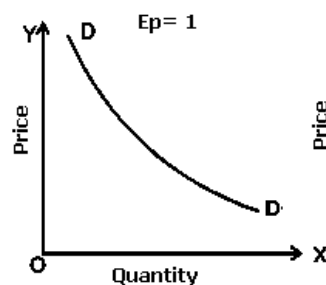


Fig. 8(b)

Demand curve of unitary elasticity

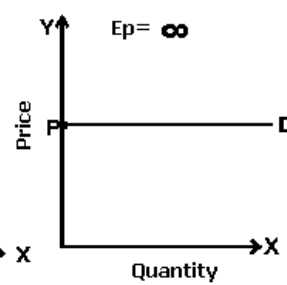


Fig. 8(c)

Demand curve of infinite elasticity

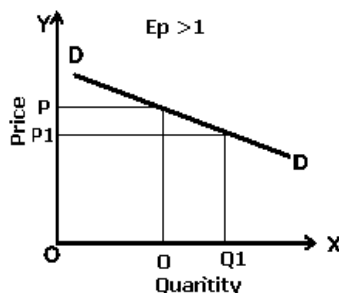


Fig. 8(d)

Demand curve of elasticity greater than one

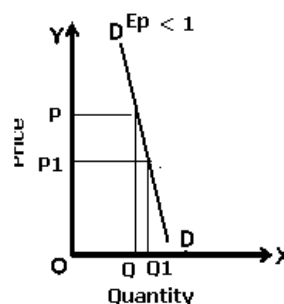


Fig. 8(e)

Demand curve of Elasticity less than one

Table 4 : Elasticity Measures, Meaning and Nomenclature

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

Now that we are able to classify goods according to their price elasticity, let us see whether the goods mentioned below are price elastic or inelastic.

| Sl. No. | Name of the Commodity | Calculation of Elasticity $E_p = \frac{Q_2 - Q_1}{Q_2 + Q_1} \times \frac{P_2 + P_1}{P_2 - P_1}$ | Nature of Elasticity |
|---------|-----------------------|---|----------------------|
| 1. | Headphones | $\frac{100 - 150}{100 + 150} \times \frac{500 + 400}{500 - 400} = 1.8 > 1$ | Elastic |
| 2. | Wheat | $\frac{500 - 520}{500 + 520} \times \frac{20 + 18}{20 - 18} = 0.37 < 1$ | Inelastic |
| 3. | Common Salt | $\frac{1000 - 1005}{1000 + 1005} \times \frac{9 + 7.50}{9 - 7.50} = 0.02743 < 1$ | Inelastic |

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

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

1.5.6 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 significantly related to each other. As the total expenditure (price of the commodity multiplied by the quantity of that commodity purchased) made on a commodity is the total revenue received by the seller (price of the commodity multiplied by quantity of that commodity sold of that commodity), we can say that the price elasticity and total revenue received are closely related to each other. By analysing the changes in total expenditure (or total revenue) in response to a change in the price of the commodity, we can know the price elasticity of demand for it.

Price Elasticity of demand equals one or Unity: When, as a result of the change in price of a good, the total expenditure on the good or the total revenue received from that good remains the same, the price elasticity for the good is equal to unity. This is because the 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 given percentage increase (or decrease) in the price of a good and if the price elasticity is unitary, total expenditure of the buyer on the good or the total revenue received from it will remain unchanged.

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

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

The main drawback of this method is that by using this we can only say whether the demand for a good is elastic or inelastic; we cannot find out the exact coefficient of price elasticity.

Why should a business firm be concerned about elasticity of demand? The reason is that the degree of elasticity of demand predicts how changes in the price of a good will affect the total revenue earned by the producers from the sale of that good. The total revenue is defined as the total value of sales of a good or service. It is equal to the price multiplied by the quantity sold.

1.5.7 Total Revenue

$$\text{Total revenue (TR)} = \text{Price} \times \text{Quantity sold}$$

Except in the rare case of a good with perfectly elastic or perfectly inelastic demand, when a seller raises the price of a good, there are two effects which act in opposite directions on revenue.

- **Price effect:** After a price increase (decrease), each unit sold sells at a higher (lower) price, which tends to raise (lower) the revenue.
- **Quantity effect:** After a price increase (decrease), fewer (more) units are sold, which tends to lower (increase) the revenue.

What will be the net effect on total revenue? It depends on which effect is stronger. If the price effect which tends to raise total revenue is the stronger of the two effects, then total revenue goes up. If the quantity effect, which tends to reduce total revenue, is the stronger, then total revenue goes down.

The price elasticity of demand tells us what happens to the total revenue when price changes: its size determines which effect, the price effect or the quantity effect, is stronger.

If demand for a good is unit-elastic (the price elasticity of demand is equal to one; Figure 9), an increase in price or decrease in price does not change total revenue. In this case, the quantity effect and the price effect exactly balance each other. When price rises from P to P_1 , the gain in revenue (Area A) is equal to loss in revenue due to lost sales (Area B)

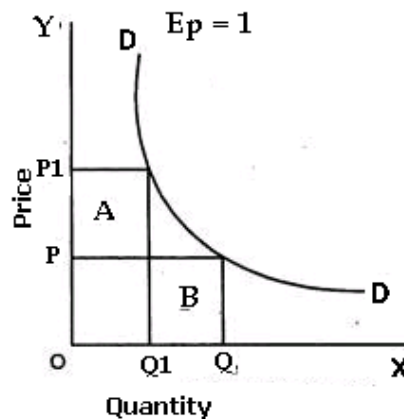


Figure 9: Total revenue when Elasticity = 1

If demand for a good is inelastic (the price elasticity of demand is less than one), a higher price increases total revenue. In this case, the quantity effect is weaker than the price effect. On the contrary, when demand is elastic, a fall in price reduces total revenue because the quantity effect is dominated by the price effect. Refer Figure 8 (e) above.

