society. In recent years, a branch of economics, known as *welfare economics*, has been developed. This welfare economics seeks to evaluate the social desirability of alternative social states or economic policies. Thus, Professor Scitovsky writes, " welfare economics is that branch of economic analysis which is concerned primarily with establishment of criteria that can provide a positive basis for adopting policies which are likely to maximise social welfare."[32]

QUESTIONS FOR REVIEW

1. "Economics is a science of wealth which enquires into the nature and causes of wealth of nations". Who gave this definition of economics and make your comments on it?
2. According to Marshall, economics is a science of material welfare of man. Critically examine this. How is it different from Robbin's definition?
3. According to Marshall, "economics is a study of mankind in the ordinary business of life". Explain and critically examine this.
4. Explain Robbin's definition of economics. How is it based on unlimited wants and scarce means? Critically examine it. Are subjects of unemployment and economic growth covered in it ?
5. What are the fundamental propositions of Robbin's definition of economics? How is it superior to Marshall's definition?
6. "Economics is a science which studies human behaviour as a relationship between ends and scarce means which have alternative uses". Discuss.
7. "Economics is a science of choice". Discuss.

   OR

   In Economics, the fundamental problem is the problem of choice. Elucidate this statement.
8. What is meant by scarcity in economics? Scarcity is mother of all economic problem. Discuss.
9. Distinguish between positive economics and normative economics. Explain some of the questions which are explained in each of them.
10. Economics is neutral between ends. Explain and critically examine this view point.
11. The task of an economist is not to praise and condemn but only to analyse and explain.
12. Which of the following statements are true and which false? Give reasons in brief for your answer.
    (*a*) Robbin's definition treats economics as a purely positive science.
    (*b*) Price theory is an important constituent of economic theory.
    (*c*) The concept of scarcity is valid only in poor economies.
    (*d*) According to Robbins, economics is neutral between ends.
13. Some important definitions of economics are given below. Name the economist who gave each definition and explain them.
    (*a*) Economics is a science which studies human behaviour as a relationship between ends and scarce means which have alternative uses.
    (*b*) Economics is an enquiry into the nature and causes of wealth of nations.
    (*c*) Economics is a study of mankind in the ordinary business of life.
    (*d*) Economics is a study which enquires into the material welfare of man.
    (*e*) The produce of the earth — all that is derived from its surface by the united application of labour, machinery and capital is divided among three classes of the community. To determine the laws which govern this distribution is the principal problem in political economy.
14. What are value judgements? Critically examine their role in economics.

32. Tibor Scitovsky, *Papers on Welfare and Growth*, 1962, p. 174.

CHAPTER 2
MICRO AND MACRO ECONOMICS

The subject-matter of economics has been divided into two parts : Microeconomics and Macroeconomics. These terms were first coined and used by Ragnar Frisch and have now been adopted by economists all the world over. *Nowadays one can hardly come across a text-book on modern economic analysis which does not divide its analysis into two parts, one dealing with microeconomics and the other with macroeconomics.* The term microeconomics is derived from the Greek word *mikros*, meaning "small" and the term macroeconomics is derived from the Greek word *makros*, meaning "large." Thus microeconomics deals with the analysis of small individual units of the economy such as individual consumers, individual firms and small aggregates or groups of individual units such as various industries and markets. On the other hand, macro-economics concerns itself with the analysis of the economy as a whole and its large aggregates such as total national output and income, total employment, total consumption, aggregate investment. Thus, according to K. E. Boulding, "Microeconomics is the study of particular firms, particular households, individual prices, wages, incomes, individual industries, particular commodities."[1] About macroeconomics he writes, "Macroeconomics deals not with individual quantities as such but with aggregates of these quantities; not with individual incomes but with national income; not with individual prices but with price levels; not with individual outputs but with the national output."[2]

MICROECONOMICS

As stated above, microeconomics studies the economic actions and behaviour of *individual units* and *small groups* of individual units. In microeconomic theory we discuss how the various cells of economic organism, that is, the various units of the economy such as thousands of consumers, thousands of producers or firms, thousands of workers and resource suppliers in the economy do their economic activities and reach their equilibrium states. In other words, in microeconomics we make a *microscopic study* of the economy. But it should be remembered that microeconomics does not study the economy in *its totality*. Instead, in microeconomics we discuss equilibrium of innumerable units of the economy *piece meal* and their inter-relationship to each other. Thus, micro-economics consists of looking at the economy through a microscope, as it were, to see how the millions of cells in the economy —the individuals or households as consumers, and the individuals firms as producers— play their part in the working of the whole economic organisation. For instance, in microeconomic analysis we study the demand of an individual consumer for a good and from there go on to derive the *market demand* for the good (that is, demand of a group of individuals consuming a particular good). Likewise, microeconomic theory studies the behaviour of the individual firms in regard to the fixation of price and output and their reactions to the changes in the demand and supply conditions. From there we go on to establish price-output fixation by an industry (Industry means a group of firms producing the same product).

Thus, microeconomic theory seeks to determine the mechanism by which the different economic units attain the position of equilibrium, proceeding from the individual units to a *narrowly*

1. K. E. Boulding, *A Reconstruction of Economics*, (1950), p. 3.
2. K. E. Boulding, *Economic Analysis*, p. 25.

defined group. Microeconomic analysis concerns itself with narrowly defined groups since it does not study the *totality of behaviour* of all units in the economy. In other words, the study of economic system or economy as a whole lies outside the domain of microeconomic analysis.

Microeconomics and Allocation of Resources

Microeconomic theory takes the total quantity of resources as given and *seeks to explain how they are allocated to the production of various goods*. It is the allocation of resources that determines what goods shall be produced and how they shall be produced. The allocation of resources to the production of various goods in a free-market economy depends upon prices of the various goods and prices of the various resources or factors of production. Therefore, to explain how the allocation of resources is determined, microeconomics proceeds to analyse how relative prices of goods and factors are determined. Thus the theory of product pricing and the theory of factor pricing (or the theory of distribution) fall within the domain of microeconomics. The theory of product pricing explains how relative prices of cotton cloth, foodgrains, jute, kerosene oil, *Vanaspti ghee* and thousands of other goods are determined. The theory of distribution explains how *wages* (price for the use of labour), *rent* (payment for the use of land), *interest* (price for the use of capital) and *profits* (the reward for the entrepreneur) are determined. Thus, the theory of product pricing and the theory of factor pricing are the branches of microeconomic theory.

Prices of products depend upon the forces of demand and supply. The demand for goods depends upon the consumers' behaviour pattern, and the supply of goods depends upon the conditions of production and cost and the behaviour pattern of the firms or entrepreneurs. Thus the demand and supply sides have to be analysed in order to explain the determination of prices of goods and factors. Thus the theory of demand and the theory of production are two subdivisions of the theory of pricing.

Microeconomics and Economic Efficiency

Besides analysing the pricing of products and factors and the allocation of resources based upon the price mechanism, microeconomics also seeks to explain whether the allocation of resources determined is *efficient*. Efficiency in the allocation of resources is attained when the resources are so allocated that maximises the satisfaction of the people. Economic efficiency involves three efficiencies; *efficiency in production, efficiency in distribution* of goods among the people (This is also called *efficiency in consumption*) and *allocative economic efficiency*, that is, efficiency in the *direction of production*. Microeconomic theory shows under what conditions these efficiencies are achieved. Microeconomics also shows what factors cause departure from these efficiencies and result in the decline of satisfaction from the maximum possible level.

Efficiency in production involve producing the maximum possible amount of various goods from the given available amount of resources. When such productive efficiency is attained, then it is no longer possible by any reallocation of the productive resources or factors among the production of various goods and services to increase the output of any good without a reduction in the output of some other good. Efficiency in consumption consists of distributing the given amount of produced goods and services among millions of the people for consumption in such a way as to maximise the total satisfaction of the society. When such an efficiency is achieved it is no longer possible — by any redistribution of goods among the people — to make some people better off[3] without making some other ones worse off.[4] Allocative economic efficiency or optimum direction of production consists of producing those goods which are most desired by the people, that is, when the amounts of different goods produced is such that maximises the satisfaction of the people.

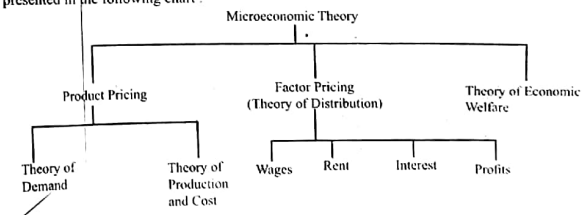
In other words, allocative economic efficiency implies that pattern of production (*i.e.* amounts

3. Making some people *better off* means increasing their satisfaction.
4. Making some people *worse off* means reducing their satisfaction.

of the various goods and services produced) should correspond to the desired pattern of consumption of the people. Even if efficiencies in consumption and production of goods are present, it may be that the goods which are produced and distributed for consumption may not be those preferred by the people. There may be some goods which are more preferred by the people but which have not been produced and vice versa. To sum up, *allocative efficiency (optimum direction of production) is achieved when the resources are so allocated to the production of various goods that the maximum possible satisfaction of the people is obtained.* Once this is achieved, then by producing some goods more and others less by any rearrangement of the resources will mean loss of satisfaction or efficiency. The question of economic efficiency is the subject matter of theoretical *welfare economics* which is an important branch of microeconomic theory.

That microeconomic theory is intimately concerned with the question of efficiency and welfare is evident from the following remarks of A. P. Lerner, a noted American economist. "In microeconomics we are more concerned with the avoidance or elimination of waste, or with inefficiency arising from the fact that production is not organised in the most efficient possible manner. Such inefficiency means that it is possible, by rearranging the different ways in which products are being produced and consumed, to get more of something that is scarce without giving up any part of any other scarce item, or to replace something by something else that is preferred. Microeconomic theory spells out the conditions of efficiency (*i.e.*, for the elimination of all kinds of inefficiency) and suggests how they might be achieved. These conditions (called Pareto-optimal conditions) can be of the greatest help in raising the standard of living of the population."[5]

The four basic economic questions namely, (1) what goods shall be produced and in what quantities, (2) how they shall be produced, (3) how the goods and services produced shall be distributed among the people and (4) whether the production of goods and their distribution for consumption is efficient fall within the domain of micro-economics. The whole content of microeconomic theory is presented in the following chart :



Microeconomics as a Microscopic Study of the Economy

It is generally understood that microeconomics does not concern itself with the economy as a whole and an impression is created that microeconomics differs from macroeconomics in that whereas the latter examines the economy as a whole, the former is not concerned with it. But this is not correct. That microeconomics is concerned with the economy as a whole is quite evident from its discussing the problem of allocation of resources in the society and judging the efficiency of the same. Both microeconomics and macroeconomics analyse the economy as a whole but with two different ways or approaches. Microeconomics examines the economy as a whole, so to say *microscopically*, that is, it analyses the behaviour of individual economic units of the economy, their inter-relationships

5. Abba P. Lerner, Microeconomic Theory, printed in *Perspectives in Economics*, edited by Brown, Neuberger and Palmatier (Preliminary edition, 1968), p. 50.

and equilibrium adjustment to each other which determine the allocation of resources in the society. This is known as *general equilibrium analysis*.

No doubt, microeconomic theory mainly makes particular or partial equilibrium analysis, that is the analysis of the equilibrium of the individual economic units, taking other things remaining the same. But microeconomic theory, as stated above, also concerns itself with general equilibrium analysis of the economy wherein it is explained how all the economic units, various product markets, various factor markets, money and capital markets are inter-related and interdependent to each other and how through various adjustments and readjustments to the changes in them, they reach a general equilibrium, that is, equilibrium of each of them individually as well as collectively to each other. Professor A. P. Lerner rightly points out, "Actually microeconomics is much more intimately concerned with the economy as a whole than is macroeconomics, and can even be said *to examine the whole economy microscopically*. We have seen how economic efficiency is obtained when the "cells" of the economic organism, the households and firms, have adjusted their behaviour to the prices of what they buy and sell. Each cell is then said to be 'in equilibrium.' But these adjustments in turn affect the quantities supplied and demanded and therefore also their prices. This means that the adjusted cells then have to readjust themselves. This in turn upsets the adjustment of others again and so on. An important part of microeconomics is to examine whether and how *all* the different cells get adjusted at the same time. This is called *general equilibrium analysis* in contrast with *particular equilibrium* or *partial equilibrium analysis*. General equilibrium analysis is the microscopic examination of the inter-relationships of parts within the economy as a whole. Overall economic efficiency is only a special aspect of this analysis."[6]

Importance and Uses of Microeconomics

Microeconomics occupies a vital place in economics and it has both theoretical and practical importance. It is highly helpful in the formulation of economic policies that will promote the welfare of the masses. Till recently, especially before Keynesian Revolution, the body of economics consisted mainly of microeconomics. In spite of the popularity of macroeconomics these days, microeconomics retains its importance, theoretical as well as practical. It is *microeconomics that tells us how a free-market economy with its millions of consumers and producers work to decide about the allocation of productive resources among the thousands* of goods and services. As Professor Watson says, "microeconomic theory explains the composition or allocation of total production, why more of some things are produced than of others."[7] He further remarks that microeconomic theory has many uses. The greatest of these is depth in understanding of how a free private enterprise economy operates."[8] Further, it tells us *how the goods and services produced are distributed among the various people for consumption through price or market mechanism*. It shows how the relative prices of various products and factors are formed, that is, why the price of cloth is what it is and why the wages of an engineer are what they are and so on.

Moreover, as described above, microeconomic theory *explains the conditions of efficiency in consumption and production* and highlights the factors which are responsible for the departure from the efficiency or economic optimum. On the basis of this microeconomic theory *suggests suitable policies* to promote economic efficiency and welfare of the people. Thus, not only does microeconomic theory describe the actual operation of the economy, it has also a normative role in that it suggests policies to eradicate "inefficiency" from the economic system so as to maximise the satisfaction or welfare of the people. The usefulness and importance of microeconomics has been nicely stated by Professor Lerner. He writes, "Microeconomic theory facilitates the understanding of what would be a hopelessly complicated confusion of billions of facts by constructing simplified models of behaviour

6. Abba P. Lerner, *op. cit.*, pp. 36-37.
7. D. S. Watson, *Price Theory and its Uses* (1963), p. 5.
8. *Ibid.*, p. 11.

which are sufficiently similar to the actual phenomena to be of help in understanding them. These models at the same time enable economists to explain the degree to which the actual phenomena depart from certain ideal constructions that would most completely achieve individual and social objectives. They thus help not only *to describe* the actual economic situation but to *suggest policies* that would most successfully and most efficiently bring about desired results and to predict the outcomes of such policies and other events. Economics thus has descriptive, normative and predictive aspects."[9]

We have noted above that microeconomics reveals how a decentralised system of a free private enterprise economy functions without any central control. It also brings to light the fact that the functioning of a completely centrally directed economy with efficiency is impossible. Modern economy is so complex that a central planning authority will find it too difficult to get all the information required for the optimum allocation of resources and to give directions to thousands of production units with various peculiar problems of their own so as to ensure efficiency in the use of resources. To quote Professor Lerner again, "Microeconomics teaches us that completely 'direct' running of the economy is impossible — that a modern economy is so complex that no central planning body can obtain all the information and give out all the directives necessary for its efficient operation. These would have to include directives for adjusting to continual changes in the availabilities of millions of productive resources and intermediate products, in the known methods of producing every thing everywhere, and in the quantities and qualities of the many items to be consumed or to be added to society's productive equipment. The vast task can be achieved, and in the past has been achieved, only by the development of a decentralised system whereby the millions of producers and consumers are induced to act in the general interest without the intervention of anybody at the centre with instructions as to what one should make and how and what one should consume."[10]

Microeconomic theory shows that welfare optimum or economic efficiency is achieved when there prevails perfect competition in the product and factor markets. Perfect competition is said to exist when there are so many sellers and buyers in the market that no individual seller or buyer is in a position to influence the price of a product or factor. Departure from perfect competition leads to a lower level of welfare, that is, involves loss of economic efficiency. It is in this context that a large part of microeconomic theory is concerned with showing the nature of departures from perfect competition and therefore from welfare optimum (economic efficiency). The power of giant firms or a combination of firms over the output and price of a product constitutes the problem of monopoly. Microeconomics shows how monopoly leads to misallocation of resources and therefore involves loss of economic efficiency or welfare. It also makes important and useful policy recommendations to regulate monopoly so as to attain economic efficiency or maximum welfare. Like monopoly, *monopsony* (that is, when a large buyer or a combination of buyers exercises control over the price) also leads to the loss of welfare and therefore needs to be controlled. Similarly, micro- economics brings out the welfare implications of oligopoly (or oligopsony) whose main characteristic is that individual sellers (or buyers) have to take into account, while deciding upon their course of action, how their rivals react to their moves regarding changes in price, product and advertising policy.