If demand for a good is elastic (the price elasticity of demand is greater than one), an increase in price reduces total revenue and a fall in price increases total revenue. In this case, the quantity effect is stronger than the price effect. Refer Figure 8 (d) above.

Table 5 below summarizes the relationship between price elasticity and total revenue.

Table 5: The Relationship between Price elasticity and Total Revenue (TR)

| Demand | | | |
|----------------|--------------|-----------------|--------------|
| | Elastic | Unitary Elastic | Inelastic |
| Price increase | TR Decreases | TR remains same | TR Increases |
| Price decrease | TR Increases | TR remains same | TR Decreases |

1.5.8 Determinants of Price Elasticity of Demand

In the above section we have explained what price elasticity is 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 substitutability and the extent of availability of substitutes. Some commodities like butter, cabbage, car, soft drink etc. have close substitutes. These are margarine, other green vegetables, other brands of cars, other brands of cold drinks respectively. A change in the 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. Moreover, wider the range of substitutes available, the greater will be the elasticity. For example, toilet soaps, toothpastes etc have wide variety of brands and each brand is a close substitute for the other.

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 the demand for a generic good like 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 hospital. Likewise, the demand for common salt and sugar is inelastic because good substitutes are not available for these.

- (2) **Position of a commodity in the 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 rental apartments and clothing tends to be elastic since households generally spend a good part of their income on them. When the good absorbs a significant share of consumers' income, it is worth their time and effort to find a way to reduce their demand when the price goes up.
- (3) **Nature of the need that a commodity satisfies:** In general, luxury goods are price elastic because one can easily live without a luxury. In contrast, necessities are price inelastic. Thus, while the demand for a home theatre is relatively elastic, the demand for food and housing, in general, is inelastic. If it is possible to

postpone the consumption of a particular good, such good will have elastic demand. Consumption of necessary goods cannot be postponed and therefore, their demand 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. When the price of a commodity which has multiple uses decreases, people tend to extend their consumption to its other uses. 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. Time gives buyers the opportunity to find alternatives or substitutes, or change their habits. A simple 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 adjustments to higher prices.
- (6) **Consumer habits:** If a person is a habitual consumer of a commodity, no matter how much its price change, the demand for the commodity will be inelastic. If buyers have rigid preferences demand will be less price elastic.
- (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. For example printers and ink cartridges.
- (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.
- (9) **Minor complementary items:** The demand for cheap, complementary items to be used together with a costlier product will tend to have an inelastic demand.

Knowledge of the price elasticity of demand and the factors that may change it is of key importance to business managers because it helps them recognise the effect of a price change on their total sales and revenues. Firms aim to maximise their profits and their pricing strategy is highly decisive in attaining their goals. Knowledge of the price elasticity of demand for the goods they sell helps them in arriving at an optimal pricing strategy.

If the demand for a firm's product is relatively elastic, the managers need to recognize that lowering the price would expand the volume of sales and result in an increase in total revenue. On the contrary, when the demand is elastic, they have to be very cautious about increasing prices because a price increase will lead to a decline in total revenue as fall in sales would be more than proportionate. If the firm finds that the demand for their product is relatively inelastic, the firm may safely increase the price and thereby increase its total revenue as they can be assured of the fact that the fall in sales on account of a price rise would be less than proportionate.

Knowledge of price elasticity of demand is important for governments while determining the prices of goods and services provided by them, such as, transport and telecommunication. Further, it also helps the governments to understand the nature of responsiveness of demand to increase in prices on account of additional taxes and the implications of such responses on the tax revenues. Elasticity of demand explains

why the governments are inclined to raise the indirect taxes on those goods that have a relatively inelastic demand, such as alcohol and tobacco products.

1.6 Income Elasticity of Demand

The income elasticity of demand is a measure of how much the demand for a good is affected by changes in consumers' incomes. Estimates of income elasticity of demand are useful for businesses to predict the possible growth in sales as the average incomes of consumers grow over time.

Income elasticity of demand is the degree of responsiveness of the quantity demanded of a good to changes 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:

$$\begin{aligned} E_i &= \frac{\Delta Q}{Q} \div \frac{\Delta Y}{Y} \\ &= \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} \\ E_i &= \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q} \end{aligned}$$

E_i = Income elasticity of demand

ΔQ = Change in demand

Q = Original demand

Y = Original money income

ΔY = 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 that good is equal to one.
2. If the proportion of income spent on a good increase as income increases, then the income elasticity for that good is greater than one. The demand for such goods increase faster than the rate of increase in income
3. If the proportion of income spent on a good decrease as income rises, then income elasticity for the good is positive but less than one. The demand for income-inelastic goods rises, but substantially slowly compared to the rate of increase in income. Necessities such as food and medicines tend to be income- inelastic

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 demand for 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 the demand for the good. This happens in the case of most of the goods and such goods are called normal goods. For

all normal goods, income elasticity is positive. However, the degree of elasticity varies according to the nature of commodities.