Another class of departure from welfare optimum is the problem of *externalities*. Externalities are said to exist when the production or consumption of a commodity *affects other people* than those who produce, sell or buy it. These externalities may be in the form of either *external economies* or *external diseconomies*. External economies prevail when the production or consumption of a commodity by an individual benefits other individuals and external diseconomies prevail when the production or consumption of a commodity by him *harms other individuals*. Microeconomic theory reveals that

9. A. P. Lerner, *op cit.*, p. 29.
10. A. P. Lerner, *op. cit.*, p. 33.

when the externalities exist, free working of the price mechanism fails to achieve economic efficiency since it does not take into account the benefits or harms made to those external to the individual producers and the consumers. The existence of these externalities requires government intervention for correcting imperfections in the price mechanism in order to achieve maximum social welfare.

Microeconomic analysis is also usefully applied to the various applied branches of economics such as Public Finance, International Economics. It is the microeconomic analysis which is used to explain the factors which determine the distribution of the *incidence or burden* of a commodity tax between producers or sellers on the one hand and the consumers on the other. Further, microeconomic analysis is applied to show the *damage* done to the social welfare or economic efficiency by the imposition of a tax. If it is assumed that resources are optimally allocated or maximum social welfare prevails before the imposition of a tax, it can be demonstrated by microeconomic analysis that what amount of the damage will be caused to the social welfare. The imposition of a tax on a commodity (*i.e.*, indirect tax) will lead to the loss of social welfare by causing deviation from the optimum allocation of resources, the imposition of a direct tax (for example, income tax) will not disturb the optimum resource allocation and therefore will not result in loss of social welfare. Further, microeconomic analysis is applied to show the *gain from international trade* and to explain the factors which determine the distribution of this gain among the participant countries. Besides, microeconomics finds application in the various problems of international economies. Whether devaluation will succeed in correcting the disequilibrium in the balance of payments depends upon the elasticities of demand and supply of exports and imports. Furthermore, the determination of the foreign exchange rate of a currency, if it is free to vary, depends upon the demand for and supply of that currency.

We thus see that microeconomic analysis is a very useful and important branch of modern economic theory.

MACROECONOMICS

We now turn to explain the approach and content of macroeconomics. As said above, word macro is derived from the Greek word '*makros*' meaning '*large*' and therefore macroeconomics is concerned with the economic activity *in the large*. Macroeconomics analyses the behaviour of the whole economic system in totality or entirety. In other words, macroeconomics studies the behaviour of the large aggregates such as total employment, the national product or income, the general price level of the economy. Therefore, macroeconomics is also known as *aggregative economics*. Macroeconomics analyses and establishes the functional relationship between these large aggregates. Thus Professor Boulding says, "Macroeconomics deals not with individual quantities as such but with the aggregates of these quantities; not with individual incomes but with the national income; not with individual prices but with the price level; not with individual output but with the national output."[11]

In his other famous work, "*Economic Analysis*", he similarly remarks, "Macroeconomics, then, is that part of the subject which deals with large aggregates and averages of the system rather than with particular items in it and attempts to define these aggregates in a useful manner and to examine their relationships."[12] Professor Gardner Ackley makes the distinction between the two types more clear and specific when he says, "macroeconomics concerns itself with such variables as the aggregate volume of output in an economy, with the extent to which its resources are employed, with the size of the national income, with the "general price level". Microeconomics, on the other hand, deals with the *division* of total output among industries, products and firms and the allocation of

11. K. E. Boulding, "*A Reconstruction of Economics*" (1950), p. 3.
12. K. E. Boulding, "*Economic Analysis*", p. 259

resources among competing uses. It considers problems of income distribution. Its interest is in relative prices of particular goods and services.[13]

Macroeconomics should be carefully distinguished from microeconomics. It should be noted that microeconomics also does deals with some "aggregates" but not of the type with which macroeconomics is concerned. Microeconomics examines the behaviour of the industry in regard to the determination of its product price, output and employment, and the industry is an *aggregate of the various firms* producing the same or similar product. Likewise, micro-economic theory seeks to explain the determination of price of a product through the interaction of market demand and market supply for a product. Market demand for a product is the aggregate of individual demands of all consumers wishing to buy the product and the market supply of a product is the aggregate of the productions of many firms producing that product. Similarly, demand for and supply of labour in an industry of a city through which microeconomics explains wage determination are aggregative concepts.

But the aggregates with which macroeconomics is concerned are of somewhat different variety. Macroeconomics concerns itself with these *aggregates which relate to the whole economy*. Macroeconomics also discusses the sub-aggregates of the large aggregates relating to the whole economy, but these sub-aggregates of macroeconomics, unlike the aggregates of microeconomics which examines aggregates relating to a particular product, a particular industry or a particular market, cut across various products and industries. For example, the total production of consumer goods (*i.e.*, total consumption) and the total production of capital goods (*i.e.*, total investment) are two important sub-aggregates dealt with in macroeconomics but these aggregates are not confined to a single product or a single industry but instead they refer to all industries producing consumer goods and all industries producing capital goods. Moreover, the sub-aggregates, discussed in macroeconomics, add up to an aggregate for the whole economy. For instance, total consumption and total investment, two important sub-aggregates in macroeconomics, together constitute the total national product. Likewise, the total wage income (*i.e.*, total share of labour) and total profits (defined as total property income) add up to the national income. Professor Ackley thus says, "Macroeconomics also *uses* aggregates smaller than for the whole economy but only in a context which makes them sub-divisions of an economy wide total. Microeconomics also uses aggregates, but not in a context which relates them to *an economy-wide* total."[14]

Macroeconomics as a Study of Determination of Income and Employment

As we said above, the subject matter of microeconomics consists in explaining the determination of relative prices of products and factors and the allocation of resources based upon them. On the other hand, the subject matter of macroeconomic analysis is to explain what determines the *level of national income and employment*, and what causes *fluctuations* in the level of national income, output and employment. Further, it also explains the *growth* of national income over a long period of time. In other words, macroeconomics examines the determination of the level, fluctuations (cycles) and trends (growth) in the overall economic activity (*i.e.*, national income, output and employment).

There were no doubt pre-Keynesian theories of business cycles and the general price level which were "macro" in nature but it was late Lord J. M. Keynes who laid great stress on macro-economic analysis and put forward a general theory of income and employment in his revolutionary book, "*A General Theory of Employment, Interest and Money*" published in 1936. Keynes's theory made a genuine break from the classical economics and produced such a fundamental and drastic change in economic thinking that his macro-economic analysis has earned the names "*Keynesian Revolution*" and "*New Economics*". Keynes in his analysis made a frontal attack on the classical

13. Gardner Ackley, *Macroeconomic Theory*, 1961, p. 4.
14. *Op. cit.*, p. 5.

"*Say's Law of Markets*" which was the basis of full-employment assumption of classical economics and challenged the classical dictum that involuntary unemployment could not prevail in a free private enterprise economy. He showed how the equilibrium level of national income and employment was determined by aggregate demand and aggregate supply and further that this equilibrium level of income and employment may well be established at a far less than full employment level in a free private enterprise economy and thereby causing involuntary unemployment of labour on the one hand and excess productive capacity (*i.e.*, under-utilization of the existing capital) on the other. His macro-economic model reveales how consumption function, investment function, liquidity preference function, conceived in aggregative terms, interact to determine national income, employment, interest and the general price level.

Therefore, before showing how a level of income and employment is determined, we have to study the determinants of consumption function and investment function. The analysis of consumption function and investment function are the important subjects of macroeconomic theory. It is the total consumption demand and total investment demand taken together that constitute the level of aggregate demand which is the crucial determinant of the level of income and employment in the country.

Macroeconomics and General Level of Prices

Besides studying how a level of income and employment is determined in the economy, macroeconomics also concerns itself with showing how the general level of prices is determined. Keynes made a significant improvement over the Quantity Theory of Money by showing that the increase in the supply of money does not always bring about rise in prices. Important topic in this field is to explain the causes of inflation. Keynes, who before the Second World War showed that involuntary unemployment and depression were due to deficiency of aggregate demand, during the war period when prices rose very high he explained in a booklet entitled "*How to Pay for War*" that just as unemployment and depression were caused by deficiency of aggregate demand, inflation was due to excessive aggregate demand. Since Keynes's theory of inflation has been further developed and many types of inflation depending upon various causes have been pointed out. The problem of inflation is a serious problem faced these days, both by the developed and developing countries of the world. Theory of inflation is an important subject of macroeconomics.

Macroeconomics and Theory of Economic Growth

Another distinct and more important branch of macroeconomics that has been developed recently is the *theory of economic growth*, or what is briefly called *growth economics*. The problem of growth is a long-run problem and Keynes did not deal with it. It was Harrod [15] and Domar [16] who extended the Keynesian analysis to the long-run problem of growth with stability. They pointed out the dual role of investment – one of income generating, which Keynes considered, and the second of increasing capacity which Keynes ignored because of his pre-occupation with the short run. In view of the fact that an investment adds to the productive capacity (*i.e.*, capital stock), then if growth with stability (*i.e.* without secular stagnation or secular inflation) is to be achieved, income or demand must be increasing at a rate sufficient enough to ensure the full utilisation of the increasing capacity. Thus, macroeconomic models of Harrod and Domar have revealed the rate of growth of income that must take place if steady growth of the economy is to be achieved. These days growth economics has been further developed and extended a good deal. Though a general growth theory applies to both the developed and developing economies, special theories which explain the causes of underdevelopment and poverty in developing countries and which also suggest strategies for initiating and accelerating growth in them have been propounded. These special growth theories relating to developing countries are generally known as *Economics of Development*.

15. R. F. Ha... *Economics* (1948).
16. E. D. D... loyment, *American Economic Review* (March 1947).

INTERDEPENDENCE BETWEEN MICRO AND MACRO ECONOMICS

Actually micro and macro-economics are interdependent. The theories regarding the behaviour of some macroeconomic aggregates (but not all) are derived from theories of individual behaviour. For instance, the theory of investment, which is a part and parcel of the microeconomic theory, is derived from the behaviour of individual entrepreneur. According to this theory, an individual entrepreneur in his investment activity is governed by the expected rate of profit on the one hand and rate of interest on the other. And so is the aggregate investment function. Similarly, the theory of aggregate consumption function is based upon the behaviour patterns of individual consumers. It should be noted that we are able to derive aggregate investment function and aggregate consumption function from individual functions because in this respect the behaviour of the aggregate is in no way different from the behaviour patterns of individual components. Moreover, we can derive the behaviour of these aggregates only if either the composition of aggregates is constant or the composition changes in some regular way as the size of aggregates changes. From this it should not be understood that behaviour of all macroeconomic relationships is in conformity with behaviour patterns of individuals composing them. As we saw above, saving-investment relationship and wage-employment relationship for the economic system as a whole are quite different from the corresponding relationships found in case of individual parts.

Microeconomic theory contributes to macroeconomic theory in another way also. The theory of relative prices of products and factors is essential in the explanation of the determination of general price level. Even Keynes used microeconomic theory to explain rise in the price level as a result of increase in the money supply in the economy. According to Keynes, when as a result of the increase in money supply, aggregate demand in the economy increases and more output is produced, the cost of production rises. With the rise in the cost of production, the price level rises. According to Keynes, cost of production rises because of (1) the law of diminishing returns operates and (2) wages and prices of raw materials may rise as the economy approaches full-employment level. Now, the influence of cost of production, diminishing returns, etc., on the determination of prices are parts of microeconomics.

Not only does macroeconomics depend upon to some extent on microeconomics, micro-economics also depends upon to some extent on macroeconomics. The determination of rate of profit and rate of interest are well-known microeconomic topics, but they greatly depend upon the macroeconomic aggregates. In microeconomic theory, the profits are regarded as reward for uncertainty bearing but microeconomic theory fails to show the economic forces which determine the magnitude of profits earned by the entrepreneur and why there are fluctuations in them. The magnitude of profits depends upon the level of aggregate demand, national income, and the general price level in the country. We know that at times of depression when the levels of aggregate demand, national income and price level are low, entrepreneurs in the various fields of the economy suffer losses. On the other hand, when aggregate demand, incomes of the people, the general price level go up and conditions of boom prevail, entrepreneurs earn huge profits.

Now, take the case of the rate of interest. Strictly speaking the theory of the rate of interest has now become a subject of macroeconomic theory. Partial equilibrium theory of interest which belongs to microeconomic theory does not reveal all the forces which take part in the determination of the rate of interest. Keynes showed that the rate of interest was determined by the liquidity preference function and the stock (or supply) of money in the economy. The liquidity preference function and the stock of money in the economy are macroeconomic concepts. No doubt, the Keynesian theory of interest has also been shown to be indeterminate, but in the modern theory of interest Keynesian aggregative concepts of liquidity preference and stock of money play an important role in the determination of rate of interest. Moreover, in the modern interest theory (intersection of

3 Laws of Demand and Supply

CHAPTER OUTLINE

We have noted in Chapter 2 that **market mechanism** plays a crucial role in solving the basic economic problems in a free market economy and that the entire market system functions in an orderly manner, though some aspects of it may not be desirable. The market system works in an

orderly manner because it is governed by certain **Fundamental Laws of Market** known as the **Laws of Demand and Supply**. The forces of demand and supply interact to determine the price of goods and services brought to the market. The laws of demand and supply are all pervasive in economic analysis. That is why (perhaps) Thomas Carlyle, the famous 19th century historian remarked, "It is easy to train an economist; teach a parrot to say Demand and Supply."[1] In fact, the most important function of microeconomics is to explain the laws of demand and supply, market mechanism and working of the price system. In this chapter, we explain the concept and the laws of demand and supply, price determination, and equilibrium of the commodity market.

3.1 THE CONCEPT OF MARKET

The word 'market' generally means a place or area where goods and services are bought and sold, e.g., Chandani Chowk, Karol Bagh, Connaught Place, Delhi Stock Exchange, Bombay Stock Exchange, Sabzi Mandi, etc. In economics, the word 'market' is used in a rather abstract sense. The market means a system by which sellers and buyers of a commodity interact to settle its price and the quantity to be bought and sold. According to Samuelson and Nordhaus[2], "A **market** is a mechanism by which buyers and sellers interact to determine the price and quantity of a good or service". Market for a commodity consists of the buyers and sellers who interact to settle its price and quantity to be transacted. The sellers and buyers may be individuals, firms, factories, dealers and agents.

Some important points in the market concept are :

(i) A market need not be situated in a particular place or locality. The geographical area of a market depends on how scattered are the buyers and sellers. It may be as small as a fish market in a corner of a city or as large as the entire world, e.g., the global markets for arms, cars, electronic goods, aeroplanes, computers, oil, medicines, etc.

(ii) Buyers and sellers need not come in personal contact with each other. The transactions can be effected through postal services, telephone, fax, agents, or e-mail, etc. People do buy many goods and services directly from the producers without having ever seen them.

(iii) The word 'market' may refer to a commodity or service (e.g., fruit market, car market, share market, money market, paper market, labour market, etc.) or to a geographical area, Bombay market, Indian market, Asian market, etc.

(iv) The economists distinguish between markets also on the basis of (a) nature of goods and services, e.g., factor market and commodity market or input market and output market; (b) number of firms and degree of competition, e.g., competitive market (large number of firms with homogenous products), monopolistic market (many firms with differentiated products); oligopolistic market and so on.

3.2 THE DEMAND SIDE OF THE MARKET

3.2.1 Meaning of Demand

Conceptually, demand can be defined as the desire for a good for whose fulfilment a person has sufficient purchasing power and willingness to pay for the good. In simple words, *demand is a desire for a good, backed by ability and willingness to pay*. A desire without sufficient resources (money income) is merely a wish. A desire with resources but without willingness to spend is only a potential demand.

1. Samuelson attributes this statement to "anonymous" in his *Economics*, 13th Edn., p. 55.
2. Samuelson, P. A and Nordhaus, W., *Economics*, 15th Edn., (McGraw-Hill, Inc., New York, 1995), p. 23.

A desire accompanied by ability and willingness to pay makes a real or **effective demand**.

Individual and market demand. *Individual demand* can be defined as the quantity of a commodity that a person is willing to buy at a given price over a specified period of time, say per day, per week, per month, etc. *Market demand* refers to the total quantity that all the users of a commodity are willing to buy at a given price over a specific period of time. In fact, market demand is the sum of individual demands. Individual and market demand curves are illustrated ahead in section 3.2.7.

3.2.2 The Law of Demand

The law of demand states the relationship between the quantity demanded and price of a commodity. Although quantity demanded of a commodity depends also on many other factors, e.g., consumer's income, price of the related goods, consumer's taste and preferences, advertisement, etc., price is the most important and the only determinant of demand in the short run.

The law of demand can be stated as, ***all other things remaining constant, the quantity demanded of a commodity increases when its price decreases and decreases when its price increases***. This law implies that demand and price are inversely related. Marshall states the law of demand as "the amount demanded increases with a fall in price and diminishes with a rise in price". This law holds under *ceteris paribus* assumption, that is, *all other things remain unchanged*. The law of demand can be illustrated through a ***demand schedule*** and a ***demand curve***.

3.2.3 The Demand Schedule

A *demand schedule* is a tabular presentation of different prices of a commodity and its corresponding quantity demanded per unit of time. A hypothetical market demand schedule is given in Table 3.1. This table presents price of shirts (P_x) and the corresponding number of shirts demanded (Q_x) per month.

Table 3.1 Demand Schedule for Shirts

P_x (price in Rs)	Q_x (Shirts in '000)
800	8
600	15
400	30
300	40
200	55
100	80

Table 3.1 illustrates the law of demand. As data given in the table shows, the demand for shirts (Q_x) increases as its price (P_x) decreases. For instance, at price Rs 800 per shirt, only 10 thousand shirts are demanded per month. When price decreases to Rs 400, the demand for shirts increases to 30 thousand and when price falls further to Rs 100, demand rises to 80 thousand. This relationship between price and quantity demanded gives the law of demand.

3.2.4 The Demand Curve

A ***demand curve*** is a graphical presentation of the demand schedule. A demand curve is obtained by plotting a demand schedule. For example, when the data given in the demand schedule (Table 3.1) is

presented graphically as in Fig. 3.1, the resulting curve DD' is the **demand curve**. The curve DD' in Fig. 3.1 depicts the law of demand. It slopes downward to the right. It has a negative slope. The negative slope of the demand curve DD' shows the *inverse relationship* between the price of shirt and its quantity demanded. It shows that demand for shirts increases with the decrease in its price and decreases with rise in its price. As can be seen in Fig. 3.1, downward movement on the demand curve DD' from point D towards D' shows fall in price and rise in demand. Similarly, an upward movement from point D' towards D reads rise in price and fall in demand.

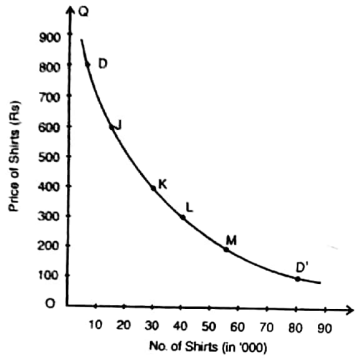


Fig. 3.1 The Demand Curve

The law of demand is based on an empirical fact. For example, when prices of cell phones and personal computers (PCs), specially of the latter, were astronomically high, only few rich persons and big firms could afford them. Now with the revolution in computer cell phone technology and the consequent fall in their prices, demand for these goods has shot up in India.

3.2.5 Why Demand Curve Slopes Downward to the Right

Figure 3.1 shows that *demand curve slopes downward to the right*. Why does it happen? The reasons behind the law of demand are following:

(i) Income effect. When price of a commodity falls, real income of its consumers increases in terms of this commodity. In other words, their purchasing power increases since they are required to pay less for the same quantity. According to another economic law, increase in real income (or purchasing power) increases demand for goods and services in general and for the goods with reduced price in particular. The increase in demand on account of increase in real income is called *income effect*.

It should however be noted that the *income effect* is negative in case of *inferior goods*. In case price of an ***inferior good*** accounting for a considerable proportion of the total consumption expenditure falls substantially, consumers' real income increases. Consequently, they substitute superior goods for inferior ones. Therefore, *income effect* on the demand for inferior goods becomes *negative*.

(ii) Substitution effect. When price of a commodity falls, it becomes cheaper compared to its substitutes, their prices remaining constant. In other words, when price of a commodity falls, price

of its substitutes remaining the same, its substitute becomes relatively costlier. Consequently, rational consumers tend to substitute cheaper goods for costlier ones within the range of normal goods—goods whose demand increases with increase in consumer's income—other things remaining the same. Therefore, demand for the relatively cheaper commodity increases. The increase in demand on account of this factor is known as ***substitution effect***.

(iii) Diminishing marginal utility. Marginal utility is the utility derived from the marginal unit consumed of a commodity. Diminishing marginal utility is also responsible for increase in demand for a commodity when its price falls. When a person buys a commodity, he exchanges his money income with the commodity in order to maximise his satisfaction. He continues to buy goods and services so long as marginal utility of his money (MU_m) is less than the marginal utility of the commodity (MU_c). Given the price (P_c) of a commodity, the consumer adjusts his purchases so that $MU_c = MU_m$. This proposition holds under both constant MU_m and diminishing MU_m.

If MU_m is assumed to be constant, then $MU_m = P_c$. Under this condition, utility maximising consumer makes his purchases in such quantities that

$$MU_m = P_c = MU_c$$

When price falls, $(MU_m = P_c) < MU_c$. The only way to regain his equilibrium is to reduce MU_c. So the consumer purchases more of the commodity. When the stock of a commodity increases, MU_c decreases. As a result, demand for a commodity increases when its price decreases.

This conclusion holds also under diminishing MU_m. When price of a commodity falls and consumer buys only as many units as before the fall in price, he saves some money on this commodity. As a result, his stock of money increases and his MU_m decreases, whereas MU_c remains unchanged because his stock of commodity remains unchanged. Since MU_m is less than MU_c the utility maximizing consumer exchanges money with commodity to equate MU_m with MU_c, with a view to maximising his satisfaction. Consequently, demand for a commodity increases when its price falls.

3.2.6 Exceptions to the Law of Demand

The law of demand is one of the fundamental laws of economics. The law of demand, however, does not apply to the following cases:

(i) Expectations regarding future prices. When consumers expect a continuous increase in the price of a durable commodity, they buy more of it despite increase in its price, to avoid the pinch of still higher price in future. Similarly, when consumers anticipate a considerable decrease in the price in future, they postpone their purchases and wait for the price to fall further, rather than buy the commodity when its price initially falls. Such decisions of the consumers are contrary to the law of demand.

(ii) Prestigious goods. The law does not apply to the commodities which serve as a 'status symbol', enhance social prestige or display wealth and richness, e.g., gold,[1] precious stones, rare paintings and antiques, etc. Rich people buy such goods mainly because their prices are high.

(iii) Giffen goods. An exception of this law, is also the classic case of Giffen goods named after a British economist Sir Robert Giffen, (1837–1910). A Giffen good does not mean any specific commodity. It may be any essential commodity much cheaper than its substitutes, consumed mostly by the poor households and claiming a large part of their income. If price of such goods increases (price of its substitute remaining constant), its demand increases instead of decreasing. For instance, let us suppose that the *monthly minimum* consumption of foodgrains by a poor household is 30 kgs

1. Goods of this category are also accumulated to store value.

including 20 kgs of *bajra* (an inferior good) and 10 kgs of wheat (a superior good). Suppose also that *bajra* sells at Rs 5 a kg and wheat Rs 10 a kg. At these prices, the household spends Rs 200 per month on food grains. That is the maximum it can afford. Now, if price of *bajra* increases to Rs 6 per kg, the household will be forced to reduce its consumption of wheat by 5 kgs[1] and increase that of *bajra* by the same quantity in order to meet its minimum monthly consumption requirement within Rs 200 per month. Obviously, household's demand for *bajra* increases from 20 to 25 kgs per month despite increase in its price and that of wheat falls to 5 kgs.

3.2.7 The Concept of Market Demand

Market demand for a commodity is the sum of all individual demands for the commodity at a given price, per unit of time. Suppose, there are only three consumers (*A*, *B* and *C*) of Pepsi and their weekly individual demand for Pepsi at its different prices is given as in Table 3.2. The last column of the table shows the market demand, i. e., the aggregate of individual demands for Pepsi.

Table 3.2 Individual and Market Demand for the Pepsi Cans

Price (Rs)	No. of Pepsi Cans demanded by			Market demand
	A	B	C	$= A + B + C$
12	0	0	0	0
10	0	0	4	4
8	0	4	8	12
6	3	8	12	23
4	5	12	16	33
2	8	16	20	44
0	11	20	24	55

The last column of Table 3.2 shows weekly market demand for Pepsi. The *market demand curve* can be obtained by plotting the data in the last column of the table.

Graphical Derivation. Alternatively, market demand curve can be derived graphically by horizontal summation of the individual demand curves at each price of Pepsi. Graphical derivation of the market demand curve is illustrated in Fig. 3.2. The individual demand curves of buyers *A*, *B* and *C* are shown by the demand curves D_A, D_B and D_C, respectively. Horizontal summation of these demand curves produces weekly *market demand curve* for Pepsi as shown by the curve D_M. Thus, a *market curve is horizontal summation of individual demand curves at different prices.*

It is *important* to note here that there is a significant difference between the individual demand curves and the market demand curve. The individual demand curves may not slope downward in case of many consumer goods, e.g., a book by an author, umbrella, cinema ticket for a show, or a passenger ticket, etc. But market demand for all such goods, slopes downward following the decrease in their prices, due to increase in the number of consumers.

1. The increase in demand for *bajra* by 5 kgs can be worked out as follows. Suppose the household maintains its food consumption at its minimum level of 30 kgs. For this, it will be required to substitute x kgs of *bajra* for the same quantity of wheat (x kgs). Its food consumption basket may be expressed as $(20 + x)$ kgs of bajra + $(10 - x)$ kgs of wheat = 30 kgs. Since household can afford only Rs 200 per month, its budget equation can be written as $6(20 + x) + 10(10 - x) =$ Rs 200. Solving this equation for x, we get $x = 5$ kgs.

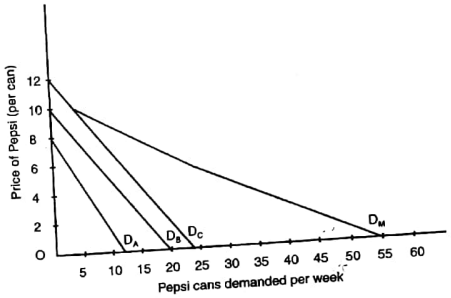


Fig. 3.2 Derivation of Market Demand Curve

3.2.8 Other Determinants of Market Demand

In the short run, price of a commodity is the main determinant of its market demand. In the long run, however, market demand for a product is determined by the number of other factors. We will discuss here, some other important quantifiable and non-quantifiable determinants of demand for a product.

(i) Price of substitutes and complementary goods. The demand for a commodity depends also on the prices of its substitutes and complementary goods. Two commodities are deemed to be ***substitutes*** for one another, if change in price of one affects the demand for the other in the same direction. For instance, commodities X and Y are, in economic sense, substitutes for one another if a rise in the price of X increases the demand for Y, and *vice versa*. Tea and coffee, hamburger and hot-dog, wheat and rice, alcohol and drugs are some common examples of common substitutes. By definition, the relation between demand for a product and price of its substitute is of **positive** nature. When price of a product (say, tea) falls (or increases), then demand for its substitute (coffee) falls (or increases). The relationship of this nature is given in Fig. 3.3 (a).

A commodity is deemed to be a ***complement*** of another when it complements the use of the other For example, petrol is a complement to motor vehicles; butter and jam are complements to bread; milk and sugar are complement to tea and coffee and so on. Conceptually, two goods are complements for one another, if an increase in the price of one causes a decrease in the demand for another. By definition, *there is an inverse relationship between the demand for a good and the price of its complement.* For instance, an increase (or a decrease) in the price of petrol causes a decrease (or an increase) in the demand for car, other things remaining the same. The nature of relationship between the demand for a product and the price of its complement is given in Fig. 3.3 (b).

(ii) Consumers' income and Engel curves. Consumer's income is the basic determinant of the quantity demanded of a product. It is a common knowledge that the people with higher disposable income spend a larger amount on goods and services than those with lower income. Income-demand relationship is of a more varied nature than that between demand and its other determinants.

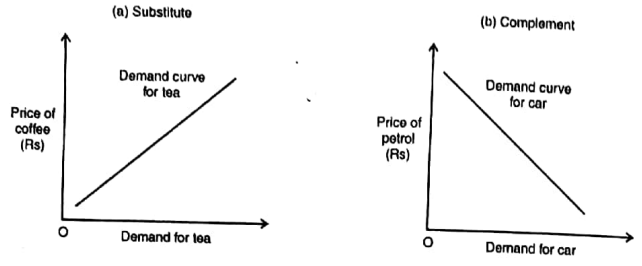


Fig. 3.3 Demand for Substitute and Complement

For the purpose of income-demand analysis, goods and services may be grouped under four broad categories, viz. (a) essential consumer goods; (b) inferior goods; (c) normal goods; and (d) prestige or luxury goods. The relationship between income and the different kinds of goods is presented through the **Engel Curves.***

(a) Essential consumer goods (ECG). The goods and services which fall in this category are essentially consumed by almost all persons of a society, e.g., food grains, clothes, vegetable oils, sugar, matches, cooking fuel and housing, etc. The quantity demanded of such goods increases with increase in consumer's income only upto a certain limit, other factors remaining the same. The relation between goods and services of this category and consumer's income is shown by curve *ECG* in Fig. 3.4. As the curve shows, consumer's demand for essential goods increases until his income rises to OY_2 and beyond this level of income, it does not.

(b) Inferior goods. Inferior and superior goods are generally known to both consumers and sellers. For instance, every consumer knows that *bajra* is inferior to wheat and rice; *bidi* (an indigenous cigarette) is inferior to cigarette, coarse textiles are inferior to refined ones, kerosene stove is inferior to gas-stove; travelling by bus is inferior to travelling by taxi, and so on. In economic terminology, however, *a commodity is deemed to be inferior if its demand decreases with the increase in consumers'* income. The relation between income and demand for an inferior good is shown by curve *IG* in Fig. 3.4 assuming that other determinants of demand remain the same. Demand for such goods may initially increase with increase in income (say upto Y_1) but it decreases when income increases beyond this level.

(c) Normal goods. In economic sense, normal goods are those which are demanded in increasing quantities as consumers' income rises. Clothing is the most important example of this category of goods. Household furniture, electricity, telephones, household gadgets, etc. are other examples of this category of goods. The nature of relation between income and demand for normal goods is shown by the curve *NG* in Fig. 3.4. As the curve shows, demand for such goods increases with increase in income of the consumer, but at different rates at different levels of income. Demand for normal goods initially increases rapidly with the increase in income and later, at a lower rate.