When the income elasticity of demand is negative, the good is an inferior good. In this case, the quantity demanded at any given price decreases as income increases. The reason is that when income increases, consumers choose to consume superior substitutes.

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 bulks 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 the consumer's eye or, it is a good which 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,

$$\text{i.e. } E_i = \frac{\text{Percentage change in demand}}{\text{Percentage change in income}}$$

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

| S. No. | Commodity | Income-elasticity for the household | Remarks |
|--------|-----------|---|--|
| a | Wheat | $\frac{5\%}{10\%} = .5 (E_i < 1)$ | Since $0 < .5 < 1$, wheat is a normal good and fulfils a necessity. |
| b | T.V. | $\frac{20\%}{10\%} = 2 (E_i > 1)$ | Since $2 > 1$, T.V. is a luxurious commodity. |
| c | Bajra | $\frac{(-)2\%}{5\%} = (-) .4 (E_i < 0)$ | Since $-.4 < 0$, Bajra is an inferior commodity in the eyes of the household. |
| d | X | $\frac{7\%}{7\%} = 1 (E_i = 1)$ | Since income elasticity is 1, X has unitary income elasticity. |
| e | Buttons | $\frac{0\%}{5\%} = 0 (E_i = 0)$ | Buttons have zero income-elasticity. |

It is to be noted that the words 'luxury', 'necessity', 'inferior good' do not signify the strict dictionary meanings here. In economic theory, we distinguish them in the manner shown above.

An important feature of income elasticity is that income elasticities differ in the short run and long run. For nearly all goods and services the income elasticity of demand is larger in the long run than in the short run

Knowledge of income elasticity of demand is very useful for a business firm in estimating the future demand for its products. Knowledge of income elasticity of demand helps firms measure the sensitivity of sales for a given product to incomes in the economy and to predict the outcome of a business cycle on its market demand. For instance, if $EY = 1$, sales move exactly in step with changes in income. If $EY > 1$, sales are highly cyclical, that is, sales are sensitive to changes in income. For an inferior good, sales are countercyclical, that is, sales move in the opposite direction of income and $EY < 0$. This knowledge enables the firm to carry out appropriate production planning and management

ILLUSTRATION 6

Income Elasticity of Demand

A car dealer sells new as well as used cars. Sales during the previous year were as follows;

| Car type | Price | Quantity (Nos) |
|----------|-----------|----------------|
| New | 6.5 lakhs | 400 |
| Used | 60,000 | 4000 |

During the previous year, other things remaining the same, the real incomes of the customers rose on average by 10%. During the last year sales of new cars increased to 500, but sales of used cars declined to 3,850.

What is the income elasticity of demand for the new as well as used cars? What inference do you draw from these measures of income elasticity?

SOLUTION

Income Elasticity of demand for new cars

Percentage change in income = 10%, given

Percentage change in quantity of new cars demanded = $(\Delta Q/Q) \times 100 = (100/400) \times 100 = 25\%$

Income elasticity of demand = $25\% / 10\% = + 2.5$

New car is therefore income elastic. Since income elasticity is positive, new car is a normal good.

Income Elasticity of demand for used cars

Percentage change in income = 10%, given

% change in quantity of used cars demanded = $(\Delta Q/Q) \times 100 = (-150/4000) \times 100 = -3.75\%$
Income elasticity of demand = $-3.75 / 10 = -0.375$

Since income elasticity is negative, used car is an inferior good.



1.7. CROSS - PRICE ELASTICITY OF DEMAND

1.7.1 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.

(a) Substitute Products and Demand

In the case of substitute commodities, the cross demand curve slopes upwards (i.e. positively) showing that more quantities of a commodity, will be demanded whenever there is a rise in the price of a substitute commodity. In figure 10, the 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, due to the operation of the law of demand, the demand for coffee falls. The consumers will substitute tea in the place of coffee. The price of tea is assumed to be constant. Therefore, whenever there is an increase in the price of one commodity, the demand for the substitute commodity will increase.

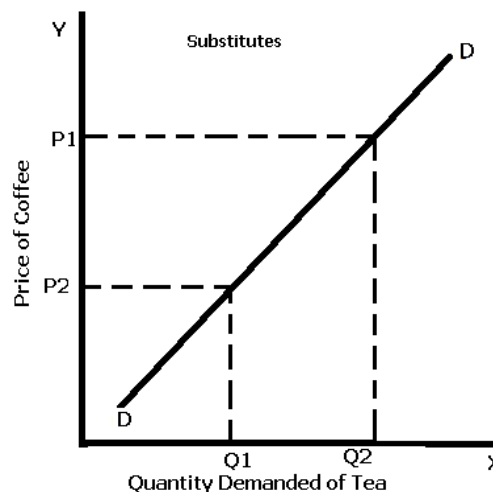


Fig. 10 : Substitutes

(b) Complementary Goods

In the case of complementary goods, as shown in the figure 11 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 solar panels will necessarily increase the demand for batteries. The same is the case with complementary goods such as bread and butter; car and petrol, electricity and electrical gadgets etc. Whenever there is a fall in the demand for solar panels due to a rise in their prices, the demand for batteries will fall, not because the price of batteries has gone up, but because the price of solar panels 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).