* Engel Curve has been named after a German Statistician, Christian Lorenz Ernst Engel (1821–1986), who was one of the first to study systematically the relation between quantity demanded of a good and the consumer's income. According to Engel's law, proportion of expenditure on essential goods decreases as income increases.

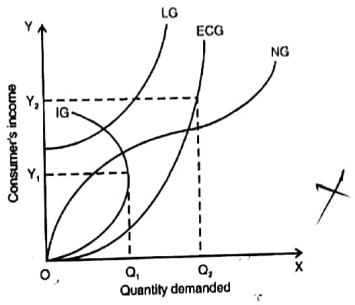


Fig. 3.4. Income-Demand Curves

It may be noted from Fig. 3.4 that upto a certain level of income (Y_1) the relation between income and demand for all types of goods is similar. The difference is of degree only. The relation between income and different kind of goods becomes distinctly different only beyond a certain level of income.

(d) Prestige or luxury goods. Prestige goods are those which are consumed mostly by the rich section of the society, e.g., precious stones, studded jewellery, costly cosmetics, luxury cars, airconditioners, costly decoration items (e.g., antiques), etc. Demand for such goods arises only beyond a certain level of consumer's income. The income-demand relationship of this category of goods is shown by the curve *LG* in Fig. 3.4.

(iii) Consumer's taste and preference. Consumer's taste and preferences play an important role in determining the demand for a product. Taste and preferences depend, generally, on the social customs, religious values attached to a commodity, habits of the people, the general life-style of the society and also the age and sex of the consumers. Change in these factors changes consumers' taste and preferences. When there is a change in consumers' liking, tastes and preferences for certain goods and services following the change in fashion, people switch their consumption pattern from cheaper and old fashioned goods over to costlier 'mod' goods, so long as price differentials commensurate with their preference. For example, preference for 'junk food' in the younger generation has increased as compared to normal home-made nutritious food. Consumers are prepared to pay higher prices for 'mod' goods even if their virtual utility is the same as that of old-fashioned goods. This fact reveals that tastes and preferences also influence demand for goods and services.

(iv) Expected utility at equilibrium. Most consumers have limited income to satisfy unlimited wants. They spend their income on various goods they consume in such a manner that the total satisfaction derived out of their limited income is maximum. A consumer maximises his total satisfaction or his total utility when marginal utility, per unit of expenditure, derived from each commodity is the same. For example, let us suppose that a consumer has to spend his limited income on bread (B), shirts (S), and cinema shows (C). Given their respective prices as P_b, P_s, P_c, he would spend his income on these items according to the law of equi-marginal-utility* so that marginal

* This law is discussed in detail in Chapter 6.

utility (MU) per unit of expenditure from each of these goods is the same, i.e.,

$$\frac{MU_b}{P_b} = \frac{MU_s}{P_s} = \frac{MU_c}{P_c}$$

where MU_b, MU_s and MU_c denote the MU of bread, shirts and cinema shows, respectively.

This is a necessary condition of consumer's equilibrium. Since MU schedule for each of these goods would be different, the consumer would buy different quantities of these goods with a view to equalising their MU per unit of expenditure. The equilibrium condition itself determines the quantity of each good (given their MU schedule) which a utility maximising consumer would like to buy. Although, in practice, a consumer may not be able to achieve the theoretical precision of his equilibrium, his pattern of expenditure and the quantity of each commodity that he would buy would approximate to the equilibrium condition stated above.

(v) Consumers' expectations. Consumers' expectations regarding the future course of economic events, particularly regarding changes in prices, income, and supply position of goods, play an important role in determining the demand for goods and services in the short run. If consumers expect a rise in the price of a commodity, they would buy more of it at its current price, with a view to avoiding the pinch of price-rise in future. On the contrary, if consumers expect prices of certain goods to fall, they postpone their purchases of such goods with a view to taking advantage of lower prices in future, mainly in case of non-essential goods. This behaviour of consumers reduces (or increases) the current demand for the goods whose prices are expected to decrease (or increase) in future. Similarly, an expected increase in income on account of the announcement of revision of pay-scales, dearness allowance, bonus, etc., induces increase in curent purchase, and *vice versa*.

(vi) Demonstration effect. When new commodities or new models of existing ones appear in the market, rich people buy them first. Some people buy new goods or new model of goods because they have genuine need for them while others buy because they want to exhibit their affluence. But once new commodities come in vogue, many households buy them, not because they have a genuine need for them but because others or neighbours have bought these goods. The purchase by the latter category of buyers are made out of such feelings as jealousy, competition, equality in the peer group, social inferiority and the desire to raise social status. Purchases made on account of these factors are the result of *'Demonstration Effect'* or the *'Bandwagon Effect'*. These effects have a positive effect on the demand. On the contrary, when a commodity becomes the thing of common use, some people, mostly rich, decrease or give up the consumptions of such goods. This is known as **'Snob Effect'**. It has a negative effect on the demand for the related goods.

(vii) Consumer-credit facility. Availability of credit to the consumers from the sellers, banks, relations and friends or from any other source encourages the consumers to buy more than what they would buy in the absence of credit facility. That is why the consumers who can borrow more consume more than those who can borrow less or cannot borrow at all. Credit facility affects mostly the demand for consumer durables, particularly those which require bulk payment at the time of purchase.

(viii) Population of the country. The total domestic demand for a product depends also on the size of population. Given the price, per capita income, taste and preferences etc., the larger the population, the larger the demand for a product of common use. With an increase (or decrease) in the size of population, employment percentage remaining the same, demand for the product increases (or decreases). The relation between market demand for a product (normal) and the size of population is similar to the income–demand relationship.

(ix) Distribution of national income. The distribution pattern of national income also affects the demand for a commodity. If national income is evenly distributed, market demand for ***normal goods*** will be the largest. If national income is unevenly distributed, i.e., if majority of population belongs to the lower income groups, market demand for essential goods will be the largest whereas the same for other kinds of goods will be relatively low.

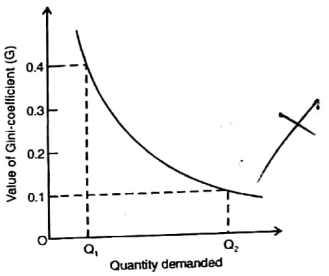


Fig. 3.5 Gini-coefficient and Demand

The relationship beteween market demand for a normal good and national income distribution is illustrated in Fig. 3.5. In the figure, vertical axis measures the Gini efficient[1] (a measure of national income distribution—G) and the horizontal axis measures the quantity demanded of a normal good. As Fig. 3.5 shows, at high value of $G = 0.4$, quantity demand of a normal good is small equal to Q_1. As G decreases from 0.4 to 0.1 (i.e., income distribution becomes more and more even) quantity of a normal goods demanded increases from Q_1 towards Q_2.

3.2.9 Demand Function

In mathematical language, a function is a symbolic statement of relationship between a dependent and independent variables. Demand function states the relationship between demand for a product (the dependent variable) and its determinants (the independent variables). Let us consider the most common form of a demand function, i.e., the short-run demand function, which consists of quantity demand (Q) and price (P). Assume that the quantity demanded of a commodity (D_x) depends only on its price, other factors remaining constant. The demand function will then read as 'demand for a commodity (D_x) depends on its price (P_x)'. The same statement may be written in its functional form as

$$D_x = f(P_x) \tag{3.1}$$

where D_x is demand for commodity X, the dependent variable, and P_x is price of X, the independent variable.

1. Gini-coefficient is a standard measure of national income distribution through Phillips curve. Gini-coefficient (G) having numerical value equal to zero indicates equal distribution of national income. $G > O$ indicates inequality. The higher the value of G, the greater the inequality in the distribution of national income.

The function (3.1), however, does not give the quantitative relationship between D_x and P_x. When quantitative relationship between D_x and P_x is known, the demand function may be expressed in the form of an equation as

$$D_x = a - bP_x \tag{3.2}$$

where a and b are constants—a is intercept and b quantifies the relationship between D_x and P_x.

The form of equation depends on the empirical demand-price relationship. The two most common forms of demand-price relationship are ***linear*** and ***non-linear***. Accordingly, the demand function may take a linear or a non-linear form.

(i) Linear demand function. A demand function is said to be linear when the slope of the demand curve remains constant throughout its length. The simplest form of a linear demand function is given by equation (3.2). In equation (3.2), the alphabet a denotes total demand at zero price and $b = \Delta D/\Delta P$, also a constant, denotes slope of the demand curve.

Given the demand function (3.2), if values of a and b are known, total demand (D_x) for any given price (P_x) can easily be obtained. For example, let us assume that $a = 100$ and $b = 5$. Now the demand function (3.2) can be written as

$$D_x = 100 - 5P_x \tag{3.3}$$

Given the Eq. (3.3), the value of D_x can be easily obtained for any value of P_x. For example, if $P_x = 4$,

$$D_x = 100 - 5 \times 4$$
$$= 80;$$

and if $P_x = 10$,

$$D_x = 100 - 5 \times 10$$
$$= 50.$$

Thus, a demand schedule can be prepared assigning different values to P_x. When this demand schedule is plotted, it produces a linear demand curve as shown in Fig. 3.6.

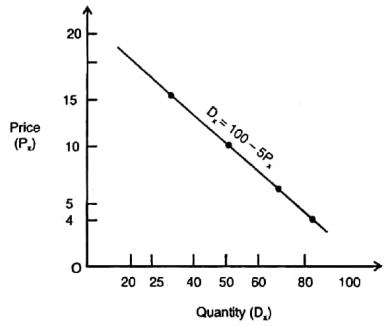


Fig. 3.6 Linear Demand Function

From the demand function, one can easily derive a corresponding ***price function***. For example, given the demand function (3.2), the price function may be written as

$$P_x = \frac{a - D_x}{b} \tag{3.4}$$

or

$$P_x = \frac{a}{b} - \frac{1}{b} D_x$$

Denoting a/b by a' and $1/b$ by b', Eq. (3.4.) may be written as

$$P_x = a' - b'D_x$$

Given the demand function (3.3), price function can be derived as follows.

If $D_x = 100 - 5P_x$,

then $P_x = 20 - 0.20\, D_x$

(ii) Non-linear demand function. A demand function is said to be non linear or curvilinear when the slope of a demand curve ($\Delta P/\Delta Q$) changes all along the demand curve. Non-linear demand function yields a demand curve instead of a ***demand line***, as shown in Fig. 3.7. A non-linear demand function, generally, takes the form of a power function as

$$D_x = aP_x^{-b} \tag{3.5}$$

or of a rectangular hyperbola of the form

$$D_x = \frac{a}{P_x + c} b \quad \text{where } a, b, c > 0. \tag{3.6}$$

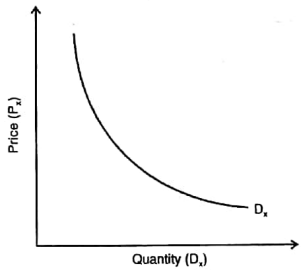


Fig. 3.7 Nonlinear Demand Function

Note that the exponent ($-b$) of the price variable in a non-linear demand function (3.5) is the coefficient of price elasticity of demand, which is constant.

(iii) Dynamic demand function. The demand function with price as a single independent variable, as described above, may be termed as ***short-term demand function***. A short-run demand function assumes all other factors than price to be given. In the long-run, however, the market demand for a product depends on the composite impact of all the determinants operating simultaneously. Therefore, in a ***long-run*** or ***dynamic demand function***, all the relevant determinants of demand for a product are included in the demand function. For instance, if individual demand (D_x) for a commodity X, depends

The function (3.1), however, does not give the quantitative relationship between D_x and P_x. When quantitative relationship between D_x and P_x is known, the demand function may be expressed in the form of an equation as

$$D_x = a - bP_x \qquad (3.2)$$

where a and b are constants—a is intercept and b quantifies the relationship between D_x and P_x.

The form of equation depends on the empirical demand-price relationship. The two most common forms of demand-price relationship are ***linear*** and ***non-linear***. Accordingly, the demand function may take a linear or a non-linear form.

(i) Linear demand function. A demand function is said to be linear when the slope of the demand curve remains constant throughout its length. The simplest form of a linear demand function is given by equation (3.2). In equation (3.2), the alphabet a denotes total demand at zero price and $b = \Delta D/\Delta P$, also a constant, denotes slope of the demand curve.

Given the demand function (3.2), if values of a and b are known, total demand (D_x) for any given price (P_x) can easily be obtained. For example, let us assume that $a = 100$ and $b = 5$. Now the demand function (3.2) can be written as

$$D_x = 100 - 5P_x \qquad (3.3)$$

Given the Eq. (3.3), the value of D_x can be easily obtained for any value of P_x. For example, if $P_x = 4$,

$$D_x = 100 - 5 \times 4$$
$$= 80;$$

and if $P_x = 10$,

$$D_x = 100 - 5 \times 10$$
$$= 50.$$

Thus, a demand schedule can be prepared assigning different values to P_x. When this demand schedule is plotted, it produces a linear demand curve as shown in Fig. 3.6.

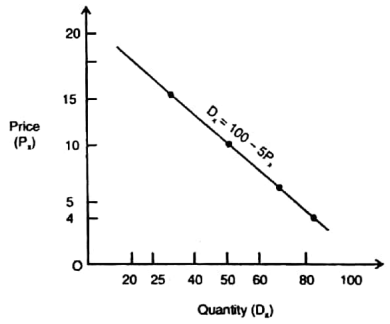


Fig. 3.6 Linear Demand Function

From the demand function, one can easily derive a corresponding ***price function***. For example, given the demand function (3.2), the price function may be written as

$$P_x = \frac{a - D_x}{b} \qquad (3.4)$$

or

$$P_x = \frac{a}{b} - \frac{1}{b} D_x$$

Denoting a/b by a' and $1/b$ by b', Eq. (3.4.) may be written as

$$P_x = a' - b'D_x$$

Given the demand function (3.3), price function can be derived as follows.

If $D_x = 100 - 5P_x$,

then $P_x = 20 - 0.20\, D_x$

(ii) Non-linear demand function. A demand function is said to be non linear or curvilinear when the slope of a demand curve ($\Delta P/\Delta Q$) changes all along the demand curve. Non-linear demand function yields a demand curve instead of a *demand line*, as shown in Fig. 3.7. A non-linear demand function, generally, takes the form of a power function as

$$D_x = aP_x^{-b} \qquad (3.5)$$

or of a rectangular hyperbola of the form

$$D_x = \frac{a}{P_x + c} b \quad \text{where } a, b, c > 0. \qquad (3.6)$$

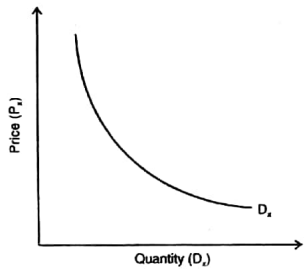


Fig. 3.7 Nonlinear Demand Function

Note that the exponent ($-b$) of the price variable in a non-linear demand function (3.5) is the coefficient of price elasticity of demand, which is constant.

(iii) Dynamic demand function. The demand function with price as a single independent variable, as described above, may be termed as ***short-term demand function***. A short-run demand function assumes all other factors than price to be given. In the long-run, however, the market demand for a product depends on the composite impact of all the determinants operating simultaneously. Therefore, in a ***long-run*** or ***dynamic demand function***, all the relevant determinants of demand for a product are included in the demand function. For instance, if individual demand (D_x) for a commodity X, depends

on its price (P_x), consumer's income (Y), consumer's wealth (W), price of its substitute (P_y), price of complementary goods (P_c), consumer's taste (T), and advertisement expenditure (A), it can be expressed as

$$D_x = f(P_x, Y, W, P_y, P_c, T, A) \quad (3.7)$$

If relationship between D_x and the independent variables P_x, Y, W, P_y, P_c and A is of linear form, the estimable form of the demand function is expressed as

$$D_x = a - bP_x + cY + wW + dP_y + jA \quad (3.8)$$

where a is a constant term and b, c, w, d and j are the coefficient of relation between D_x and the respective independent variables.

In a *market demand function* for a product, other independent vaiables, viz., size of population (N) and a measure of income distribution, i.e., Gini-coefficient (G), may also be included.

3.2.10 Shift in Demand Curve

When demand curve changes its position retaining its shape (though not necessarily), the change is known as *shift in demand curve*. Let us suppose that the demand curve, D_2 in Fig. 3.8 is the original demand curve for commodity X. As shown in the figure, at price OP_2, demand equals OQ_2 units of X, other factors remaining constant. But if any of the other factors (e.g., consumers' income or price of the substitutes) changes, it will change consumer's ability and willingness to buy commodity X. For example, if consumer's disposable income decreases due to increase in income tax, he may be able to buy only OQ_1 units of X instead of OQ_2 at price OP_2. As a result, demand curve D_2 shifts downward D_1. This is true for the whole range of price of X, that is, consumers would be able to buy less at all other prices. This will cause a ***downward shift*** in demand curve from D_2 to D_1. Similarly, increase in disposable income of the consumer, say, due to reduction in taxes, may cause an ***upward shift*** from D_2 to D_3. The consumer shifts to point E_3 on demand curve D_3 and can buy OQ_3 of commodity X. Such changes in the location of demand curves are known as shifts in demand curve.

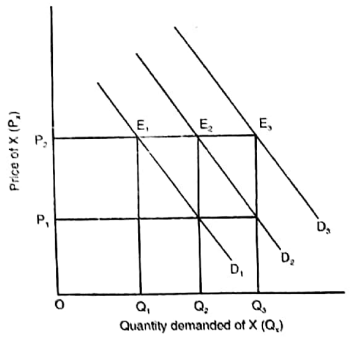


Fig. 3.8 Shift in Demand Curve

Reasons for shift in demand curve. Shifts in a demand curve may take place owing to the change in one or more of the determinants of demand. Consider, for example, the decrease in demand for commodity X by Q_1Q_2 in Fig. 3.8. This fall in demand may have been caused by any of the following reasons:

(i) fall in the consumer's income so that consumer can buy only OQ_1 of X at price OP_2 — it is called ***income effect;***

(ii) fall in the price of X's substitute so that the consumers find it gainful to substitute Q_1Q_2 of X for its substitute—it is ***substitution effect;***

(iii) advertisement made by the producer of the substitute, changes consumer's taste or preference against commodity X so much that they replace Q_1Q_2 of it with its substitute—again a ***substitution effect;***

(iv) increase in the price of complements of X so that consumers can afford only OQ_1 of X; and

(v) also for such reasons as commodity X is going out of fashion; its quality has deteriorated; consumers' technology has so changed that only OQ_1 of X can be used, and change in season if commodity X has only seasonal use.

3.3 THE SUPPLY SIDE OF THE MARKET

In a market economy, while buyers of a product constitute the demand side of the market, sellers of that product make the supply side of the market. In this section, we turn to discuss the law of supply.

Market Supply

Supply means the quantity of a commodity which its producers or sellers offer for sell at a given price, per unit of time. Market Supply, like market demand, is the sum of supplies of a commodity made by all individual firms.

3.3.1 The Law of Supply

The supply of a commodity depends on its price and cost of its production. In other words, supply is the function of price and production cost.[1] The law of supply is, however, expressed generally in terms of price-quantity relationship. The ***law of supply*** can be stated as follows: ***The supply of a product increases with the increase in its price and decreases with decrease in its price, other things remaining constant.*** It implies that the supply of a commodity and its price are positively related. This relationship holds under the assumption that "other things remain the same" "Other things" include technology, price of related goods (substitute and complements), and weather and climatic conditions in case of agricultural products.

3.3.2 The Supply Schedule

A supply schedule is a tabular presentation of the law of supply. A supply schedule is a table showing different prices of a commodity and the corresponding quantity that suppliers are willing to offer for sale. Table 3.2 presents a hypothetical supply schedule of shirts, i.e., number of shirts supplied per month at different prices.

1. Cost of production determines, in fact, the minimum price of a commodity.

on its price (P_x), consumer's income (Y), consumer's wealth (W), price of its substitute (P_y), price of complementary goods (P_c), consumer's taste (T), and advertisement expenditure (A), it can be expressed as

$$D_x = f(P_x, Y, W, P_y, P_c, T, A) \quad (3.7)$$

If relationship between D_x and the independent variables P_x, Y, W, P_y, P_c and A is of linear form, the estimable form of the demand function is expressed as

$$D_x = a - bP_x + cY + wW + dP_y + jA \quad (3.8)$$

where a is a constant term and b, c, w, d and j are the coefficient of relation between D_x and the respective independent variables.

In a *market demand function* for a product, other independent vaiables, viz., size of population (N) and a measure of income distribution, i.e., Gini-coefficient (G), may also be included.

3.2.10 Shift in Demand Curve

When demand curve changes its position retaining its shape (though not necessarily), the change is known as *shift in demand curve*. Let us suppose that the demand curve, D_2 in Fig. 3.8 is the original demand curve for commodity X. As shown in the figure, at price OP_2, demand equals OQ_2 units of X, other factors remaining constant. But if any of the other factors (e.g., consumers' income or price of the substitutes) changes, it will change consumer's ability and willingness to buy commodity X. For example, if consumer's disposable income decreases due to increase in income tax, he may be able to buy only OQ_1 units of X instead of OQ_2 at price OP_2. As a result, demand curve D_2 shifts downward D_1. This is true for the whole range of price of X, that is, consumers would be able to buy less at all other prices. This will cause a ***downward shift*** in demand curve from D_2 to D_1. Similarly, increase in disposable income of the consumer, say, due to reduction in taxes, may cause an ***upward shift*** from D_2 to D_3. The consumer shifts to point E_3 on demand curve D_3 and can buy OQ_3 of commodity X. Such changes in the location of demand curves are known as shifts in demand curve.

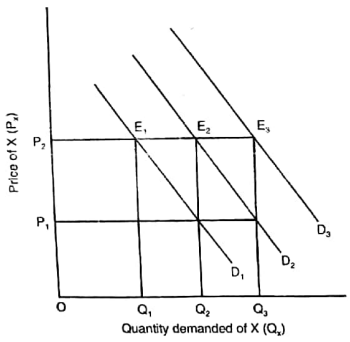


Fig. 3.8 Shift in Demand Curve

Reasons for shift in demand curve. Shifts in a demand curve may take place owing to the change in one or more of the determinants of demand. Consider, for example, the decrease in demand for commodity X by Q_1Q_2 in Fig. 3.8. This fall in demand may have been caused by any of the following reasons:

(i) fall in the consumer's income so that consumer can buy only OQ_1 of X at price OP_2 — it is called ***income effect;***

(ii) fall in the price of X's substitute so that the consumers find it gainful to substitute Q_1Q_2 of X for its substitute—it is ***substitution effect;***

(iii) advertisement made by the producer of the substitute, changes consumer's taste or preference against commodity X so much that they replace Q_1Q_2 of it with its substitute—again a ***substitution effect;***

(iv) increase in the price of complements of X so that consumers can afford only OQ_1 of X; and

(v) also for such reasons as commodity X is going out of fashion; its quality has deteriorated; consumers' technology has so changed that only OQ_1 of X can be used, and change in season if commodity X has only seasonal use.

3.3 THE SUPPLY SIDE OF THE MARKET

In a market economy, while buyers of a product constitute the demand side of the market, sellers of that product make the supply side of the market. In this section, we turn to discuss the law of supply.

Market Supply

Supply means the quantity of a commodity which its producers or sellers offer for sell at a given price, per unit of time. Market Supply, like market demand, is the sum of supplies of a commodity made by all individual firms.

3.3.1 The Law of Supply

The supply of a commodity depends on its price and cost of its production. In other words, supply is the function of price and production cost.[1] The law of supply is, however, expressed generally in terms of price-quantity relationship. The ***law of supply*** can be stated as follows: ***The supply of a product increases with the increase in its price and decreases with decrease in its price, other things remaining constant.*** It implies that the supply of a commodity and its price are positively related. This relationship holds under the assumption that "other things remain the same". "Other things" include technology, price of related goods (substitute and complements), and weather and climatic conditions in case of agricultural products.

3.3.2 The Supply Schedule

A supply schedule is a tabular presentation of the law of supply. A supply schedule is a table showing different prices of a commodity and the corresponding quantity that suppliers are willing to offer for sale. Table 3.2 presents a hypothetical supply schedule of shirts, i.e., number of shirts supplied per month at different prices.

1. Cost of production determines, in fact, the minimum price of a commodity.

Table 3.2 Supply Schedule of Shirts

Price (in Rs)	Supply (Shirts in '000)
100	10
200	35
300	50
400	60
600	75
800	80

3.3.3 The Supply Curve

A supply curve is a graphical presentation of the supply schedule. The supply curve *SS'* given in Fig. 3.9 has been obtained by plotting the data in Table 3.2. The points *S, P, Q, R, T* and *S'* show the price-quantity combinations on the supply curve *SS'*. The supply curve, *SS'*, depicts ***the law of supply***. The upward slope of the supply curve indicates the rise in the supply of shirts with the rise in its price and fall in the supply with fall in prices. For example, at price Rs 200, only 35 thousand shirts are supplied per month. When price rises to Rs 400, supply increases to 60 thousand shirts.

As shown in Fig. 3.9, ***a supply curve has a positive slope***. The positive slope or upward movement of the supply curve is caused by seller's desire to make larger profit and, more importantly, by the rise in cost of production. The rise in cost of production results from the law of diminishing returns. In fact, supply curve is derived from the marginal cost curve. The derivation of supply curve from the marginal cost curve is discussed and illustrated ahead in Chapter 15.

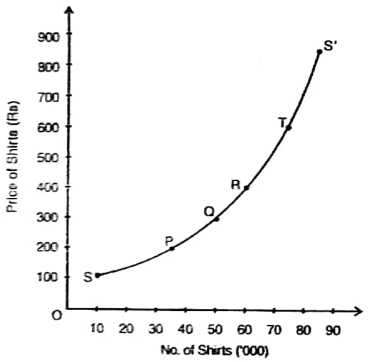


Fig. 3.9 Supply Curve of Shirts

3.3.4 Shift in the Supply Curve

We have shown above that a change in the price of a commodity causes a change in its quantity supplied along a given supply curve. Although price of a commodity is the most important determinant of its supply, it is not the only determinant. Many other factors influence the supply of a commodity. Given the supply curve of a commodity, when there is change in its other determinants, the supply curve shifts rightward or leftward depending on the effect of such changes. Let us now explain how other determinants of supply cause shift in the supply curve.

(i) Change in input prices. When input prices decrease, the use of inputs increases. As a result, product supply increases and the supply curve *SS* shifts to the right to *SS''*, as shown in Fig. 3.10. Similarly, when input prices increase, product supply curve shifts leftward from *SS* to *SS'*.

(ii) Technological progress. Technological changes that reduce cost of production or increase efficiency cause increase in product supply. For instance, introduction of high yielding variety of paddy and new techniques of cultivation increased per acre yield of rice in India in the 1970s. Such changes make the supply curve shift to the right.

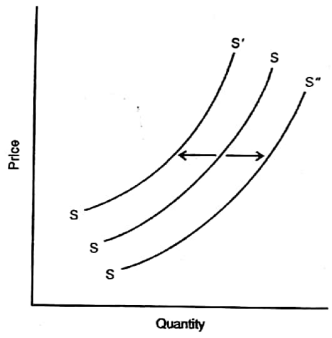


Fig. 3.10 Shift in the Supply Curve

(iii) Price of product substitutes. In production of many commodities, it is possible to produce some other goods which require a similar technology. For example, a refrigerator company can also produce ACs; Tatas famous for truck production can also produce cars; Maruti Udyog can produce trucks, and so on. Fall in the price of one of the product substitutes may lead to the rise in the supply of other due to capacity utilization for profit maximisation.

(iv) Nature and size of the industry. The supply of a commodity depends also on whether an industry is monopolized or competitive. Under monopoly, supply is fixed. When a monopolized industry is made competitive, the total supply increases. Besides, if size of an industry increases due to new firms joining the industry, the total supply increases and supply curve shifts rightward.

(v) Government policy. When government imposes restrictions on production, e.g., import quota on inputs, rationing of or quota imposed on input supply, etc., production tends to fall. Such restrictions make supply curve to shift leftward.

(vi) Non-economic factors. The factors like labour strikes and lock-outs, war, drought, flood, communal riots, epidemics, etc. also affect adversely the supply of commodities.

3.3.5 Supply Function

The ***supply function*** is a mathematical statement which states the relationship between the quantity supplied of a commodity (as a dependent variable) and its determinants (as independent variables). Supply function is based on the law of supply. The law of supply states only the nature of relationship between the price and the quantity supplied. A supply function quantifies this relationship. A supply function may be written as

$$Q_x = 10\,P_x \qquad (3.9)$$

(where Q_x denotes the quantity supplied of commodity X and P_x denotes its price).

Given the supply function, a supply schedule can be obtained by substituting numerical values for P_x. For example, if $P_x = 2$, $Q_x = 20$ and if $P_x = 5$, $Q_x = 50$. By plotting the supply schedule, a supply curve can be obtained. (For procedure, refer to the section on demand function).

3.4 THE MARKET EQUILIBRIUM: EQUILIBRIUM OF DEMAND AND SUPPLY

Determination of Price in a Free Market

In sections 3.2 and 3.4, we have explained the laws of demand and supply and how demand and supply behave in response to the change in price and other determinants. In this section, we explain how demand and supply strike a balance, how market attains **equilibrium**, and how **equilibrium price** is determined in a free market. A **free market** is one in which market forces of demand and supply are free to take their own course and there is no outside control on price, demand and supply.

The Concept of Market Equilibrium

In physical sense, the term equilibrium means the "state of rest". In general sense, it means balance in opposite forces. In the context of market analysis, ***equilibrium refers to a state of market in which quantity demanded of a commodity equals the quantity supplied of the commodity***. The equality of demand and supply produces an ***equilibrium price***. The **equilibrium price** is the price at which quantity demanded of a commodity equals its quantity supplied. That is, at equilibrium price, demand and supply are in equilibrium. Equilibrium price is also called ***market-clearing price***. Market is cleared in the sense that there is no unsold stock and no unsupplied demand.

Determination of Market Price

Equilibrium price of a commodity in a free market is determined by the market forces of demand and supply. In order to analyse how equilibrium price is determined, we need to integrate the demand and supply curves. For this purpose, let us use the example of shirts. Let us suppose that the market demand and supply schedules for shirts are given as shown in Table 3.3.

As the table shows, there is only one price of shirts (Rs 300) at which the market is in equilibrium: quantity demanded equals the quantity supplied at 40 thousand shirts. At all other prices, the shirt market is in ***disequilibrium***—the state of imbalance between supply and demand. When market is in the state of disequilibrium, either demand exceeds supply or supply exceeds demand. As the table shows, at all prices below Rs 300, demand exceeds supply showing *shortage* of shirts in the market. Likewise, at all prices above Rs 300, supply exceeds demand showing *excess supply*.

Table 3.3 *Monthly Demand and Supply Schedules for Shirts*

Price per Shirt (Rs)	Demand ('000 shirts)	Supply ('000 shirts)	Market Position	Effect on Price
100	80	10	Shortage	Rise
200	55	28	Shortage	Rise
300	40	40	**Equilibrium**	**Stable**
400	28	50	Surplus	Fall
500	20	55	Surplus	Fall
600	15	60	Surplu	Fall

In a free market, disequilibrium itself creates the condition for equilibrium. When there is excess supply, it forces downward adjustments in the price and quantity supplied. When there is excess demand, it forces upward adjustments in the price and quantity demanded. The process of downward and upward adjustments in price and quantity continues till the price reaches Rs 300 and quantities supplied and demanded balance at 40 thousand shirts. This process is automatic. Let us now look into the process of price and quantity adjustments called 'market mechanism'.