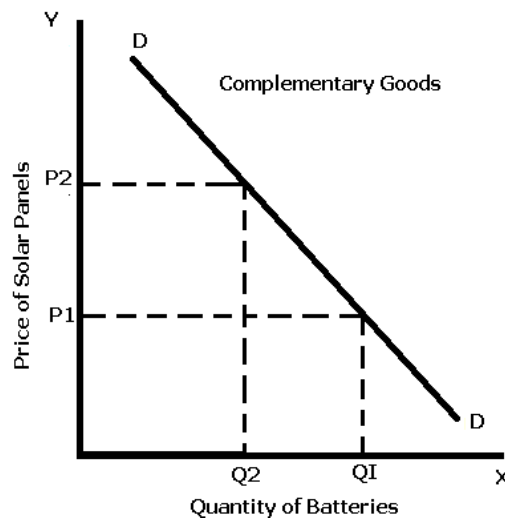


Fig. 11: Complementary Goods

We shall now look into the cross - price elasticity of demand.

The cross-price elasticity of demand between two goods measures the effect of the change in one good's price on the quantity demanded of the other good. Here, we consider the effect of changes in relative prices within a market on the pattern of demand. 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. It is equal to the percentage change in the quantity demanded of one good divided by the percentage change in the other good's price.

$$E_c = \frac{\text{Percentage change in quantity demanded of good X}}{\text{Percentage change in price of good Y}}$$

Symbolically, (mathematically)

$$E_c \frac{\Delta q_x}{q_x} \div \frac{\Delta p_y}{p_y}$$

$$E_c \frac{\Delta q_x}{\Delta p_y} \div \frac{p_y}{q_x}$$

Where E_c stands for cross elasticity.

q_x stands for original quantity demanded of X.

Δq_x stands for change in quantity demanded of X

p_y stands for the original price of good Y.

Δp_y stands for a small change in the price of Y.

In the case of the cross-price elasticity of demand, the sign (plus or minus) is very important: it tells us whether the two goods are complements or substitutes.

When two goods X and Y are substitutes, the cross-price elasticity of demand is positive: a rise in the price of Y increases the demand for X and causes a rightward shift of the demand curve. When the cross-price elasticity of demand is positive, its size is a measure of how closely substitutable the two goods are. Greater the cross elasticity, the closer is the substitute. Higher the value of cross elasticity, greater will be the substitutability.

- If two goods are perfect substitutes for each other, the cross elasticity between them is infinite.
- If two goods are close substitutes, the cross-price elasticity will be positive and large.
- If two goods are not close substitutes, the cross-price elasticity will be positive and small.
- If two goods are totally unrelated, the cross-price elasticity between them is zero.

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 causing a leftward shift of the demand curve. The size of the cross-price elasticity of demand between two complements tells us how strongly complementary they are: if the cross-price elasticity is only slightly below zero, they are weak complements; if it is negative and very high, they are strong complements.

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.

The concept of cross elasticity of demand is useful for a manager while making decisions regarding changing the prices of his products which have substitutes and complements. If cross elasticity to change in the price of substitutes is greater than one, the firm may lose by increasing the prices and gain by reducing the prices of his products. With proper knowledge of cross elasticity, the firm can plan policies to safeguard against fluctuating prices of substitutes and complements.

Cross- price elasticity of demand

ILLUSTRATION 7

A shopkeeper sells only two brands of note books Imperial and Royal. It is observed that when the price of Imperial rises by 10% the demand for Royal increases by 15%. What is the cross price elasticity for Royal against the price of Imperial?

SOLUTION

$$E_c = \frac{\text{Percentage change in quantity demanded of good X}}{\text{Percentage change in price of good Y}}$$

$$E_c = \frac{15\%}{10\%} = +1.5$$

The two brands of note book Imperial and Royal are substitutes with significant substitutability

ILLUSTRATION 8

The cross price elasticity between two goods X and Y is known to be - 0.8. If the price of good Y rises by 20%, how will the demand for X change?

SOLUTION

Inserting the values in the formula:

$$-0.8 = X / 20\%$$

$$\% \text{ change in quantity demanded of X} = 20\% \times -0.8 = -16\%$$

Since cross elasticity is negative, X and Y are complementary goods

ILLUSTRATION 9

The price of 1kg of tea is Rs 30. At this price 5kg of tea is demanded. If the price of coffee rises from Rs 25 to Rs 35 per kg, the quantity demanded of tea rises from 5kg to 8kg. Find out the cross price elasticity of tea.

SOLUTION

$$\text{Cross elasticity} = \frac{\Delta q_x}{\Delta p_y} \times \frac{p_y}{q_x} \quad \text{Here } \begin{matrix} x = \text{tea} \\ y = \text{coffee} \end{matrix}$$

$$E_c = \frac{8 - 5}{10} \times \frac{25}{5} = \frac{3}{10} \times \frac{25}{5} = +1.5$$

The elasticity of demand of tea is +1.5 showing that the demand of tea is highly elastic with respect to coffee. The positive sign shows that tea and coffee are substitute goods.

ILLUSTRATION 10

The price of 1 kg of sugar is Rs 50. At this price 10 kg is demanded. If the price of tea falls from Rs 30 to Rs 25 per kg, the consumption of sugar rises from 10 kg to 12 kg. Find out the cross price elasticity and comment on its value.

SOLUTION

$$\text{Cross elasticity} = \frac{\Delta q_x}{\Delta p_y} \times \frac{p_y}{q_x} \quad \text{Here } \begin{matrix} x = \text{Sugar} \\ y = \text{Tea} \end{matrix}$$

$$= \frac{2}{-5} \times \frac{30}{10} = (-) 1.2$$

Since the elasticity is -1.2, we can say that sugar and tea are complementary in nature.