Market mechanism: How market brings about balance

Market mechanism is a process of interaction between the market forces of demand and supply to determine equilibrium price. To understand how it works, let the price of shirts be initially set at Rs 100. At this price, the quantity demanded exceeds the quantity supplied by 70 thousand shirts. The shortage will force buyers to bid higher price to buy the desired number of shirts. This gives sellers an opportunity to raise the price. Increase in price enhances the profit margin. This induces firms to produce and sell more in order to maximize their profits. This trend continues till price rises to Rs 300. As Table 3.3 shows, at price Rs 300, the buyers are willing to buy 40 thousand shirts. This is exactly the number of shirts that sellers would like to sell at this price. At this price, there is neither shortage nor excess supply of shirts in the market. Therefore, Rs 300 is the equilibrium price. The market is, therefore, in equilibrium.

Similarly, at all prices above Rs 300, supply exceeds demand showing excess supply of shirts in the market. The excess supply forces the competing sellers to cut down the price. Some firms find low price unprofitable and go out of market and some cutdown their production. Therefore, supply of shirts goes down. On the other hand, fall in price invites more customers. This process continues until price of shirts falls to Rs 300. At this price, demand and supply are in balance and market is in equilibrium. Therefore, price at Rs 300 per shirt is equilibrium price.

Graphical Illustration of Price Determination

The determination of equilibrium price is illustrated graphically in Fig. 3.11. The demand curve DD' and the supply curve SS' have been obtained by plotting the demand and supply schedules, respectively, (given in Table 3.3) on the price and quantity axes.

As Fig. 3.11 shows, demand and supply curves intersect at point E determining the equilibrium price at Rs 300. At this price, the quantity demanded (40 thousand shirts) equals the quantity supplied. Thus, the equilibrium price is Rs 300 and equilibrium quantity is 40 thousand shirts. The quilibrium condition is not fulfilled at any other point on the demand and supply curves. Therefore, if price is set at any price other than Rs 300, there would be either excess supply or shortage of shirts in the market.

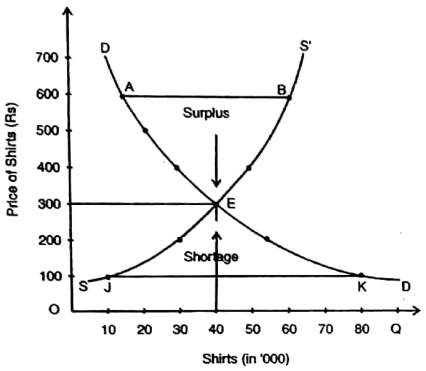


Fig. 3.11 Equilibrium of Demand and Supply: Price Determination

Let us now see how market works to bring about balance in demand for and supply of shirts. Let the price be initially set at Rs 600. At this price, suppliers bring in a supply of 60 thousand shirts whereas buyers are willing to buy only 15 thousand shirts. The supply, obviously, far exceeds the demand. As Fig. 3.11 shows, the excess supply equals, $AB = 60 - 15 = 45$ thousand shirts. The suppliers would, therefore, lower down the price gradually in order to get rid of the unsold stock and cut down the supply simultaneously. Besides, when price falls, demand for shirts increases too. In this process, the supply-demand gap is reduced. This process continues until price reaches Rs 300 at point E, the point of equilibrium where demand and supply equal at 40 thousand shirts. At this price, the market is in equilibrium and there is no inherent force at work which can disturb the market equilibrium.

Likewise, if price is initially set at Rs 100, the buyers would be willing to buy 80 thousand shirts whereas suppliers would be willing to supply only 10 thousand shirts. Thus, there would be a shortage of 70 thousand shirts as shown by the distance JK in Fig. 3.11. The shortage will force the buyers to bid a higher price. This will lead to increase in price which will encourage the suppliers to increase their supply. This process of adjustment will continue as long as demand exceeds supply. When price rises to Rs 300, the market reaches its equilibrium.

Price Determination: A Numerical Example

In the previous section, we have illustrated how equilibrium of demand and supply is determined at the point of intersection of the demand and supply curves. If demand and supply functions are known, the equilibrium quantity and equilibrium price can also be determined numerically.

Let **demand function** for a commodity X be given as

$$Q_d = 150 - 5P_x$$

and **supply function** as

$$Q_s = 10P_x$$

We know that at equilibrium, quantity supplied equals quantity demanded, i.e., $Q_s = Q_d$.

By substituting supply and demand functions, we get

$$10P_x = 150 - 5P_x$$

$$P_x = 10$$

At equilibrium price $P_x = 10$, the quantity supplied and demanded are in equilibrium.

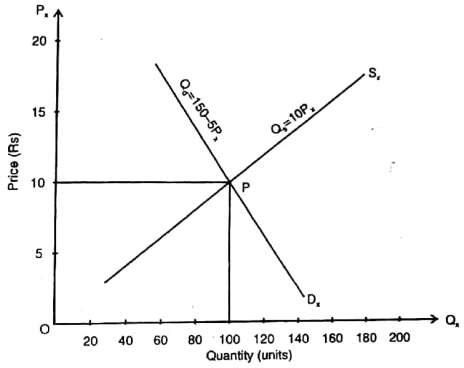


Fig. 3.12 Determination of Equilibrium Price and Quantity

The algebraic determination of equilibrium price and quantity is illustrated graphically in Fig. 3.12. The demand curve DD' has been drawn by using the demand function $Q_d = 150 - 5P_x$ and the supply curve SS' by using the supply function $Q_s = 10P_x$. As the figure shows, demand and supply curves intersect at point P. A perpendicular drawn from point P to the quantity axis determines the equilibrium quantity at 100 units and a line drawn from point P to the price axis determines the equilibrium price at Rs 10. At this price, the quantity demanded equals the quantity supplied and hence the shirt market is in equilibrium.

3.5 SHIFT IN DEMAND AND SUPPLY CURVES AND MARKET EQUILIBRIUM

3.5.1 Shift in Demand Curve

Whenever there is a shift in the demand and/or supply curve, there is also a shift in the equilibrium point. The effect of shift in the demand curve on the equilibrium is shown in Figure 3.13. Suppose that the initial demand curve is given by the curve DD' and supply curve by SS'. The demand and supply curves intersect each other at point P. The equilibrium price is determined at PQ and equilibrium quantity at OQ. Let the demand curve now shift from its position DD' to DD'', supply curve remaining the same. The demand curve DD'' intersects the supply curve SS' at point M. Thus, shift in the demand curve causes a shift in the equilibrium from point P to point M. At the equilibrium, quantity demand and supplied increases from OQ to ON and price increases from PQ to MN. Note that, the supply curve remaining the same, a rightward shift in the demand curve results in a higher

The ***elasticity of demand*** *is the measure of responsiveness of demand for a commodity to the change in any of its determinants,* viz., price of the commodity, price of the substitutes and complements, consumers' income and consumer expectations regarding prices. Accordingly, there are several kinds of elasticities of demand—***price elasticity, cross elasticity, income elasticity*** and ***elasticity of price expectations***. In the following section, we have discussed ***price elasticity of demand***. The other kinds of elasticities have been discussed in the subsequent sections.

4.1 PRICE ELASTICITY OF DEMAND

The price ***elasticity***[1] ***of demand*** *is* defined as *the degree of responsiveness or sensitiveness of demand for a commodity to the change in its price.* More precisely, elasticity of demand is the percentage change in the quantity demanded of a commodity as a result of a certain percentage change in its price. A formal definition of price-elasticity of demand (e_p) is given below.

$$e_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

A more general formula for calculating ***coefficient of price-elasticity*** is given as

$$e_p = -\frac{\Delta Q}{Q_0} \div \frac{\Delta P}{P_0}$$

$$= -\frac{\Delta Q}{Q_0} \cdot \frac{P_0}{\Delta P}$$

$$= -\frac{\Delta Q}{\Delta P} \cdot \frac{P_0}{Q_0} \qquad (4.1)$$

where Q_0 = original quantity demanded, P_0 = original price, ΔQ = change in quantity demanded, and ΔP = change in price.

To measure price elasticity numerically by using the formula given in Eq. (4.1), let us suppose that price of a commodity X decreases from Rs 10 per unit to Rs 8 per unit and quantity demanded of X increases from 50 units to 60 units per time unit. Thus, ΔP = Rs 10 – Rs 8 = Rs 2 and $\Delta Q = 50 - 60 = -10$. By substituting these values in elasticity formula, we get

$$e_p = -\frac{-10}{2} \cdot \frac{10}{50} = 1.0$$

Thus, elasticity co-efficient (e_p) equals 1.

Note that a minus sign (–) is inserted in the formula (Eq. 4.1) with a view to making elasticity coefficient a ***non-negative value***. The coefficient of price-elasticity calculated without minus sign in the formula will always be negative, because either ΔP or ΔQ will carry a negative sign depending on whether price increases or decreases. But a negative coefficient of elasticity is rather misleading because elasticity cannot be negative–less than zero. The 'minus' sign is, therefore, inserted in the price-elasticity formula as a matter of 'linguistic convenience' to make the coefficient of elasticity a non-negative value. Sometimes, it is also advised to ignore the negative sign of ΔP or ΔQ. The price-elasticity measure is, however, always reported with a negative sign just to indicate inverse relationship between price change and quantity demanded.

1. Generally, the adjective 'price' is omitted in 'price-elasticity of demand'. In fact, the term 'elasticity of demand' refers to the elasticity with respect to price. The concept of the elasticity used to denote other kinds of elasticities, however, the relevant adjective is generally used, e.g., income-elasticity and cross-elasticity and so on.

4.1.1 Arc and Point Elasticity

When price–elasticity of demand is measured between any two finite points on a demand curve, it is called ***arc elasticity*** and elasticity measured at a point on the demand curve is called ***point elasticity***. As noted above, the elasticity of demand measures the percentage change in quantity demanded due to a certain percentage change in price. The percentage change in price may be considerably high (e.g., 10 per cent, 20 per cent or even higher) or it may be very small—so small that it is not significantly different from zero. When change in price is significantly high, it shows a movement from one point on the demand curve to another point, making an *arc*. Therefore, price elasticity measured for a considerably high change in price, is called ***arc elasticity of demand***. And, when price elasicity is measured for very small changes in price—not significantly different from zero—it is called ***point elasticity***.

4.1.2 Measuring Arc Elasticity

The elasticity co-efficient between any two finite points on a demand curve, i.e., *arc elasticity*, can be measured by using the formula given in Eq. (4.1). For example, the measure of elasticity between points J and K on the demand curve PM in Fig. 4.1 is the measure of arc elasticity. The movement from point J to K on the straight line demand curve PM shows a fall in price of commodity X from Rs 25 to Rs 15 and the consequent increase in demand from 30 units to 50 units. Here, $\Delta P = 25 - 15 = 10$ and $\Delta Q = 30 - 50 = -20$. The arc elasticity between points J and K (moving from J to K) can be calculated as given below:

$$e_p = -\frac{\Delta Q}{\Delta P} \cdot \frac{P_0}{Q_0}$$

$$e_p = -\frac{-20}{10} \cdot \frac{25}{30} = 1.66 \qquad (4.2)$$

Interpretation: Elasticity coefficient is interpreted as percentage change in demand due to one percent change in price. For example, in Eq. (4.2), *elasticity coefficient is 1.66*. The *elasticity coefficient (1.66)* will be *interpreted as a 1 per cent decrease in price of commodity X results in a 1.66 per cent increase in demand for it*.

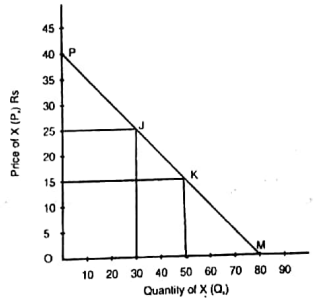


Fig. 4.1 Change in Price and Elasticity Coefficient

Problem in Using Arc Elasticity

The arc elasticity coefficeint should be used carefully because the measure of arc elasticity between any two finite points on a demand curve produces *two different* elasticity coefficients for the same fall and rise in price. In other words, *the arc elasticity coefficient varies between the same two finite points on a demand curve when the direction of change in price is reversed.* It is, therefore, open to misinterpretation. Consider, for example, arc elasticity of the demand curve PM between points J and K (Fig. 4.1). Price elasticity of demand for a fall in price from Rs 25 to Rs 15 is estimated to be 1.66 (see Eq. 4.2). This measure of arc elasticity can be mistaken to be the price elasticity of demand curve PM between points J and K, irrespective of the direction of change in price, whereas this elasticity coefficient is relevant only for the downward movement on the demand curve. It is not relevant for the upward movement from point K to J. The movement from point K to J implies a different arc elasticity, as shown below.

In case of the movement from point K to J, i.e., for rise in price, we have

$$P = 15,\ \Delta P = 15 - 25 = -10$$

and $$Q = 50,\ \Delta Q = 50 - 30 = 20$$

Substituting these values into the elasticity formula (Eq. 4.1), we get

$$e_p = -\frac{20}{10}\cdot\frac{15}{50} = 0.60 \qquad (4.3)$$

Note that price elasticity coefficient (0.60) for increase in price by Rs 5 is materially different from price elasticity (1.66) the same for the same decrease in price. Clearly, arc elasticity between any two finite points on a demand curve depends also on the *direction of change in price.*

Suggested Modifications

Economists have suggested some modifications in the elasticity formula to remove this anomaly in the concept of arc elasticity.

One, it is suggested that the problem arising due to the change in the direction of price-change may be avoided by using the lower values of P and Q in the elasticity formula. The formula is then

$$e_p = -\frac{\Delta Q}{\Delta P}\cdot\frac{P_l}{Q_l} \qquad (4.4)$$

where subscript l denotes lower values of P and Q.

Going by this formula for measuring elasticity between points J and K in Fig. 4.1, we use $P_l = 15$ (the lower one of the two prices) and $Q_l = 30$ (the lower one of the two quantities). By sustituting these values in Eq. 4.4, for decrease in price, we get

$$e_p = -\frac{20}{10}\cdot\frac{15}{30} = 1.0$$

This method, however, violates the rule of computing percentage change. The choice of the lower values of P and Q is arbitrary. This method is, therefore, devoid of any logic.

Two, another method suggested* to resolve this problem is to use average of the upper and lower values of P and Q in the fraction P/Q. The suggested formula can be written as

* See, for example, K. Lancaster, *Introduction of Modern Microeconomics*, 2nd Edn., 1974, p. 28.

$$e_p = -\frac{\Delta Q}{\Delta P}\cdot\frac{(P_u + P_l)/2}{(Q_l + Q_u)/2}$$

or

$$e_p = -\frac{Q_l - Q_u}{P_u - P_l}\cdot\frac{(P_u + P_l)/2}{(Q_l + Q_u)/2} \qquad (4.5)$$

(where subscripts u and l refer to upper and lower values, respectively.)

Substituting the values from our example, we get

$$e_p = -\frac{30 - 50}{25 - 15}\cdot\frac{(25 + 15)/2}{(30 + 50)/2} = 1.0$$

This method measures the elasticity mid-way between points J and K. The elasticity coefficient (1.0) is not applicable to the whole range of price-quantity combination between points J and K (see Fig. 4.1). It does not resolve the problem that arises due to the change in the direction of the price. It gives only the mean of the elasticities between the two points.

An ***alternative method*** to avoid this problem is to use point elasticity.

4.1.3 Measuring Point Elasticity

Point elasticity *is the measure of price elasticity at a finite point on a demand curve.* Point elasticity is, in fact, the measure of the proportionate change in quantity demanded in response to a very small proportionate change in price. The concept of point elasticity is useful where change in price and the consequent change in quantity demanded are very small. Besides, it offers an alternative to the arc elasticity. Point elasticity may be symbolically expressed as

$$e_p = \frac{\partial Q}{\partial P}\cdot\frac{P}{Q} \qquad (4.6)$$

The method of measuring price elasticity on linear and non-linear demand curves is explained below.