**1.8 ADVERTISEMENT ELASTICITY**

Advertisement elasticity of sales or promotional elasticity of demand is the responsiveness of a good's demand to changes in the firm's spending on advertising. The advertising elasticity of demand measures the percentage change in demand that occurs given a one percent change in advertising expenditure. Advertising elasticity measures the effectiveness of an advertisement campaign in bringing about new sales.

Advertising elasticity of demand is typically positive. Higher the value of advertising elasticity greater will be the responsiveness of demand to change in advertisement. Advertisement elasticity varies between zero and infinity. It is measured by using the formula;

$$E_a = \frac{\% \text{ Change in quantity demanded}}{\% \text{ change in spending on advertising}}$$

$$E_a = \frac{\Delta Q_d / Q_d}{\Delta A / A}$$

Where ΔQ_d denotes increase in demand

ΔA denotes additional expenditure on advertisement

Q_d denotes initial demand

A denotes initial expenditure on advertisement

| Elasticity | Interpretation |
|----------------------------|--|
| $E_a = 0$ | Demand does not respond at all to increase in advertisement expenditure |
| $E_a > 0 \text{ but } < 1$ | Increase in demand is less than proportionate to the increase in advertisement expenditure |
| $E_a = 1$ | Demand increase in the same proportion in which advertisement expenditure increase |
| $E_a > 1$ | Demand increase at a higher rate than increase in advertisement expenditure |

As far as a business firm is concerned, the measure of advertisement elasticity is useful in understanding the effectiveness of advertising and in determining the optimum level of advertisement expenditure.



1.9 DEMAND FORECASTING

1.9.0 Meaning

Forecasting, in general, refers to knowing or measuring the status or nature of an event or variable before it occurs. Forecasting of demand is the art and science of predicting the probable demand for a product or a service at some future date on the basis of certain past behaviour patterns of some related events and the prevailing trends at present. It should be kept in mind that demand forecasting is not simple guessing, but it refers to estimating demand scientifically and objectively on the basis of certain facts and events relevant to forecasting.

1.9.1 Usefulness

The significance of demand or sales forecasting in the context of business policy decisions can hardly be over emphasized. Forecasting of demand plays a vital role in the process of planning and decision-making, whether at the national level or at the level of a firm. The effectiveness of the plans of business managers depends upon the level of accuracy with which future events can be predicted. The importance of demand forecasting has increased all the more on account of mass production and production in response to demand.

A good forecast enables the firm to perform efficient business planning. Forecasts offer information for budgetary planning and cost control in functional areas of finance and accounting. Good forecasts help in efficient production planning, process selection, capacity planning, facility layout and inventory management. A firm can plan production scheduling well in advance and obtain all necessary resources for production such as inputs and finances. Capital investments can be aligned to demand expectations and this will check the possibility of overproduction and underproduction, excess of unused capacity and idle resources. Marketing personnel often rely on sales forecasting in making key decisions. Demand forecasts also provide the necessary information for formulation of suitable pricing and advertisement strategies.

It is said that no forecast is completely fool-proof and correct. However, the very process of forecasting helps in evaluating various forces which affect demand and is in itself a rewarding activity because it enables the forecasting authority to know about various forces relevant to the study of demand behaviour.

1.9.2 Scope of Forecasting

Demand forecasting can be at the national or international level depending upon the area of operation of the given economic institution. It can also be confined to a given product or service supplied by a small firm in a local area. The scope of the forecasting task will depend upon the area of operation of the firm in the present as well as what is proposed in future. Much would depend upon the cost and time involved in relation to the benefit of the information acquired through the study of demand. The necessary trade-off has to be struck between the cost of forecasting and the benefits flowing from such forecasting.

1.9.3 Types of Forecasts

- (i) Macro-level forecasting deals with the general economic environment prevailing in the economy as measured by the Index of Industrial Production (IIP), national income and general level of employment etc.
- (ii) Industry- level forecasting is concerned with the demand for the industry's products as a whole. For example, demand for cement in India.
- (iii) Firm- level forecasting refers to forecasting the demand for a particular firm's product, say, the demand for ACC cement

Based on time period, demand forecasts may be short term demand forecasting and long term demand forecasting.

- (i) Short term demand forecasting covers a short span of time, depending of the nature of industry. It is done usually for six months or less than one year and is generally useful in tactical decisions.
- (ii) Long term forecasts are for longer periods of time, say two to five years and more. It provides information for major strategic decisions of the firm such as expansion of plant capacity.

1.9.4 Demand Distinctions

Business managers should have a clear understanding of the kind of demand which their products have. Before we analyse the different methods of forecasting demand, it is important for us to understand the demand distinctions which 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, plant and equipments. 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) **Demand for Durable goods and Non-durable goods**

Goods may be further sub-divided into durable and non-durable goods. Non durable goods are those which cannot be consumed more than once. Raw materials, fuel and power, packing items etc are examples of non durable producer goods. Beverages, bread, milk etc are examples of non-durable consumer goods. These will meet only the current demand. On the other hand, durable goods do not quickly wear out, can be consumed more than once and yield utility over a period of time. Examples of durable consumer goods are: cars, refrigerators and mobile phones. Building, plant and machinery, office furniture etc are durable producer goods. The demand for durable goods is likely to be derived demand. Further, there are semi-durable goods such as, clothes and umbrella.

(c) **Derived demand and Autonomous demand**

The demand for a commodity that arises because of the demand for some other commodity called 'parent product', 'is called derived demand. For example, the demand for cement is derived demand, being directly related to building activity. In general, the demand for producer goods or industrial inputs is derived demand. Also the demand for complementary goods is derived demand. If the demand for a product is independent of the demand for other goods, then it is called autonomous demand. It arises on its own out of an innate desire of the consumer to consume or to possess the commodity. But this distinction is purely arbitrary and it is very difficult to find out which product is entirely independent of other products.

(d) **Demand for firm's product and industry 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 demand for firm's product denotes the demand for the products of a particular firm, i.e. the quantity that a firm can dispose off at a given price over a period of time. E.g. demand for steel produced by the Tata Iron and Steel Company. The demand for a firm's product when expressed as a percentage of industry demand signifies the market share of the firm.

(e) **Short - run demand and Long-run demand**

This distinction is based on time period. Short run demand refers to demand with its immediate reaction to changes in product price and prices of related commodities, income fluctuations, ability of the consumer to adjust their consumption pattern, their susceptibility to advertisement of new products etc.

Long-run demand refers to demand which exists over a long period. Most generic goods have long term demand. Long term demand depends on long term income trends, availability of substitutes, credit facilities etc. In short, 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 buy and use electric appliances.

The above distinction is important because each of these goods exhibit distinctive characteristics which should be taken into account while analysing demand for them.

1.9.5 Factors Affecting Demand for Non-Durable Consumer Goods

There are three basic factors which influence the demand for these goods:

- (i) **Disposable income:** Other things being equal, the demand for a commodity depends upon the disposable income of the household. Disposable income is found out by deducting personal taxes from personal income.
- (ii) **Price:** Other things being equal, the demand for a commodity depends upon its own price and the prices of related goods (its substitutes and complements). While the demand for a good is inversely related to its own price and the price of its complements, it is positively related to the price of its substitutes.
- (iii) **Demography:** This involves the characteristics of the population, human as well as non-human, using the product concerned. For example, it may pertain to the number and characteristics of children in a study of demand for toys and characteristics of automobiles in a study of the demand for tyres or petrol.

Non durables are purchased for current consumption only. From a business firm's point of view, demand for non durable goods gets repeated depending on the nature of the non durable goods. Usually, non durable goods come in wide varieties and there is competition among the sellers to acquire and retain customer loyalty.

1.9.6 Factors Affecting the Demand for Durable-Consumer Goods

Demand for durable goods has certain special characteristics. Following are the important factors that affect the demand for durable goods.

- (i) A consumer can postpone the replacement of durable goods. Whether a consumer will go on using the good for a long time or will replace it depends upon factors like his social status, prestige, level of money income, rate of obsolescence etc.
- (ii) These goods require special facilities for their use e.g. roads for automobiles, and electricity for refrigerators and radios. The existence and growth of such factors is an important variable that determines the demand for durable goods
- (iii) As consumer durables are used by more than one person, the decision to purchase may be influenced by family characteristics like income of the family, size, age distribution and sex composition. Likely changes in the number of households should be considered while determining the market size of durable goods.
- (iv) Replacement demand is an important component of the total demand for durables. Greater the current holdings of durable goods, greater will be the replacement demand. Therefore, all factors that determine replacement demand should be considered as a determinant of the demand for durable goods.
- (v) Demand for consumer durables is very much influenced by their prices and credit facilities available to buy them.

1.9.7 Factors Affecting the Demand for Producer Goods

Since producers' goods or capital goods help in further production, the demand for them is derived demand, derived from the demand of consumer goods they produce. The demand for them depends upon the rate of profitability of user industry and the size of the market of the user industries. Hence data required for estimating demand for producer goods (capital goods) are:

- (i) growth prospects of the user industries;

- (ii) norms of consumption of capital goods per unit of installed capacity.

An increase in the price of a substitutable factor of production, say labour, is likely to increase the demand for capital goods. On the contrary, an increase in the price of a factor which is complementary may cause a decrease in the demand for capital.

Higher the profit making prospects, greater will be the inducement to demand capital goods. If firms are optimistic about selling a higher output in future, they will have greater incentive to invest in producer goods. Advances in technology enabling higher efficiency at reduced cost on account of higher productivity of capital will have a positive impact on investment in capital goods. Investments in producer goods will be greater when lower interest rates prevail as firms will have lower opportunity cost of investments and lower cost of borrowing.

1.9.8 Methods of Demand Forecasting

There is no easy method or simple formula which enables an individual or a business to predict the future with certainty or to escape the hard process of thinking. The firm has to apply a proper mix of judgment and scientific formulae in order to correctly predict the future demand for a product. The following are the commonly available techniques of demand forecasting:

- (i) **Survey of Buyers' Intentions:** The most direct method of estimating demand in the short run is to ask customers what they are planning to buy during the forthcoming time period, usually a year. This method involves direct interview of potential customers. Depending on the purpose, time available and costs to be incurred, the survey may be conducted by any of the following methods:
- Complete enumeration method where nearly all potential customers are interviewed about their future purchase plans
 - Sample survey method under which only a scientifically chosen sample of potential customers are interviewed
 - End-use method, especially used in forecasting demand for inputs, involves identification of all final users, fixing suitable technical norms of consumption of the product under study, application of the norms to the desired or targeted levels of output and aggregation.

Thus, under this method the burden of forecasting is put on the customers. However, it would not be wise to depend wholly on the buyers' estimates and they should be used cautiously in the light of the seller's own judgement. A number of biases may creep into the surveys. The customers may themselves misjudge their requirements, may mislead the surveyors or their plans may alter due to various factors which are not identified or visualised at the time of the survey.

This method is useful when bulk of sale is made to industrial producers who generally have definite future plans. In the case of household customers, this method may not prove very helpful for several reasons viz. irregularity in customers' buying intentions, their inability to foresee their choice when faced with multiple alternatives, and the possibility that the buyers' plans may not be real, but only wishful thinking.

- (ii) **Collective opinion method:** This method is also known as sales force opinion method or grass roots approach. Firms having a wide network of sales personnel can use the knowledge, experience and skills of the sales force to forecast future demand. Under this method, salesmen are required to estimate expected sales in their respective territories. The rationale of this method is that salesmen being closest to the customers are likely to have the most intimate feel of the reactions of customers to changes in the market.

These estimates of salesmen are consolidated to find out the total estimated sales. These estimates are reviewed to eliminate the bias of optimism on the part of some salesmen and pessimism on the part of others. These revised estimates are further examined in the light of factors like proposed changes in selling prices, product designs and advertisement programmes, expected changes in competition and changes in secular forces like purchasing power, income distribution, employment, population, etc. The final sales forecast would emerge after these factors have been taken into account.

Although this method is simple and based on first hand information of those who are directly connected with sales, it is subjective as personal opinions can possibly influence the forecast. Moreover salesmen may be unaware of the broader economic changes which may have profound impact on future demand. Therefore, forecasting could be useful in the short run, for long run analysis however, a better technique is to be applied.

- (iii) **Expert Opinion method:** In general, professional market experts and consultants have specialised knowledge about the numerous variables that affect demand. This, coupled with their varied experience, enables them to provide reasonably reliable estimates of probable demand in future. Information is elicited from them through appropriately structured unbiased tools of data collection such as interview schedules and questionnaires.

The Delphi technique, developed by Olaf Helmer at the Rand Corporation of the USA, provides a useful way to obtain informed judgments from diverse experts by avoiding the disadvantages of conventional panel meetings. Under this method, instead of depending upon the opinions of buyers and salesmen, firms solicit the opinion of specialists or experts through a series of carefully designed questionnaires. Experts are asked to provide forecasts and reasons for their forecasts. Experts are provided with information and opinion feedbacks of others at different rounds without revealing the identity of the opinion provider. These opinions are then exchanged among the various experts and the process goes on until convergence of opinions is arrived at. The following chart shows the Delphi process.

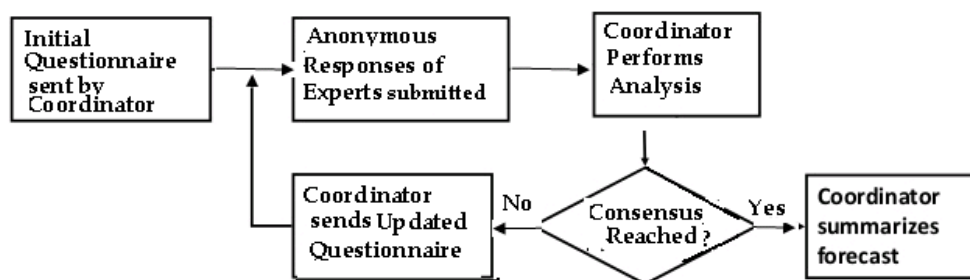


Fig: 12 The Delphi process

The Delphi method is best suited in circumstances where intractable changes are occurring and the relevant knowledge is distributed among experts spread over different geographical locations. For example, the method may be used for forecasting national energy demand 50 years from now, long term transportation needs, environmental issues and long term human resource forecasting to mention a few. Delphi technique is widely accepted due to its broader applicability, absence of group pressure, capability to tap collective human expertise and intelligence and ability to address complex questions. It also has the advantages of speed and cheapness.

- (iv) **Statistical methods:** statistical methods have proved to be very useful in forecasting demand. Forecasts using statistical methods are considered as superior methods because they are more scientific, reliable and free from subjectivity. The important statistical methods of demand forecasting are:

- (a) **Trend Projection method:** This method, also known as classical method, is considered as a 'naive' approach to demand forecasting. A firm which has been in existence for a reasonably long time would have accumulated considerable data on sales pertaining to different time periods. Such data, when arranged chronologically, yield a 'time series'. The time series relating to sales represent the past pattern of effective demand for a particular product. Such data can be used to project the trend of the time series.

The trend projection method assumes that factors responsible for the past trend in demand will continue to operate in the same manner and to the same extent as they did in the past in determining the magnitude and direction of demand in future. The popular techniques of trend projection based on time series data are; graphical method and fitting trend equation or least square method.

- (i) **Graphical Method:** This method, also known as 'free hand projection method' is the simplest and least expensive. This involves plotting of the time series data on a graph paper and fitting a free-hand curve to it passing through as many points as possible. The direction of the curve shows the trend. This curve is extended into the future for deriving the forecasts. The direction of this free hand curve shows the trend. The main draw-back of this method is that it may show the trend but the projections made through this method are not very reliable.
- (ii) **Fitting trend equation: Least Square Method:** It is a mathematical procedure for fitting a line to a set of observed data points in such a manner that the sum of the squared differences between the calculated and observed value is minimised. This technique is used to find a trend line which best fit the available data. This trend is then used to project the dependant variable in the future. This method is very popular because it is simple and in-expensive. Moreover, the trend method provides fairly reliable estimates of future demand.

The least square method is based on the assumption that the past rate of change of the variable under study will continue in the future. The forecast based on this method may be considered reliable only for the period during which this assumption holds. The major limitation of this method is that it cannot be used where trend is cyclical with sharp turning points of troughs and peaks. Also, this method cannot be used for short term forecasts.

- (b) **Regression analysis:** This is the most popular method of forecasting demand. Under this method, a relationship is established between the quantity demanded (dependent variable) and the independent variables (explanatory variables) such as income, price of the good, prices of related goods etc. Once the relationship is established, we derive regression equation assuming the relationship to be linear. The equation will be of the form $Y = a + bX$. There could also be a curvilinear relationship between the dependent and independent variables. Once the regression equation is derived, the value of Y i.e. quantity demanded can be estimated for any given value of X.

- (v) **Controlled Experiments:** Under this method, future demand is estimated by conducting market studies and experiments on consumer behaviour under actual, though controlled, market conditions. This method is also known as market experiment method. An effort is made to vary separately certain determinants of demand which can be manipulated, for example, price, advertising, etc., and conduct the experiments assuming that the other factors would remain constant. Thus, the effect of demand determinants like price, advertisement, packaging, etc., on sales can be assessed by either varying them over different markets or by varying them over different time periods in the same market. The responses of demand to such changes over a period of time are recorded and are used for assessing the future demand for the product. For example, different prices would be associated with different sales and on that basis the price-quantity relationship is estimated in the form of regression equation and used for forecasting purposes. It should be noted however, that the market divisions here must be homogeneous with regard to income, tastes, etc.

The method of controlled experiments is used relatively less because this method of demand forecasting is expensive as well as time consuming. Moreover, controlled experiments are risky too because they may lead to unfavourable reactions from dealers, consumers and competitors. It is also difficult to determine what conditions should be taken as constant and what factors should be regarded as variable so as to segregate and measure their influence on demand. Besides, it is practically difficult to satisfy the condition of homogeneity of markets.

Market experiments can also be replaced by 'controlled laboratory experiments' or 'consumer clinics' under which consumers are given a specified sum of money and asked to spend in a store on goods with varying prices, packages, displays etc. The responses of the consumers are studied and used for demand forecasting.

- (vi) **Barometric method of forecasting:** The various methods suggested till now are related with the product concerned. These methods are based on past experience and try to project the past into the future. Such projection is not effective where there are economic ups and downs. As mentioned above, the projection of trend cannot indicate the turning point from slump to recovery or from boom to recession. Therefore, in order to find out these turning points, it is necessary to find out the general behaviour of the economy.

Just as meteorologists use the barometer to forecast weather, the economists use economic indicators to forecast trends in business activities. This information is then used to forecast demand prospects of a product, though not the actual quantity demanded. For this purpose, an index of relevant economic indicators is constructed. Movements in these indicators are used as basis for forecasting the likely economic environment in the near future.

There are leading indicators, coincidental indicators and lagging indicators. The leading indicators move up or down ahead of some other series. For example, the heavy advance orders for capital goods give an advance indication of economic prosperity. Increase in the number of construction permits for new houses will be reflected in corresponding increase in the number of sheets of glass ordered several months later.

The coincidental indicators, however, move up and down simultaneously and are witnessed at around the same time the changes they signal occur. Since these happen almost in real time, they do not offer much predictive insight, but provide a fair reading of the current scenario. For example, Figures on retail sales, rate of unemployment and Index of Industrial Production (IIP).

The lagging indicators follow a change after some time lag. The heavy household electrical connections confirm the fact that heavy construction work was undertaken during the past with a lag of some time.

SUMMARY

- Buyers constitute the demand side of the market; sellers make the supply side of that market. The quantity that consumers buy at a given price determines the size of the market.
- Demand means desire or wish to buy and consume a commodity or service backed by adequate ability to pay and willingness to pay
- The important factors that determine demand are price of the commodity, price of related commodities, income of the consumer, tastes and preferences of consumers, consumer expectations regarding future prices, size of population, composition of population, the level of national income and its distribution, consumer-credit facility and interest rates.
- 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 table that shows various prices and the corresponding quantities demanded. The demand schedules 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 necessities and speculative goods.
- When the quantity demanded decreases due to a rise in own price, 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 four kinds. They are price elasticity of demand, income elasticity of demand, advertisement elasticity 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. Because demand curve slopes downwards and to the right, the sign of price elasticity is negative. We normally ignore the sign of elasticity and concentrate on the coefficient. Greater the absolute coefficient, greater is the price elasticity.
- In point elasticity, we measure elasticity at a given point on a demand curve. 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, we use arc elasticity
- 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. Goods and services are classified as luxuries, normal or inferior, depending on the responsiveness of spending on a product relative to percentage change in income.

- 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. Products can be substitutes, and their cross elasticity is then positive; cross elasticity is negative for products that are complements.
- Advertisement elasticity of sales or promotional elasticity of demand measures the responsiveness of a good's demand to changes in the firm's spending on advertising.
- Forecasting of demand is the art and science of predicting the probable demand for a product or a service at some future date on the basis of certain past behaviour patterns of some related events and the prevailing trends in the present.
- The commonly available techniques of demand forecasting are survey of buyers' intentions, collective opinion method, expert opinion method, barometric method, and statistical methods such as trend projection method, graphical method, least square method, regression analysis, and market studies such as controlled experiments, and controlled laboratory experiments,