(i) Point elasticity of a linear demand curve. To illustrate the measurement of point elasticity on a linear demand curve, let us suppose that a *linear* demand curve is given by MN in Fig. 4.2 and that we need to measure elasticity at point P. Let us now substitute the values from Fig. 4.2 in Eq. 4.6. It is obvious from the figure that $P = PQ$ and $Q = OQ$. What we need to find now are the values for ∂Q and ∂P. These can be obtained by assuming a *very small* change in price. But it will be difficult to depict these changes graphically as $\partial P \to 0$ and hence $\partial Q \to 0$. There is, however, an easy way to find the value for $\partial Q/\partial P$. In fact, the ratio $\partial Q/\partial P$ gives the reciprocal of the slope of the demand curve, MN. *The reciprocal of the slope of a straight line,* MN, at point P is geometrically given by QN/PQ. Therefore,

$$\frac{\partial Q}{\partial P} = \frac{QN}{PQ}$$

Since at point P, P (price) $= PQ$ and $Q = OQ$, by substituting these values in (ignoring the minus sign), Eq. (4.6), we get

$$e_p = \frac{QN}{PQ}\cdot\frac{PQ}{OQ} = \frac{QN}{OQ} \qquad (4.7)$$

It can be proved geometrically that

$$e_p = \frac{QN}{OQ} = \frac{PN}{PM}$$

Proof: To prove that $QN/OQ = PN/PM$, let us draw a horizontal line from P to the vertical axis. We have now three triangles ΔMON, ΔMRP and ΔPQN (Fig. 4.2.). Note that $\angle MON$, $\angle MRP$ and $\angle PQN$ of these triangles are right (90°) angles. Therefore, the other corresponding angles of the three triangles are equal. Given these properties ΔMON, ΔMRP and ΔPQN are similar triangles.

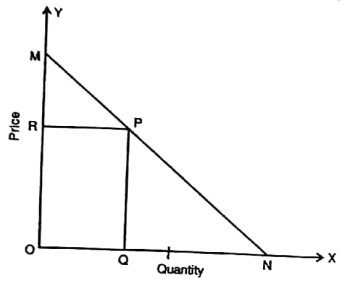


Fig. 4.2 Point Elasticity on a Linear Demand Curve

According to geometrical properties of similar triangles, the ratio of any two sides of a triangle is equal to the ratio of the corresponding sides of the other triangles. Therefore, in ΔPQN and ΔMRP,

$$\frac{QN}{PN} = \frac{RP}{PM}$$

Since $RP = OQ$, by substituting OQ for RP, we get

$$\frac{QN}{PN} = \frac{OQ}{PM}$$

By proportionality rule, $\frac{QN}{OQ} = \frac{PN}{PM}$ (4.8)

It is, thus, proved that $QN/OQ = PN/PM$.

Note that PN and PM are two lower and upper segments of the demand curve, MN. It may thus be said that price elasticity at any point on a straight line demand curve is given by

$$e_p = \frac{\text{Lower segment}}{\text{Upper segment}}$$

(ii) Measuring point elasticity on a non-linear demand curve. Point elasticity of a non-linear demand curve is measured by drawing a tangent to the demand curve at the chosen point and measuring the elasticity of the tangent at this point. This gives the elasticity of the demand curve at the chosen point. Suppose we want to measure the elasticity of demand curve DD' at point P in Fig. 4.3. Let us now draw a line tangent to the demand curve DD', at point P as shown by the tangent MN. Since demand curve DD' and the line MN pass through the same point (P), the elasticity of demand curve DD' at point P is equal to the elasticity to the tangent, MN, at point P. By measuring the elasticity at point P on the tangent MN, we get the elasticity at point P on the demand curve DD'. The elasticity of the tangent MN at point P is given by

$$e_p = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q}$$

By substitution,

$$e_p = \frac{QN}{PQ} \cdot \frac{PQ}{OQ} = \frac{QN}{OQ}$$

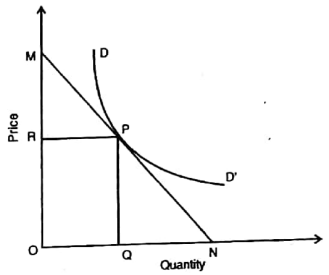


Fig. 4.3 Point Elasticity on a Non Linear Demand Curve

Geometrically, $QN/OQ = PN/PM = e$. (For Proof, see the preceding section).

4.1.4 Price Elasticity Along the Demand Curve

The price elasticity of demand varies all along a demand curve. Consider a linear demand curve MN in Fig. 4.4. At one and only one point, $e_p = 1$. At all other points (except terminal points), $e_p < 1$ or $e_p > 1$. At terminal point N, $e_p = 0$ and at terminal point M, elasticity is ***undefined***. This point is explained below.

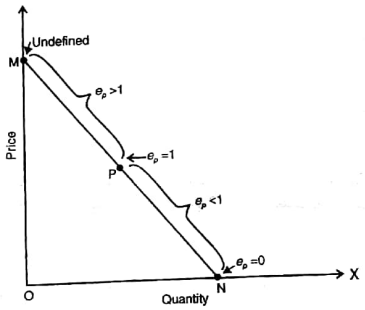


Fig. 4.4 Point Elasticities of Demand

We know that if a point on a demand curve is marked, it divides the demand curve into two parts. For example, if we choose a point mid-way, point *P*, on demand curve *MN* in Fig. 4.4, it divides the demand curve into two parts: *PM* (the upper segment) and *PN* (the lower segment). Given the above measure of point elasticity ($e_p = PN/PM$), the elasticity at a point on a linear demand curve may be interpreted as the ratio of the lower segment (*PN*) to the upper segment (*PM*) of the demand curve. That is,

$$e_p = \frac{\text{Lower segment}}{\text{Upper segment}} = \frac{PN}{PM}$$

Since in Fig. 4.4, $PN = PM$, $e_p = 1$. It follows that:

(a) at mid-point on a linear demand curve, $e_p = 1$.
(b) at any point on the upper (half) segment, $e_p > 1$;
(c) at any point on the lower (half) segment, $e_p < 1$;
(d) at point *N*, $e_p = 0$; and
(e) at point *M*, elasticity is undefined reason given below.

Important. The last point needs a clarification. It is a general practice of the text book authors to show $e_p = \infty$ at terminal point on the vertical axis, i.e., at point *M* in Fig. 4.4. This is mathematically incorrect. The reason is, measuring elasticity at point *M* involves division by zero, and division by zero is undefined. For example, at point *M*, lower segment equals *MN* and upper segment equals zero. Therefore, elasticity at point *M* is undefined. To quote Baumol, "Here [at point *M*] elasticity is not even defined because an attempt to evaluate the fraction p/x at that point forces us to commit the sin of dividing by zero. The readers who have forgotten why division by zero in immoral may recall that division is the reverse operation of multiplication. Hence, in seeking the quotient $c = a/b$ we look for a number, *c*, which when multiplied by *b* gives us the number *a*, i.e., for which $cb = a$. But if *a* is not zero, say $a = 5$, and *b* is zero, there is no such number because there is no *c* such that $c \times 0 = 5$".[1]

(i) Constant elasticity demand curve. The elasticity of most demand curves is not the same throughout. It varies from zero (0) to close to infinity, i.e., $0 < e_p < \infty$. In case of some demand curves, however, elasticity remains the same throughout their length, as shown in Fig. 4.5. Such demand curves are placed in the following categories.

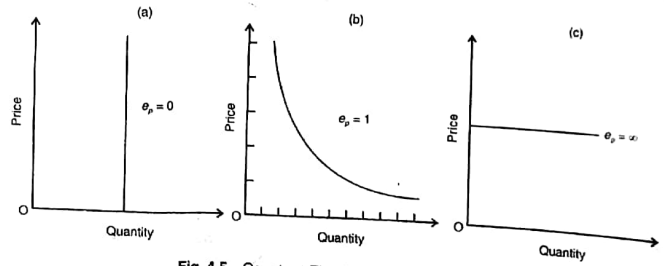


Fig. 4.5 Constant Elasticity Demand Curve

1 Baumol, W.J., *Economic Theory and Operation Analysis*, (Prentice Hall of India Private Limited, New Delhi), 4th Edn., p. 187.

(i) A perfectly inelastic demand curve — it has $e_p = 0$ throughout;
(ii) A unitary elastic demand curve — it has $e_p = 1$ throughout;
(iii) A perfectly elastic demand curve — it has $e_p = \infty$ throughout.

The three kinds of demand curves are shown in Fig. 4.5. (a), (b) and (c), respectively.

4.2 SLOPE AND PRICE ELASTICITY OF DEMAND CURVE

The elasticity of a demand curve is often judged by its appearance: the flatter the demand curve, the greater the elasticity, and *vice versa*. But such conclusions may be incorrect because two demand curves with different slopes may have the same elasticity *at a given price*. In fact, what the appearance of a demand curve reveals is its *slope*, not the elasticity. The *slope* of the demand curve is the relationship between marginal change in price (ΔP) and the resulting change in quantity demanded (ΔQ). The slope of demand curve is expressed as $\Delta P/\Delta Q$.

It is shown below (i) that demand curves having different slopes may have the same elasticity at a given price, and (ii) that demand curves having the same slope may have different elasticities at a given price.

4.2.1 Elasticity of Demand Curves With Different Slopes

Let us first illustrate that two demand curves with different slopes have the same elasticity at a given price. In Fig. 4.6, demand curves *AB* and *AD* have different slopes, as shown below.

Slope of demand curve $AB = \frac{OA}{OB}$; and

Slope of demand curve $AD = \frac{OA}{OD}$.

Note that term *OA* is common to both the ratios, but $OB < OD$. Therefore,

$$\frac{OA}{OB} > \frac{OA}{OD}.$$

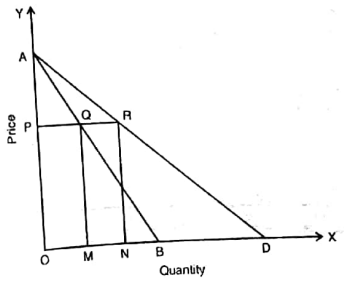


Fig. 4.6 Demand Curves having Different Slopes

Obviously, the slopes of the two demand curves are different. Let us now show that at a given price, both the demand curves have the same elasticity. As shown in Fig. 4.6, at price OP, *the relevant points for measuring the elasticity are* Q *and* R on the demand curves AB and AD, respectively. As we have already shown, price elasticity at a point on a linear demand curve is obtained as follows.

$$e_p = \frac{\text{Lower segment}}{\text{Upper segment}}$$

Thus, at point Q on the demand curve AB, $e_p = QB/QA$, and at point R on the demand curve AD, $e_p = RD/RA$.

It may be geometrically proved that the two elasticities are equal, i.e.,

$$\frac{QB}{QA} = \frac{RD}{RA}$$

Let us first consider ΔAOB. As shown in Fig. 4.6, an ordinate from Q to M at the horizontal axis, forms three triangles – ΔAOB, ΔAPQ and ΔQMB. Note that $\angle AOB$, $\angle APQ$ and $\angle QBM$ are right-angles. Therefore, all the three triangles are **right-angle triangles**. One of the properties of right-angle triangles is that the ratio of their two corresponding sides are always equal. Considering only the relevant triangles, ΔAPQ and ΔQMB, we have

$$\frac{QB}{QM} = \frac{AQ}{AP}$$

Since $QM = OP$, by substituting OP for QM in ratio QB/QM, we get

$$\frac{QB}{OP} = \frac{AQ}{AP}$$

Therefore, $\frac{QB}{AQ} = \frac{OP}{AP}$ = elasticity of AB at point Q.

It can be similarly proved that

$\frac{RD}{RA} = \frac{OP}{AP}$ = Elasticity of AD at point R.

It is thus proved that

$$\frac{QB}{QA} = \frac{RD}{RA} = \frac{OP}{AP}$$

It is thus proved that elasticity of demand curves AB and AD at price OP is the same.

4.2.2 Different Elasticity of Parallel Demand Curves at a Price

Let us now show that two demand curves having the same slope have different elasticities at a given price. Consider the demand curves JK and LM in Fig. 4.7. The demand curves JK and LM are parallel and, therefore, have the same slope. Point R on the demand curve JK and point Q on the demand curve LM show the quantities demanded at a given price, OP.

The elasticity at point R on demand curve JK is RK/RJ and elasticity at point Q on demand curve LM is QM/QL. It can be easily proved that

$$\frac{RK}{RJ} \neq \frac{QM}{QL}$$

Following the logic of the preceding section, we can prove that

$$\frac{RK}{RJ} = \frac{PO}{PJ}$$

and

$$\frac{QM}{QL} = \frac{PO}{PL}$$

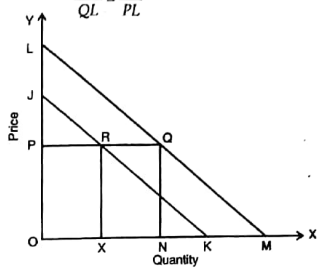


Fig. 4.7 Different Elasticities of Parallel Demand Curves

It can be seen from Fig. 4.7 that $PJ < PL$. Therefore,

$$\frac{PO}{PJ} > \frac{PO}{PL}$$

It is thus proved that

$$\frac{RK}{RJ} > \frac{QM}{QL}$$

It may be concluded from the above conclusions that demand curves having the same slope may have different elasticities, and demand curves having different slopes may have the same elasticities, both at a given price.

4.3 MEASURING PRICE ELASTICITY FROM A DEMAND FUNCTION

Price elasticity of demand can be measured directly from a demand function. In this section, we will describe the method of measuring price elasticities from a given demand function—linear and nonlinear.

(i) Measuring elasticity from a linear demand function. Suppose a linear demand function is given as follows.

$$Q = a - b\,P$$

At a given price, say, P_1, this demand function reads as

$$Q_1 = a - b\,P_1$$

When price changes from P_1 to P_2, then

$$Q_2 = a - b\,P_2$$

To measure the arc elasticity, we need two ratios: $\Delta Q/\Delta P$ and P/Q. Given the two demand functions, ratio $\Delta Q/\Delta P$ can be obtained as follows.

(vii) Direction of change in price. The direction of change in price also determines the elasticity. Between any two finite points on the demand curve, elasticity is higher for the fall in price and *vice versa* (see also pp. 71-72).

4.5 PRICE-ELASTICITY, MARGINAL, AVERAGE AND TOTAL REVENUE

In this section, we look into the relationship between (i) price elasticity of demand and marginal revenue; (ii) marginal revenue and average revenue; and (iii) price elasticity and total revenue. These relationships are of great importance in business analysis.

4.5.1 Price Elasticity and Marginal Revenue

Marginal revenue is the addition to the total revenue (TR) as a result of sale of one additional unit. It is also defined as the first derivative of TR-function, i.e.,

$$MR = \frac{\partial TR}{\partial Q}$$

The relationship between price elasticity and marginal revenue (MR) can be derived as follows. Let us suppose that a given output, Q, is being sold at a price P, so that the total revenue (TR) equals P times Q, i.e.,

$$TR = P.Q$$

The marginal revenue (MR) can be obtained by differentiating $TR = P.Q$ with respect to Q. Thus,

$$MR = \frac{\partial (P.Q)}{\partial Q}$$

$$= P\frac{\partial Q}{\partial Q} + Q\frac{\partial P}{\partial Q}$$

$$= P + Q\frac{\partial P}{\partial Q}$$

$$MR = P\left(1 + \frac{Q}{P}.\frac{\partial P}{\partial Q}\right) \qquad (4.14)$$

Note that $\frac{Q}{P}.\frac{\partial P}{\partial Q}$ in Eq. (4.14) is the reciprocal of the price elasticity coefficient. It means that

$$\frac{Q}{P}.\frac{\partial P}{\partial Q} = -\frac{1}{e}$$

By substituting $-\frac{1}{e}$ for $\frac{Q}{P}.\frac{\partial P}{\partial Q}$ in Eq. (4.14), we get

$$MR = P\left(1 - \frac{1}{e}\right) \qquad (4.15)$$

Eq. (4.15) gives the relationship between price elasticity (e) and MR.

4.5.2 Relation between MR and AR

In Eq. (4.15), P is the same as AR. Eq. (4.15) can therefore be written as

$$MR = AR\left(1 - \frac{1}{e}\right)$$

and

$$AR = \frac{MR}{\left(1 - \frac{1}{e}\right)}$$

or

$$AR = MR\left(\frac{e}{e-1}\right) \qquad (4.16)$$

Eq. (4.16) gives the relationship between AR and price elasticity.

Graphical Proof. Eq. (4.16) gives the relationship between AR and MR and between AR and price elasticity. The relationship beteween MR and AR can also be derived geometrically. Suppose AR curve is given by the curve AR in Fig. 4.8. Then MR curve is given by the curve AM.

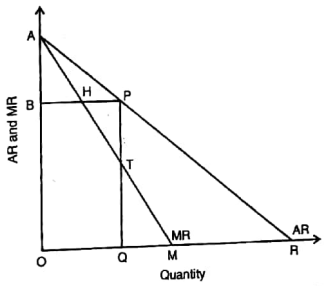


Fig. 4.8 Relationship between AR and MR

Let us suppose that price is given at PQ ($= BO$). As has been proved above, price elasticity at point P on the AR curve (which is the same as demand curve) can be expressed as

$$e = \frac{QR}{OQ} = \frac{PR}{AP} = \frac{OB}{AB}$$

Considering the last term, i.e., $e = OB/AB$, since $OB = PQ$,

$$\therefore \quad e = \frac{PQ}{AB} \qquad (4.17)$$

In Fig. 4.8, $AB = PT$.[1] By substituting PT for AB in Eq. (4.17), we get

1. Proof. At price PQ, total revenue = $PQ \times OQ$, which equals the area $OBPQ$. Considering from MR angle, the total revenue at price PQ is given by the area $OATQ$. Therefore, $OBPQ = OATQ$. It can be observed from Fig. 4.8 that area $OBHTQ$ is common to the areas $OBPQ$ and $OATQ$. Therefore, area of ΔABH = area of ΔTPH. Note that $\angle ABH$ and $\angle TPH$ are right angles. Therefore, $\Delta ABH = \Delta TPH$. The properties of right angle triangles of equal size tell that their corresponding sides are equal. Therefore, $BH = HP$, $AH = HT$, and $AB = PT$.

$$e = \frac{PQ}{PT} \tag{4.18}$$

Since $PT = PQ - TQ$, Eq. (4.18) may be written as

$$e = \frac{PQ}{PQ - TQ} \tag{4.19}$$

It can be seen in Fig. 4.8 that $PQ = AR$ and $TQ = MR$. Therefore, Eq. (4.19) can be expressed as

$$e = \frac{AR}{AR - MR}$$

and $$MR = AR - \frac{AR}{e} \tag{4.20}$$

or $$MR = AR\left(1 - \frac{1}{e}\right) \tag{4.21}$$

Then, $$AR = \frac{MR}{\left(1 - \frac{1}{e}\right)}$$

or $$AR = MR\left(\frac{e}{e-1}\right) \tag{4.22}$$

Thus, we arrive at the same relationship between MR and AR as given in Eq. (4.16).

4.5.3 Price Elasticity and Total Revenue

Since *total revenue (TR)* and *marginal revenue (MR)* are interrelated, the relationship between TR and *price elasticity* of demand (e_p) can be traced through the relationship between MR and *price elasticity* (e_p). Given the relationship between MR and e_p in Eq. (4.21), the relationship between TR and e_p can be summed up as follows.

(a) where $e_p = 1$, $MR = 0$. Therefore TR does not change with change in price;
(b) where $e_p < 1$, $MR < 0$. Therefore TR decreases with decrease in price and increases with increase in price; and
(c) where $e_p > 1$, $MR > 0$. In this case, TR decreases with increase in price and increases with decrease in price.

This nature of relationships between TR and e_p can be illustrated graphically. We know that $TR = P.Q$. The value for P and Q can be obtained by assuming a demand function. Let us assume a demand function as

$$Q = 100 - 5P$$

Given the demand function, *price function* can be obtained as given below.

$$P = 20 - 0.2Q$$

Now, that we know the value of P, TR can be obtained as follows.

$$TR = P.Q = (20 - 0.2Q)Q$$
$$= 20Q - 0.2Q^2$$

From the TR-function, MR-function can be derived as

$$MR = \frac{\partial TR}{\partial Q} = 20 - 0.4Q$$

The TR-function is presented graphically in panel (a) and the demand and MR functions are presented in panel (b) of Fig. 4.9. As the figure shows, at point P on the demand curve, $e_p = 1$ where output, $Q = 50$. Below point P, $e_p < 1$ and above point P, $e_p > 1$. It can be seen in panel (a) of Fig. 4.9 that TR increases over the range of demand curve having $e_p > 1$; TR reaches its maximum level where $e_p = 1$; and it decreases over the range $e_p < 1$.

The relationship between price-elasticity and TR is summed up in Table 4.1. As the table shows, when demand is *perfectly inelastic* (i.e., $e_p = 0$ as in the case of a vertical demand line) there is no decrease in quantity demanded when price is raised and *vice versa*. Therefore, a rise in price increases the total revenue and *vice versa*.

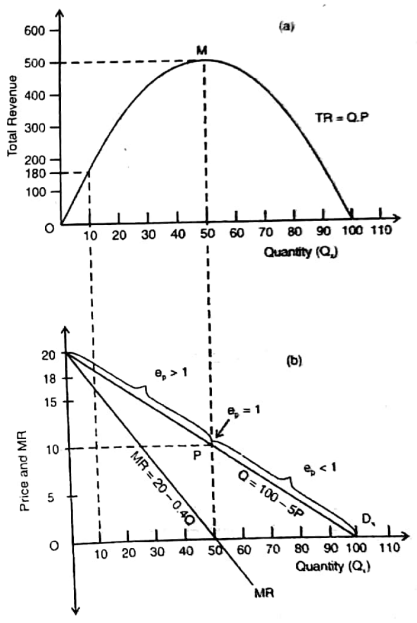


Fig. 4.9 Price Elasticity and Total Revenue

In case of an *inelastic demand* (i.e., $e_p < 1$), quantity demanded increases by less than the proportionate decrease in price and hence the total revenue falls when price falls. The total revenue increases when price increases because quantity demanded decreases by less than the proportionate increase in price.

Table 4.1. Elasticity, Price-change and Change in *TR*

Elasticity Co-efficient	Nature of demand	Change in Price	Change in TR
$e_p = 0$	Perfectly inelastic	Increase Decrease	Increase Decreases
$e_p < 1$	Inelastic	Increase Decrease	Increase Decrease
$e_p = 1$	Unitary elastic	Increase Decrease	No change No change
$e_p > 1$	Elastic	Increase Decrease	Decrease Increase

If demand for a product is *unit elastic* ($e_p = 1$) quantity demanded increases (or decreases) in the proportion to decrease (or increase) in the price. Therefore, total revenue remains unaffected.

If demand for a commodity has $e_p > 1$, change in quantity demanded is greater than the proportionate change in price. Therefore, the total revenue increases when price falls and *vice versa*.

4.6 PRICE-ELASTICITY AND CONSUMPTION EXPENDITURE

Another important relationship which is often referred to in economic analysis is one between price elasticity and consumption expenditure. From the law of demand, we know that quantity demanded of a commodity increases when its price falls. But, ***what happens to the total expenditure on that commodity***—does it fall or increase?

The relationship between price elasticity and total consumption expenditure may be derived as follows. The total consumption expenditure (TE_x) on commodity X, at a given price P_x, all other prices remaining the same, is given by

$$TE_x = Q_x \cdot P_x \tag{4.23}$$

By differentiating Eq. (4.23) with respect to P_x, we get marginal expenditure (ME_x) as

$$ME_x = \frac{\partial Q_x \cdot P_x}{\partial P_x} = Q_x + P_x \frac{\partial Q_x}{\partial P_x}$$

$$= Q_x \left[1 + \frac{P_x}{Q_x} \frac{\partial Q_x}{\partial P_x} \right]$$

In Eq. (4.24), $\frac{P_x}{Q_x} \cdot \frac{\partial Q_x}{\partial P_x} = -e_p$ (4.24)

By substitution, Eq. (4.24) can be written as

$$ME_x = \frac{Q_x \cdot P_x}{\partial P_x} = Q_x (1 - e_p) \tag{4.25}$$

It may be inferred from Eq. (4.25) that whether the total expenditure increases, decreases or remains constant as a result of change in price depends on whether

$$Q_x (1 - e_p) \gtreqless Q_x$$

Whether $Q_x (1 - e_p)$ is greater than, equal to or less than Q_x depends on whether $e_p \gtreqless 1$.

The relationship between, total consumer expenditure and price elasticity of demand has been summarised up in Table 4.2.

Table 4.2 Elasticity and Consumption Expenditure

Elasticity (e_p)	Price change	Marginal expenditure	Total expenditure
$e_p > 1$	Rise Fall	$ME < 0$ $ME > 0$	Decreases Increases
$e_p = 1$	Rise Fall	$ME = 0$ $ME = 0$	Constant Constant
$e_p < 1$	Rise Fall	$ME > 0$ $ME < 0$	Increases Decreases

As shown in the above table, when $e_p > 1$, i.e., demand is *elastic*, an increase in price causes more than proportionate decrease in quantity demanded. Hence, total expenditure decreases. And, if price decreases, quantity demanded increases more than proportionately. As a result, total expenditure increases.

When $e_p = 1$, a rise (or fall) in price causes a proportionate decrease (or increase) in quantity demanded leaving total expenditure unchanged.

When $e_p < 1$, i.e., when demand is *inelastic*, a rise in price causes increase in the total expenditure because demand decreases less than proportionately, and a fall in price reduces it as quantity demanded increases less than proportionately.

4.7 OTHER ELASTICITIES OF DEMAND

In this section, we will discuss elasticities of demand with respect to some of its other determinants often used in economic analysis.

4.7.1 Cross-Elasticity of Demand

Cross-elasticity is the measure of responsiveness of demand for a commodity to the changes in the price of its substitutes and complementary goods. For instance, cross-elasticity of demand for tea (T) is the percentage change in its quantity demanded due to a change in the price of its substitute, coffee (C). Formula for measuring cross-elasticity of demand for tea ($e_{t,c}$) with respect to price of coffee (P_c) is

$$e_{t,c} = \frac{\text{Proportionate change in demand for tea } (Q_t)}{\text{Proportionate change in price of coffee } (P_c)}$$

$$= \frac{P_c}{Q_t} \cdot \frac{\Delta Q_t}{\Delta P_c} \qquad (4.26)$$

The cross-elasticity of demand for coffee (Q_c) with respect to price of tea (P_t) is

$$e_{c,t} = \frac{P_t}{Q_c} \cdot \frac{\Delta Q_c}{\Delta P_t}$$

For a numerical example, suppose that price of coffee (P_c) increases from Rs 10 to Rs 15 per 10 grams, and as a result, demand for tea increases from 20 tons to 30 tons per week, price of tea remaining constant. By substituting these values in Eq. (4.26), we get cross-elasticity of demand for tea with respect to price of coffee, as

$$e_{t,c} = \frac{10}{20} \cdot \frac{20-30}{10-15}$$
$$= \frac{10}{20} \cdot \frac{-10}{-5}$$
$$= 1.0$$

Note that cross–elasticity with respect to substitutes is always positive.

The same formula is used to measure the cross-elasticity of demand for a good in response to change in the price of its ***complementary goods***. Electricity to electrical gadgets, petrol to automobile, butter to bread, sugar and milk to tea and coffee, are the examples of complementary goods.

When two goods are substitutes for each other, their demand has a *positive corss-elasticity* because increase in the price of one increases the demand for the other. But, the demand for complementary goods has *negative cross-elasticity*, for increase in the price of a good decreases the demand for its complementary goods.

An ***important*** aspect of cross-elasticity is that if cross-elasticities between any two goods are positive, the two goods may be considered as substitutes for each other. Also the greater the cross-elasticity, the closer the substitute. Similarly, if cross-elasticity of demand for any two related goods is negative, the two may be considered as complementary for each other: the higher the negative cross-elasticity, the higher the degree of complementarity.

4.7.2 Income-Elasticity of Demand

Apart from price of a product and its substitutes, another important determinant of demand for a product is consumer's income. As noted earlier, the relationship between demand for normal and luxury goods and consumer's income is of positive nature, unlike the negative price-demand relationship. In simple words, the demand for normal goods and services increases with increase in consumer's income and *vice versa*. The responsiveness of demand to the change in consumer's income is known as ***income-elasticity*** of demand.

Income-elasticity e_y of demand for a product, say X with respect to change in money income (M) can be defined as:

$$e_y = \frac{\Delta Q_x / Q_x}{\Delta M / M} = \frac{M}{Q_x} \cdot \frac{\Delta Q_x}{\Delta M} \qquad (4.27)$$

where Q_x = quantity of X demanded; M = disposable money income; ΔQ_x = change in quantity demanded of X; and ΔM = change in income.

Unlike price-elasticity of demand (which is negative except in case of Giffen goods), income-elasticity of demand is positive because of a positive relationship between income and quantity demanded of a product. There is an exception to this rule. Income-elasticity of demand for an *inferior good* is negative, because of negative income-effect. The demand for inferior goods decreases with increase in consumer's income and *vice versa*. When income increases, consumers switch over to the consumption of superior commodities. That is, they substitute superior goods for inferior ones. For instance, when income rises, people prefer to buy more of rice and wheat and less of inferior foodgrains like *bajra*, ragi, etc. and use more of taxi and less of bus service and so on.

Nature of commodity and income-elasticity. For all normal goods, income-elasticity is positive though the degree of elasticity varies in accordance with the nature of commodities. As noted above, consumer goods are generally grouped under three broad categories, viz., necessities (essential consumer goods), comforts, and luxuries. The general pattern of income-elasticities for goods of different categories for increase in income and their impact on sales are given in Table 4.3.

Table 4.3. Nature of Commodities, Income Elasticity and Expenditure

Commodities	Coefficient of income Elasticity	Impact on Expenditure
1. Necessities	Less than unity ($e_y < 1$)	Less than proportionate change in expenditure
2. Comforts	Almost equal to unity ($e_y \cong 1$)	Almost proportionate change in expenditure
3. Luxuries	Greater than unity ($e_y > 1$)	More than proportionate increase in expenditure

Income-elasticity of demand for different categories of goods may however vary from household to household and from time to time, depending on choice, taste and preference of the consumers, levels of their consumption and income, and their susceptibility to 'demonstration effect'. The other factor which may cause deviation from the general pattern of income-elasticities is the frequency of increase in income. If income increases regularly and frequently, income-elasticities will conform to the general pattern, otherwise not.

Uses of Income-Elasticity. Some ***important uses*** of income-elasticity are as follows.

First, the concept of income-elasticity can be used to estimate the future demand for a product provided the rate of increase in income and income-elasticity of demand for the product are known. The knowledge of income-elasticity can be used for forecasting demand, when a changes in personal income is expected, other things remaining the same.

Secondly, the concept of income-elasticity can also be used to define the '***normal***' and '***inferior***' goods. The goods whose income-elasticity is positive for all levels of income are termed as 'normal goods'. On the other hand, the goods for which income elasticities are negative, beyond a certain level of income, are termed as '***inferior goods***'.

4.7.3 Elasticity of Price Expectations

Sometimes, consumer's price expectations play a much more important role in determining demand for a commodity than any other factor. The concept of price-expectation-elasticity refers to the expected change in future price (P_f) as a result of change in price of a product in the past (P_p). The elasticity of price-expectation is defined and measured by the following formula: