# SECTION II—DEMAND ANALYSIS AND FORECASTING

# 4

# *Demand Determinants*

The demand for a product and, therefore, its sales depend upon a number of factors. These include such diverse elements as price, buyers' incomes, availabi ity and price of substitutes or competing products, advertising and sales pr motion, population, availability of credit, season of the year, weather, one's st atus, geographic location of buyers, expected future trend in prices, changes in consumer tastes, needs and preferences, changes in consumer credit facilities, etc. It would, however, be impossible in most demand studies to include all the factors that exert an influence on sales.[1] Nevertheless, there are a few factors which underline demand behaviour of so many products that they deserve a discussion. These factors are: *Price, Income, Prices of Related Goods, i.e., Substitute and Complementary Goods and Advertising and Sales Promotion.* These factors have the greatest influence on sales and, expressed and measured in various ways, they constitute the controlling variables commonly used in demand studies. The importance of each of these factors varies from product to product and the demand analysis has to be adapted to suit each individual case. This importance may also undergo changes in course of time. Again, some of these factors are within a firm's control, others are not.

1. Although it is desirable to keep the number of independent variables to the minimum, any or all of the following factors might be required for the analysis and estimate of demand for commodities and services:
   - — Price and unique characteristics of the commodity in question.
   - — Prices and characteristics of substitute and complementary goods.
   - — The general price level.
   - — Incomes of potential demanders—aggregate, per capita, and the income distribution.
   - — Population of potential demanders—number, regional distribution, behaviour characteristics and the underlying tastes.
   - — Stocks of durable commodities on hand, and the rate of use, depreciation and obsolescence of these stocks.
   - — Institutional factors affecting sales (terms of payment, service policies, etc.)
   - — Asset holdings of potential demanders, particularly liquid assets which might be spent.
   - — Anticipated technological changes.
   - — General level of economic activity, production and employment.
   - — Changes, anticipated changes and rates of changes in all of the above factors.
   - — Seasonal purchasing patterns.
   - — Time — an explicit time factor may be introduced to project the trend of changes in tastes and other factors not otherwise specified.
   - — Other factors appropriate to specific markets.

   The relationship between quantity demanded and various factors is expressed algebraically in the form of a demand function: $Q_x = f(P_x, Y, P_m, E, \ldots\ldots)$. This function shows that quantity demanded of commodity X is a function of price of X ($P_x$), consumer income (Y), price of substitutes ($P_m$), advertisement expenditure (E), and so on. This is a generalized demand function which simply lists the different variables affecting demand.



## A. PRICE AND DEMAND

### Meaning of Demand

Demand in economics means desire to buy backed by adequate purchasing power. Mere desire or wish cannot buy goods. The demand for goods, therefore, denotes that someone is able and willing to buy the goods. For example, every one desires to possess Premier Padmini Car but only a few have the ability to buy it. So everybody cannot be said to have a demand for car.

Further, the demand for goods refers to the various quantities that consumer will take off the market during a time unit at different prices. Thus, we can say that (See table 1) at a price of Rs. 5, the demand is 80 units, at price Rs. 4, the demand is 100 units and so on.

The relation of price to sales has been a major interest of economists for a long time. A better knowledge of such relationship is also of concern to management.

### Law of Demand

The relation of price to sales is known in economics as the 'Law of Demand'. The Law of Demand states that "higher the price, lower the demand, and *vice versa, other things remaining the same*".

### Demand Schedule, Demand Curve and Demand Function

In elementary economics, the relationship of price to sales or demand, or alternatively, the *Price-Quantity Relation*, as it is often called, is shown arithmetically in the form of a table showing prices and corresponding quantities. This table is known as 'Demand Schedule'. We give below an illustration of the 'Demand Schedule'.

**TABLE 1: Demand Schedule**

| *Price* | *Quantity Demanded* |
|---|---|
| Rs.5 | 80 units |
| Rs.4 | 100 units |
| Rs.3 | 150 units |
| Rs.2 | 200 units |

The 'Law of Demand' or the 'Price-Quantity Relationship' is also portrayed graphically in the form of a chart which is called the '*Demand Curve*'. An example of the 'Demand Curve' is given in Fig.1.

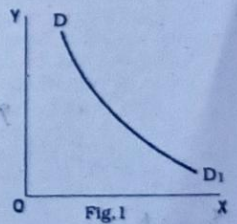

Fig.1

In Fig.1, $DD_1$ is the demand curve of a commodity. The curve slopes downward from left to right indicating that when price rises, less is demanded and when price falls, more is demanded. This kind of a slope is also called as '*negative slope*'.

Ordinarily, *Y*, a dependent variable, is shown on the *Y*-axis (vertical) and *X*, the independent variable, is shown on the *X*-axis (horizontal). But it is a convention among economists to portray price-quantity relationship by representing physical quantity on the horizontal (*X*) axis and the price on the vertical (*Y*) axis.

The demand curve concentrates exclusively on the price-quantity relationship. The relationships between quantity demanded and other variables are not shown by the '*Demand Curve*'.

A demand curve can be made to tell: *(a)* At a particular price, what is the maximum, a consumer will purchase? *(b)* For a particular quantity, what shall be the maximum price?

The price-quantity relation is also expressed algebraically in the form of the following equation:

$$Q = f(P)$$

which means that quantity demanded is a function of price.

**Chief Characteristics**

The chief characteristics of the Law of Demand are as follows:

1. *Inverse Relationship.* The relationship between price and quantity demanded is inverse. That is, if the price rises demand falls, and if the price falls, the demand goes up.

2. *Price, an independent variable, and demand, a dependent variable.* Under the Law of Demand, it is the effect of price on demand which is examined, and *not* the effect of demand on price. When demand rises, the prices would rise, and when demand falls, the price would fall. But the law of demand does not concern with this kind of behaviour or phenomenon. In other words, in the Law of Demand price is regarded as an independent variable and demand a dependent variable, as mathematical economists would call it.

3. *Other things remain the same.* The Law of Demand assumes that other things ramain the same. In other words, there should be no change in the other factors influencing demand except price. If, however, any one or more of the other factors, say, income, substitute's price, consumers' tastes and preferences, advertising outlays, etc., vary, the demand may rise, in spite of a rise in price, or alternatively, the demand may fall in spite of a fall in price.

4. *Reasons underlying the Law of Demand.* The inverse relation between price and demand as stated by the Law of Demand can be explained in terms of two reasons, *viz.*, *(a)* Income Effect, and *(b)* Substitution Effect.

*(a) Income Effect.* The fall in the price of a commodity leads to and, therefore, is equivalent to an increase in the income of the consumer because now he has to spend less for purchasing the same quantity as before. A part of the money so gained can be used for purchasing some more units of the commodity. When price rises, the consumer's income is, in effect, reduced and he has to curtail his expenditure on all commodities including the commodity whose price has risen.

*(b) Substitution Effect.* When the price of the commodity falls, the consumer tends to substitute that commodity for other commodities which have not become relatively dear. If the price of *urad* falls, it will be used by some people in place of other pulses to some extent. Conversely, when the price of a commodity rises, other commodities will be used in its place, at least to some



extent. Therefore, a fall in the price of a commodity increases demand a rise in its price reduces demand.

**Exceptions to the Law of Demand**

The Law of Demand does not hold good in the following cases:

1. There are some goods which are purchased mainly for their 'snob appeal' or ostentation. They are cases of what Veblen called 'Conspicuous consumptions'.[1] When prices of such goods rise, their snob appeal increases and they are purchased in larger quantities. On the other hand, as the price of Veblen goods falls, their capacity to perform the function of ostentation diminishes. Two examples of Veblen goods are curios and diamonds.

2. In the speculative market, a rise in prices is frequently followed by larger purchases and a fall in prices by smaller purchases. When share prices rise, people expect further rise and rush to buy. When prices fall, they wait for further fall and stop buying. This is specially applicable to purchases of industrial materials.

3. *The Giffen Case.* Giffen found that in the 19th century Ireland, people were so poor that they spent a major part of their income on potatoes and a small part on meat. When the price of potatoes rose, they had to economise on meat even to maintain the same consumption of potatoes. Further, to fill up the resulting gap in food supply caused by a reduction in meat consumption, more potatoes had to be purchased because potatoes were still the cheapest food. Thus the rise in the price of potatoes led to increased sales of potatoes. It must be noted that such cases would occur only when a considerable part of the total income is spent on an inferior good.

**Individual Demand and Market Demand**

The qunatity demanded by an individual purchaser at a given price is known as individual demand whereas the total quantity demanded by all the purchasers together is known as market demand.

The market demand, that is, the total demand for a commodity, can be calculated by *adding* the quantities demanded by all the purchasers. Suppose five person, *viz.*, *A*, *B*, *C*, *D* and *E* purchase eggs in the market. The market demand will then be calculated as follows:

**TABLE 2: Market Demand for Eggs**

| *Price per dozen* | *Quantity Demanded in Dozens by* | | | | | *Total* |
|---|---|---|---|---|---|---|
| Rs | *A* | *B* | *C* | *D* | *E* | |
| 10 | 1 | 3 | 0 | 0 | 0 | 4 |
| 9 | 2 | 4 | 1 | 0 | 0 | 7 |
| 8 | 3 | 5 | 3 | 1 | 0 | 12 |
| 7 | 4 | 6 | 5 | 2 | 1 | 18 |
| 6 | 5 | 7 | 6 | 3 | 2 | 23 |
| 5 | 6 | 8 | 7 | 4 | 3 | 28 |
| 4 | 7 | 9 | 8 | 5 | 4 | 33 |

1. American economist, Thorstein Veblen, thought that some purchases were made not for the direct satisfaction which they yield but for the impression which they made on other people.

The last column gives the total demand for eggs at different prices, that is, the *'Market Demand'*. The market demand curve will as such be a lateral summation of individual demand curves.

**Market Research and Law of Demand**

Law of demand is not the last word on consumer behaviour. Rather, sales executives have often found the law of demand irrelevant for their purposes. It was, therefore, left to the market researcher to develop a viable theory of consumer behaviour relevant to sales executives. Market research has propounded on the basis of empirical investigations certain propositions and hypotheses some of which are given below:

*(a)* The more confidence a person has in price information as a predictor of quality, the more likely he will be to choose a high-priced, rather than low-priced item.[1]

*(b)* A person who perceives himself as experienced in purchasing a product will generally choose a low-priced item, but an inexperienced person will select a high-priced one.[2]

*(c)* A person who selects a high-priced item will *(i)* believe it is more difficult to judge product quality, and *(ii)* feel he has less ability to make accurate quality judgements than one who chooses a low-priced item.[3]

*(d)* A person who purchases a high-priced product would perceive large quality differentials.[4] He would also feel that it is risky and uncertain to go in for a low priced product.[5] The customer who purchases high-priced product is also cautious.[6] Then social significance or prestige may be attached with the purchase of a high priced product.[7]

*(e)* Business executives also disbelieve that the consumer is rational. They get baffled at the behaviour of the consumer. "We could have chopped all our prices and not sold a single extra unit. I do not know why it is". Typical case of irrationality is the case of Yale—the underpriced lock. The marketing executive found in this case that the lock was the best available in the market, but it was not being sold in the quantities forecast. A queer decision was taken that the lower price was responsible for lower sales. Their reasoning was that a higher price was essential if the product's real advantages were ever to be noticed.

*(f)* Another American marketing researcher George Katona has pointed out that the purchasing behaviour of the consumer is mostly repetitive. This too is against the formulation advocated in economic theory that the consumer tries to reach the optimum in every transaction and every time.

1. The Sorting of Rule Model of Consumer Product Evaluation Process, Donald F. Cox, Ed., "Risk Taking and Information Handling in Consumer Behaviour", Boston, 1967, pp. 324-69.
2. Doody, Alton F., *Economica*, "Price as an Indicator of Quality", Feb. 1966, pp. 43-70.
3. Tibor Scitovsky, "Consequences of the Habit of Judging Quality by Price", *The Review of Economic Studies*, 12, (1944-45), pp. 100-05.
4. Leavitt, Harold J., *Journal of Business*, July 1954, pp. 205-10 and Tull, D.S. & Others, *Journal of Business*, 1964, pp. 186-91.
5. Cuumghan Scot, M., Cox, Ed., *Risk Taking and Information Handling in Consumer Behaviour*, 1967, pp. 82-108.
6. Kogan, Nathan, "Risk Taking", 1964.



It is clear that the consumer behaviour is not so simple and that buyers do not necessarily behave according to the law of demand in actual practice. Thus if price rises, the consumer may reduce his demand, he may keep it constant and he may even increase it.

**Price Elasticity of Demand**

The law of demand tells us that as the price of a commodity falls, the quantity demanded increases, and vice versa. But it does not state by how much the quantity demanded increases as a result of a certain fall in the price or by how much the quantity demanded decreases as a result of a rise in price. In other words, the law of demand tells us only the direction of change, but not the rate at which the change takes place. To know about the latter, we should know the price elasticity of demand, or elsticity of demand, as it is customarily known. Elasticity of demand should, therefore, be clearly distinguished from the law of demand although it is based upon the law of demand itself.

Elasticity of demand can be defined as "the degree of reponsiveness of quantity demanded to a change in price". It thus represents the rate of change in the quantity demanded due to a change in price.

The price elasticity of demand may be measured by the following formula:

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

or
$$e_p = \frac{\dfrac{\text{Change in quantity demanded}}{\text{Quantity demanded}}}{\dfrac{\text{Change in price}}{\text{Price}}}$$

or
$$e_p = \frac{\dfrac{(Q_2 - Q_1)}{Q_1}}{\dfrac{(P_2 - P_1)}{P_1}}$$

where $Q_1$ stands for quantity demanded before price change.

$Q_2$ stands for quantity demanded after price change.

$P_1$ stands for price charged before price change.

$P_2$ stands for price charged after price change.

*Illustration*

If $Q_1$=2,000; $Q_2$=2,500;

$P_1$=10; and $P_2$=9, then

$$e_p = \frac{\dfrac{(2{,}500-2{,}000)}{2{,}000}}{\dfrac{9-10}{10}} = -2.5$$

**The price elasticity is negative emphasising the inverse relationship between price and demand. In practice, however, the minus sign is omitted**

***A Modification.*** The above formula for elasticity of demand is at times modified a little as follows:[1]

$$e_p = \frac{\frac{Q_2 - Q_1}{\frac{Q_2 + Q_1}{2}}}{\frac{P_2 - P_1}{\frac{P_2 + P_1}{2}}} = \frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{P_2 - P_1}{P_2 + P_1}} = \frac{\frac{\Delta Q_1}{Q_2 + Q_1}}{\frac{\Delta P_1}{P_2 + P_1}}$$

Thus, while computing elasticity, instead of writing $Q_1$ and $P_1$ as denominators, we take the average of $Q_1$ and $Q_2$ and $P_1$ and $P_2$, *i.e.*, $\frac{Q_2 + Q_1}{2}$ and $\frac{P_2 + P_1}{2}$. In the process of division, however, the two 2s cancel each other and hence in the above formula afterwards, the expression $(Q_2+Q_1)$ and $(P_2+P_1)$ occur.

Applying the modified formula,

$$e_p = \frac{\frac{500}{4,500}}{\frac{-1}{19}}$$

$$= \frac{\frac{1}{9}}{\frac{-1}{19}} = \frac{19}{-9}$$

$$= -\frac{19}{9}$$

$$= -2.11$$

***Interpretation.*** A one per cent reduction in price will result in a 2.5 per cent increase in the quantity demanded according to the first formula and 2.1 per cent increase according to the modified formula.[2]

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1. The modification is done on two grounds. First, it is done to ensure reversibility. Reversibility in this context means that the value of elasticity will be the same whether we take $Q_1$ and $P_1$ or $Q_2$ and $P_2$ as the base for computing elasticity. The modification also becomes necessary to ensure consistency in the case where elasticity is equal to unity. (For example, when price changes from Re.1 to Rs.2, quantity demanded changes from 10 to 5 units. Here, the unmodified formula will not give unity as the value of the elasticity coefficient.)

2. While dealing with elasticity in the text, we have confined ourselves to what is called as 'arc elasticity', *i.e.*, the elasticity of demand between two finite points of demand curve. An alternative possibility is to measure point elasticity, *i.e.*, elasicity at a point on the demand curve which is the limiting value of the elasticity as finite price interval tends to a point. The formula for calculating the point elasticity is as under:

$$\text{point elasticity} = \frac{\frac{dQ}{Q}}{\frac{dP}{P}} = \frac{P}{Q} \cdot \frac{dQ}{dP}$$

where $P$ = the price at a given point on the demand curve.

$Q$ = the quantity demanded at that price.

$\frac{dQ}{dP}$ = the derivative of quantity with respect to price at that point.

*(Contd.)*



**Types of Price Elasticity**

1. Perfectly elastic demand—where no reduction in price is needed to cause an increase in demand. If this be the case, a firm can sell the quantity it wants at the prevailing price but none at all at even a slightly higher price. Here the shape of the demand curve is horizontal.

2. Perfectly inelastic demand—where a change in price, howsoever large, causes no change in quantity demanded. Here, the shape of the curve is vertical.

3. Demand with unity elasticity—where a given proportionate change in price causes an equal proportionate change in the quantity demanded. Here the shape of the demand curve is that of a rectangular hyperbola.[1]

4. Relatively elastic demand—where a reduction in price leads to more than proportionate change in demand. Hence the shape of the demand curve is flat.

5. Relatively inelastic demand—where a decline in price leads to less than proportionte increase in demand. Here the shape of the demand curve is steep.

Table 3 presents in a summary form the characteristics of various types of price elasticity:

**TABLE 3: Type of Price Elasticity**

| *Type* | *Numerical Expression* | *Description* | *Shape of Curve* |
|---|---|---|---|
| 1. Perfectly Elastic | $\infty$ | Infinite | Horizontal |
| 2. Perfectly Inelastic | 0 | Zero | Vertical |
| 3. Unity Elasticity | 1 | One | Rectangular Hyperbola |
| 4. Relatively Elastic | >1 | More than one | Flat |
| 5. Relatively Inelastic | <1 | Less than one | Steep |

In real life, we generally meet cases 2, 4 and 5.

**Price Elasticity—Some Notable Points**

(A) *When demand curve is linear:*

(1) Price-elasticity can range between 0 or completely inelastic demand and infinity, or perfectly elastic demand. These are known as limting cases.

(2) The elasticity will be zero if demand curve is a vertical straight-line.

(3) The elasticity will be infinity if demand curve is a horizontal straight line.

(4) The elasticity of demand can also be ascertained by the formula:

$$e_p = \frac{\text{Lower segment of the demand curve}}{\text{Upper Segment of the demand curve}}$$

---

*(Contd.)*

It is important to note that a demand curve may not have the same elasticity over every part of the curve. At a price of Rs. 9 per dozen, for example, the demand for eggs illustrated in Table 2 is very elastic; at a price of Rs. 6 per dozen the demand is moderately elastic; at a price of Rs. 4 per dozen, however, the demand is much less elastic.

1. A rectangular hyperbola is a curve such that the rectangles formed by the two axes and the abscissa (x coordinate) and the ordinate (y coordinate) of points on the curve have a constant area.

$$\text{or } e_p = \frac{L}{U}$$

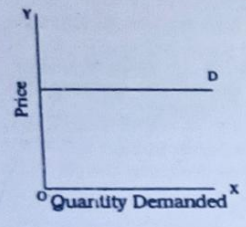
where L and U mean lower and upper segments respectively.

(5) At the mid-point of the linear demand curve, $e=1$

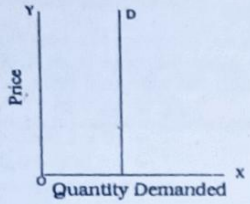
(6) The price-elasticity of a linear demand curve decreaes as one travels down the curve.

(7) The price-elasticity is never 1 throughout the linear demand curve.

**A. Limiting Cases of Price Elasticities**

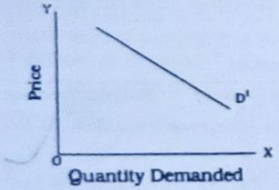



Perfectly Elastic Demand Curve
—At a given price, infinite quantity will be bought

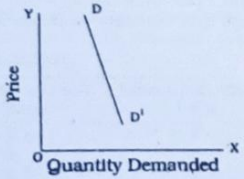



Perfectly Inelastic Demand Curve
—The same, fixed amount will be bought irrespective of price.

**B. Highly Elastic and Inelastic Demand Curves**

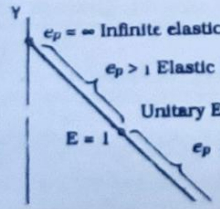



Elastic Demand Curve
—A curve of High Elasticity




Inelastic Demand Curve
—A curve of high inelasticity

**C. Elasticities Along A Linear Demand Curve**






**B. When demand curve is non-linear:**

(1) The elasticity will be one throughout the curve if it is a rectangular hyperbola; in other cases, it will never be 1 throughout in the non-linear curve.

(2) If the tangent to a non-linear demand curve is such that at the point of tangency, the upper and lower segments are equal, than $e=1$.

**Factors Determining Price Elasticity of Demand**

The elasticity of demand depends on the following factors:

1. *Nature of the Commodity.* The demand for necessities is generally inelastic because the consumption of a necessary article *(e.g.,* salt or wheat) does not change much with a change in price. The demand for luxuries, *e.g.,* a silk saree, or a terylene shirt, changes much due to a price change and is, therefore, elastic.[1] For example, with drastic reduction in the prices of television sets, the monthly production and sales of TV receivers increased from 7,200 sets in April 1976 to 19,000 sets in December 1976.

2. *Extent of Use.* A commodity having a variety of uses has a comparatively elastic demand. For example, steel can be used for many purposes. A slight fall in its price will bring forth demand from many quarters and hence demand is elastic. On the other hand, a commodity having a limited use will have a comparatively inelastic demand.

3. *Range of Substitutes.* A commodity having a number of substitutes has relatively elastic demand because if its price rises, its consumption can be curtailed in favour of the substitutes. For example, if tram fares rise, people will use buses or electric trains. A commodity without substitutes or with weak substitutes has relatively inelastic demand.

4. *Income Level.* People with high incomes are less affected by price changes than people with low incomes. A rich man will not curtail consumption of fruits and/or milk even if their price rises significantly and will continue to purchase the same quantity as before. But a poor man cannot do so. Hence the demand for fruits or milk is inelastic for the rich but elastic for the poor.

5. *Proportion of Income Spent on the Commodity.* Where an individual spends only a small part of his income on the commodity, the price change does not materially affect his demand for the commodity, *e.g.,* match box, salt, etc., and the demand is inelastic.

6. *Urgency of Demand.* If the price of goods one considers essential rises as, for example, salt and matches, one would probably give up something else than giving up salt and matches. What things one would consider essential depends largely on *(i)* the availability of substitutes, and *(ii)* habit and social custom.[2] If there were a good substitute for salt, its demand would become much less urgent and one's demand for it much more elastic. A person's demand for cigarettes or betels may become highly inelastic because he is in the habit of smoking or chewing betels. Whatever the causes, the urgency of demand tends to cause inelastic demand. If the demand for a commodity is less urgent, one is likely to give it up

1. The concept of 'necessity' may undergo a change over a priod of time. What is a 'luxury' today may become a 'necessity' after some time.

2. Beyond a certain limit, high price may affect the demand for otherwise essential commodities. For example, with a steep increase in coffee prices, coffee drinkers in Europe, the USA and Canada cut back on the number of cups they consumed. *The Economic Times*, January 8, 1977, p. 4

in case its price rises. For example, one's demand for a particular brand of soap is likely to be fairly elastic since there are so many close substitutes that this particular soap is not very essential.

7. *Durability of a Commodity.* In case the commodity is durable or repairable (*i.e.*, it can be repaired for substantially less than the price of the new commodity, *e.g.*, shoes), if the price rises considerably, one is likely to use the commodity for a longer time, if necessary, after getting it repaired. Thus the more durable and repairable a commodity is, the higher is its elasticity of demand likely to be.

8. *Purchase Frequency of a Product.* If the frequency of purchase of a product is very high, its demand is likely to be more price elastic than in the case of a product which is purchased less often.

**Revenue Relationships**

For purposes of demand analysis, it is considered useful to distinguish between various types of revenue, *viz.*, average revenue, marginal revenue, incremental revenue and total revenue and study relationships between them.

**Average revenue** means the total receipts from sales divided by the number of units sold $\left(i.e., AR = \frac{TR}{Q}\right)$.

**Total revenue** means the total sales proceeds. It can be ascertained by multiplying quantities sold by price (*i.e.*, *TR = P times Q*).

**Incremental revenue** simply measures the difference between the new total revenue and the existing total revenue. Its formula is:

$$IR = R_2 - R_1 = \Delta R$$

**Marginal revenue** is the additional revenue which would be earned by selling an additional (marginal) unit of a firm's product. It thus shows the change in total revenue when one more or one less unit is sold. Algebraically, it is the addition to total revenue earned by selling $n$ units of a product instead of $n$-1, where $n$ is any given number. Alternatively, marginal revenue refers to the addition to total revenue earned by selling $n$+1 units instead of $n$ units.

In actual business, it is rare that output is increased by one unit only. What happens is that additional inputs result in additional output. The *extra* revenue for this additional output can be determined by finding out the change in total revenue as a result of the sale of this output. This is known as incremental revenue. However, to find out the marginal revenue, the incremental revenue will have to be divided by the increase in output. This will give the extra revenue for the additional unit of output. This will give the extra revenue for the additional unit of output. It must be noted in this case that the marginal revenue over the entire range of *extra output* will be constant.

The formula for marginal revenue, thus, is:

$$MR = \frac{R_2 - R_1}{Q_2 - Q_1} = \frac{\Delta R}{\Delta Q}$$

where $R_1$ represents total revenue before price change.
$R_2$ represents total revenue after price change.
$Q_1$ represents old quantity before price change.
$Q_2$ represents new quantity after price change.



The reason for dividing by the difference between the old quantity and the new quantity is to convert the total change in revenue into *per unit* change of output.[1]

Incremental revenue differs from marginal revenue in the following respects:

(1) Incremental revenue is the change in total revenue irrespective of the change in sales whereas marginal revenue is the change in total revenue per unit of change in sales.

(2) Incremental revenue is not confined to the effects of price change. It rather measures the effect of any kind of managerial decision on total revenue.

The formula for *IR* and *MR* are as under:

$$IR = R_2 - R_1 = \Delta R \qquad ...(1)$$

$$MR = \frac{R_2 - R_1}{Q_2 - Q_1} = \frac{\Delta R}{\Delta Q}$$

**Illustration**

Suppose, the price of a commodity decreases from Rs. 10 to Rs. 9 and, as a result, sales increase from 1,000 units to 1,500 units. The incremental revenue and the marginal revenue will be calculated as under:

$$\begin{aligned} IR &= R_2 - R_1 \\ &= (9 \times 1{,}500) - (10 \times 1{,}000) \\ &= 13{,}500 - 10{,}000 \\ &= \text{Rs. } 3{,}500 \end{aligned}$$

$$\begin{aligned} MR &= \frac{R_2 - R_1}{Q_2 - Q_1} \\ &= \frac{3{,}500}{500} \\ &= \text{Rs. } 7 \end{aligned}$$

Thus, incremental revenue is Rs. 3,500 and marginal revenue is Rs. 7.

The relationship between average revenue, marginal revenue and total revenue can be seen with the help of Table 4.

*TABLE* 4: **Revenue Relationship**

| *Quantity Demanded (Q)* | *Average Revenue (AR)* | *Total Revenue (TR)* | *Marginal Revenue (MR)* |
|---|---|---|---|
| 1 | 9 | 9 | 9 |
| 2 | 8 | 16 | 7 |
| 3 | 7 | 21 | 5 |
| 4 | 6 | 24 | 3 |
| 5 | 5 | 25 | 1 |
| 6 | 4 | 24 | –1 |
| 7 | 3 | 21 | –3 |
| 8 | 2 | 16 | –5 |
| 9 | 1 | 9 | –7 |

1. In terms of Calculus, the formula for marginal revenue is:

$$MR = \frac{dR}{dQ}$$

which is simply the derivative of the total revenue curve with respect to quantity.

A study of the above table reveals:

1. So long as average revenue is falling, marginal revenue will be less than the average revenue.
2. Marginal revenue falls more steeply than average revenue.
3. Total revenue will be rising so long as marginal revenue is positive.
4. Where marginal revenue is negative, total revenue must be falling.
5. Total revenue will be the maximum at a point where marginal revenue is zero.

*Relationship between Price Elasticity of Demand, Marginal Revenue and Total Revenue.* Three general statements can be made which link total revenue, marginal revenue and price elasticity of demand together.

1. When the price elasticity of demand is greater than one, the marginal revenue is positive and the total revenue rises as price falls.
2. When the price elasticity of demand is unity, the marginal revenue is zero and a change in price will not change the total revenue.
3. When the price elasticity of demand is less than one, the marginal revenue is negative and the total revenue falls as price falls.

The relationship between elasticity of demand and the firm's total revenue can be summarized as under:

*TABLE 5:* **Elasticity of Demand and Total Revenue**

| Change in price | Elasticity greater than unity ($e>1$) | Unity Elasticity ($e=1$) | Elasticity less than unity ($e<1$) |
|---|---|---|---|
| Price Rises | Total Revenue Falls | Total Revenue Unchanged | Total Revenue Rises |
| Price Falls | Total Revenue Rises | Total Revenue Unchanged | Total Revenue Falls |

*Relationship between Average Revenue, Marginal Revenue and Price Elasticity of Demand.* Mrs. Joan Robinson has given the following formulae which show the relationship between marginal revenue, average revenue and price elasticity of demand:[1]

At any output,

1. Average Revenue = Marginal Revenue $\times \frac{e}{e-1}$

i.e., $A = M\frac{e}{e-1}$

2. Marginal Revenue = Average Revenue $\times \frac{e-1}{e}$

i.e., $M = A\frac{e-1}{1}$

where $e$ = price elasticity of demand on the average revenue curve.[2]

**Change in Demand**

In economics, a 'change in demand' means an *increase in demand* or a *decrease in demand*. An *increase in demand* means that at the *same series* of prices as before, increased quantities are demanded. An increase in demand is represented graphically by a new demand curve, lying to the *right* on the original curve (*see* Fig. 2). The increase in demand may be due to a rise in people's incomes, a rise in the price of a substitute, a fall in the price of a complement, technological changes, an improvement in the product itself, an improvement in people's tastes, discovery of a new use for the product, etc.

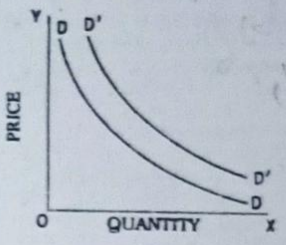



Fig. 2

Like in *increase in demand*, a *decrease in demand* would mean that at the same series of prices, lower quantities would be sold. Graphically, the decrease in demand would be shown by a curve lying to the *left* of the original curve. A decrease in demand may be due to a fall in people's income, a fall in the price of a substitute, a rise in the price of a complement, an improvement in the substitute, an adverse change in tastes, etc. An increase in the price of petrol, for example, has led to a decline in the demand for cars. An illustration of technical change affecting the demand for laundry services is provided by the development of wash and wear fabrics and of tericotton cloth.

The 'increase' or 'decrese' in demand is also known as *shift in demand curve*. This is because the demand curve shifts upward to the right or downward to the left as and when the demand *increases or decreases*.

**Change in Demand and Elasticity of Demand**

The 'change in demand' must be distinguished from the 'elasticity of demand.' The *change in demand* occurs when price does not change but demand changes due to other factors, *viz.*, income, etc. *Elasticity of demand* refers to that change in demand which occurs due to change in price, other factors remaining the same. In both cases, the demand changes but in the former case, it is due to non-price factors whereas in the latter case due to price factors. Moreover, change in price results in movement along the demand curve whereas changes in other factors result in shifts of the entire curve. Price elasticity of demand may itself undergo a change over a period of time due to the operation of non-price factors.

**Price Elasticity of Demand and Business Decisions**

The concept of price elasticity of demand has important practical applications in managerial decision-making. Often a businessman has to consider

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1. *The Economics of Imperfect Competition*, Macmillan, St. Martin Press, 1969, p. 36.
2. For measuring e, the formula is: $e = \frac{A}{A-M}$ Contd. on p. 41



(Contd.)

The formula is derived as under:

$$A = M\frac{e}{e-1} = \frac{eM}{e-1}$$

or $A(e-1) = eM$

or $eA - A = eM$

or $eA - eM = A$

or $e = \frac{A}{A-M}$

See Joan Robinson, Op. cit., p. 36.

whether a lowering of price will lead to an increase in the demand for his product, and if so, to what extent and whether his profits would increase as a result thereof. Here the concept of elasticity of demand becomes crucial. In fact, many a business has failed for lack of attention to the elasticity of demand. If the increase in sales is more than proportionate to the decline in price, his total sale proceeds, or total revenue, will increase and his profits might be greater. However, if the increase in sales is less than proportionate, the total revenue will decline and his profits will definitely be less. A knowledge of the nature of the elasticity of demand for his products will help a businessman to decide whether he should cut his price in a particular case. Such a knowledge would also help a businessman to determine whether and to what extent the increase in costs could be passed on to the consumer. In general, for items whose the demand is elastic it will pay him to charge relatively low prices, while on those whose demand is inelastic, he would be better off with a higher price. A monopolist would not be able to increase his price if the demand for his product is elastic.

Elasticity mainly depends upon the *desire* for the commodity and upon the availability of *substitutes* for it. If the desire for a commodity is specially urgent, a higher price will *not* result in a great *decrease* in the quantity sold unless there are many substitutes available. If there are many substitutes available *(i)* a decline in the price of our product will lead to our *product replacing its substitutes and (ii)* an *increase* in its price will lead to *its substitution* by the substitutes, *provided the prices of substitutes do not change at the same time and to the same extent.*

The most immediate substitutes for the product of any company are the products of its competitors. It follows that the more *highly competitive* is the situation of a company, the greater *is the elasticity* of demand for its products.

Also, the demand for a product is *more elastic over a period* than it is at a particular time because the process of substitution often takens time. Again, established methods of distribution, established brands, buyer's ignorance and buying habits, and other similar factors, expected or unexpected, *slow down the rate* at which a cheaper substitute can make inroads into the market of its competitors.

It may be pointed out here that the price elasticity of demand for a certain commodity and the price elasticity of demand for a certain brand of that commodity may be radically different. For instance, although demand for certain commodities, say, cigarettes, is highly inelastic (that is, elasticity approaching zero), the price elasticity of demand for the product of a firm, say, a particular brand of cigarette, is generally greater than one. The reason for this is weak brand loyalty and the availability of substitutes.

In practice, an accurate estimate of the probable response of volume of sales to price changes is extremely difficult. Moreover, the cost of the statistical analysis required may, in some cases, exceed the benefits especially when uncertainty is great or when the volume is too small to provide a reasonable return on the amount spent on research. Also, the subjective judgement of certain managers, based on years of experience, sometimes exceeds in accuracy the best of the present statistical techniques.[1] For these reasons, businessmen generally need not make very precise calculations of the numeri

1. Haynes, Mote and Paul, *Op. cit.*, p. 117.



cal size of the elasticity of demand; instead, subjective estimates of experienced businessmen may well serve the purpose. It must, however, be emphasized that a good knowledge of the elasticity of demand of a commodity as well as the brand produced by the company and the way total outlay responds to price changes, is essential for the effective analysis of a wide range of business problems specially pricing and marketing problems. Indeed, sound understanding of the elasticity of demand is important, for much of the success of the enterprise depends on sound business judgement in this area.

**Some Business Applications of Price Elasticity**

1. *Price Discrimination.* A monopolist adopts a price discrimination policy only when the elasticity of demand of different consumers or sub-markets is different. Consumers whose demand is inelastic can be charged a higher price than those with more elastic demand.

2. *Public Utility Pricing.* In case of public utilities which are run as monopoly undertakings, *e.g.*, electricity, water supply, railways, postal services, price discrimination is generally practised, charging higher prices from consumrs, or users with inelastic demand and lower prices in case of elastic demand.

3. *Joint Supply.* Certain goods, being products of the same process are jointly supplied, e.g., wool and mutton. Here if the demand for wool is inelastic compared to the demand for mutton, a higher price for wool can be charged with advantage.

4. *Super Market.* Super-markets are a combined set of shops run by single organization selling a wide range of goods. They are supposed to sell commodities at lower prices than charged by shopkeepers in the bazar. Hence, price policy adopted is to charge slightly lower price for goods wih elastic *demand.*

5. *Use of Machines.* Workers often oppose use of machines out of fear unemployment. Machines need not always reduce demand for labour as this depends on price elasticity of demand for the commodity produced. When machines reduce costs and hence price of products, if the product's demand is elastic, the demand will go up, production will have to be increased and more workers may be employed. On the contrary, if demand for the product is inelastic, machines will lead to unemployment as lower prices (due to lesser costs) will not increase the demand.

6. *Factor Pricing.* The factor having price-inelastic demand can obtain a higher price than those with elastic demand. Workers producing products having inelastic demand can easily get their wages raised.

7. *International Trade*

*(i)* A country benefits from exports of products as have price-inelastic demand for a rise in price and elastic demand for a fall in price.

*(ii)* The demand for imports should be inelastic for a fall in price and elastic for a rise in price.

*(iii)* While deciding whether to devalue a country's currency or not, price elasticity of demand for a country's exports would be an important factor to be taken into consideration. If the demand is price elastic, it would lead to an increase in the country's exports and devaluation would be worthwhile. If the demand is price-inelastic, devaluation would fail to achieve its objective. For example, the demand for agricultural

products is rather price inelastic and devaluation of a country's currency would not lead to any significant increase in their exports.

8. *Shifting of Tax Burden.* It is possible for a businessman to shift a commodiy tax in case of inelastic demand to his customers. But if the demand is elastic, he will have to bear the tax burden himself, otherwise demand for his goods will go down sharply.

9. *Taxation Policy.* Government can easily raise tax revenue by taxing commodities which are price-inelastic.

## B. INCOME AND DEMAND

The income of buyers is a basic demand determinant and along with price often accounts for most of the variations in the sales of many commodities. The relationship between the income and sales can be of considerable use to the businessman in planning sales, allocating territories, etc. In order to study the income-sales/demand relationship, four aspects are to be distinguished:

1. Consumption function, 2. Product consumption function, 3. Differences in regional incomes and 4. Income expectations and demand.

### Consumption Function

Consumption function refers to the relatioship of total expenditure on consumption to total income. It occupied an important place in economic thinking for a long time. Studies made by a number of economists, notably Keynes, Duesenberry, Kuznets, Modigliani, Friedman and Samuelson revealed the following characteristics of the consumption function:

1. The long-run relation of consumption to income is somewhat stable, and expenditure on consumption is regularly about 85 to 90 per cent of the income. Unless there is a change in the income distribution pattern, the average propensity to consume, i.e., the ratio of total expenditure on consumption to aggregate income, will remain fairly stable.

2. In the short run, the consumption function recorded great instability. As such, the relationship between income and consumption cannot be predicted by any mathematical formula.

3. During periods of economic prosperity, expenditure on consumption tends to increase absolutely but decreases as a percentage of income. On the other hand, in periods of depression, consumption declines absolutely but the expenditure on consumption increases as a percentage of income.

4. As it is easier for consumers to raise their standard of living than to lower it, the rate of increase in consumption is higher in periods of recovery than is the rate of decline in consumption in times of recession. As consumers tend to stick to their standard of living even in the face of falling incomes, their expenditure on consumptioin tends to become a larger proportion of income.

5. In underdeveloped countries like India where people live below the subsistence level, the propensity to consume is very high. Any increase in income of the people with low income, is likely to be spent on consumption goods.

Thus, it can be concluded that there is a definite and predictable relationship between aggregate income and total consumption. That is why at one time, after the mid-thirties, the consumption function was considered to be of substantial importance in managerial decision-making.



However, experience shows that the use of consumption function is not without its limitations. This is so because the relationship between sales of individual products and income is determined by a number of other factors, *viz.*, relative prices, consumer stocks, durable and non-durable nature of the products, etc. In fact, the consumption function is concerned only with how much to spend and how much to save, without being affected by the decision on what to buy. Thus, the relation between national income and total consumption expenditure does not necessarily hold good in the case of demand for individual products.

### Product Consumption Function

It may be defined as the relationship between the total income and sales of particular products. Empirical studies in the U.S.A. have shown that there is a definite direct relationship between changes in income and demand for specific product groups, *e.g.*, the demand for furniture. In other words, the higher the income, the greater the demand and *vice versa*. Fig. 3 illustrates the relationship between income and quantity demanded. The curve is known as Product Consumption Curve. However, when we come down to a specific product in the product group (for example, the demand for sofa-sets) or to the demand for a particular company's products, it is more difficult to establish a definite relationship and the results shown are much less dependable. Nevertheless, the direct relationship between income and product consumption shows the scope for an individual producer to push up the sales of his products.

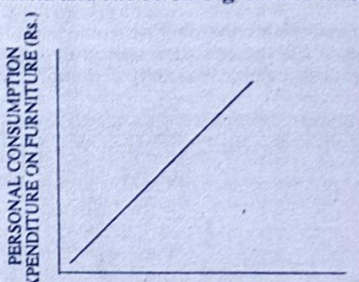

Fig. 3

### Differences in Regional Incomes

Businessmen whose markets are confined to certain regions or States are naturally more interested in market studies that reveal the purchasing power of specific regions. One method of doing so is the construction of an index of purchasing power of individual States or regions as is being done in a number of foreign countries, especially the U.S.A. This method has an advantage that it provides a ready reference for managerial purposes. Another method can be to find out the coefficient which would show the extent of changes in regional or State incomes associated with changes in national income over a period of time. The coefficient thus calculated is known as income sensitivity index.

### Income Expectations and Demand

The demand for a vast variety of products is often less influenced by people's incomes than by their expectations of income. Expectations in turn are related to people's estimates of the level and durability of future economic conditions. The demand for many consumer durables (major appliances, furniture) is often equally sensitive to general expectations regarding income level.

**Income Elasticity of Demand**

Income elasticity may be defined as the degree of responsiveness of quantities demanded to a given change in income. The income elasticity of demand can be measured by the following formula:

$$e_y = \frac{\text{Proportionate change in quantities demanded}}{\text{Proportionate change in incomes}}$$

or

$$\frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{Y_2 - Y_1}{Y_2 + Y_1}}$$

where $Q_1$ stands for quantities demanded before the change in income; $Q_2$ stands for the quantities demanded after the change in income; $Y_1$ stands for the income before the change; and $Y_2$ stands for the income after the change.

*Illustration*

Suppose a consumer's income is Rs. 1,000 and he purchases ten kilos of sugar. If his income goes up to Rs. 1,100, he is prepared to buy 12 kilos of sugar. The income elasticity of demand will be calculated as under:

$$e_y = \frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{Y_2 - Y_1}{Y_2 + Y_1}} = \frac{\frac{12 - 10}{12 + 10}}{\frac{1,100 - 1,000}{1,100 + 1,000}}$$

$$= \frac{2}{22} \div \frac{100}{2,100}$$

$$= \frac{1}{11} \times \frac{21}{1}$$

$$= \frac{21}{11} = 1.99$$

Thus, the demand for sugar is quite income elastic.

**Types of Income Elasticity**

It is useful to distinguish between the following cases of numerical values for income elasticities:

1. *Zero income elasticity.* Here, a change in income will have no effect on the quantities demanded, *e.g.*, salt.

2. *Negative income elasticity.* An increase in income may lead to a reduction in the quantities demanded. Such goods are called *inferior* goods. For example, an increase in income might lead one to shift his demand from *biris* to cigarettes. Fig. 4 shows the demand curve for inferior goods.

3. *Positive income elasticity.* An increase in income may lead to an increase in the quantities demanded. For most goods, the income elasticity of demand is positive, *i.e.*, when income rises, demand also rises. Such goods are known as *superior* goods. Positive income elasticity can be of *three* kinds: unity elasticity, more than unity elasticity and less than unity elasticity. The elasticity is unity when an increase in income leads to a proportionate change in the quantities demanded. The elasticity is more than unity when an increase in income leads to a more than proportionate change in quantities demanded. Articles of luxury fall in this category. The income elasticity for carpets is as high as 2·40751 while price elasticity is only — 0·35266. The elasticity is less than unity when the increase in income leads to a less than proportionate change in the quantities demanded. Articles of necessities, for example, wheat and rice, characterise this category.[1]



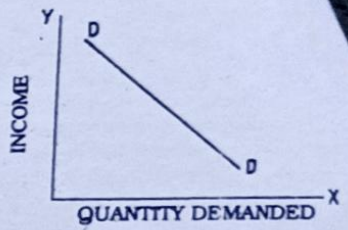


Fig. 4

It may also be noted here that income elasticity of demand for a commodity need not be uniform for the entire community. In fact, different values may emerge at different ranges of incomes.

The table below illustrates various types of income elasticity:

*TABLE* 6: **Types of Income Elasticity**

| | $Y$ | $Q$ | $e_y$ | | |
|---|---|---|---|---|---|
| | 100 | 10 | | | |
| (1) | 200 | 20 | 1 | Unity Elasticity | |
| (2) | 200 | 25 | 1·3 | More than Unity Elasticity | Positive |
| (3) | 200 | 15 | 0·6 | Less than Unity Elasticity | |
| (4) | 200 | 10 | 0 | | Negative |
| (5) | 200 | 5 | −1 | | Zero |

**Income Elasticity and Business Decisions**

As most of the goods are superior goods, economic growth (which means percentage growth in real GNP per capita)[2] will be associated with increase in

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1. Floyd F. Gills, Jr. illustrates the various types of income elasticity with what he describes as the modern version of Engel's law. Accordingly, as income increases the percentage of income spent on:

   *(a)* food and housing declines,

   *(b)* clothing remains almost constant, and

   *(c)* services and education increases.

   Thus, in case of *(a)* income elasticity is less than unity, in case of *(b)* income elasticity is equal to unity, and in case of *(c)*, income elasticity is more than unity. (See *Managerial Economics*, Floyd E. Gills, Jr., Addision Wesley Publishing Company, 1969, p. 171).

   According to National Sample Survey 38th Round, while the percentage of income spent on cereals and pulses declined from 51·5 per cent in 1967-68 to 36·3 per cent in 1983 in rural areas and from 29·6 per cent to 22·9 per cent in urban areas, there was an increase in clothing from 5·4 per cent to 8·6 per cent in rural areas and from 4·6 per cent to 7·6 per cent in urban areas as also in miscellaneous goods and services from 8·1 per cent to 12·6 per cent in rural areas and from 20 to 20·6 per cent in urban areas (Report, p. 319).

2. The usual index of economic growth is *the percentage rate of growth in real GNP per capita.* Notice that we are dealing with percentage rates rather than absolute rates of growth. Economic growth deals with real income, so that changes in GNP resulting from changes in the price level must be discounted. Furthermore, the yardstick is in terms of GNP *per capita* to take account of the fact that different nations have different sizes of population (Myron H Ross, *Income Analysis and Policy*, McGraw-Hill Book Co., 1969, p. 266). In other words, economic growth is measured as percentage growth rate in GNP per capita at constant prices.

their sales. A study by the Operations Research Group (ORG) found that during the decade ending 1990, there has been a substantial growth in real incomes even after accounting for inflation. This has led to a growth in demand for all types of goods in India. Again, with womenfolk becoming earning members, the number of two-income households has risen sharply leading to a spurt in the demand for cosmetics, toiletries and products required by women. Again, while the premium end of the market shows healthy growth, the growth of value-for-money, modest to low cost products is more impressive.

However, a businessman may be really interested in knowing whether the sale of his product will lead or lag economic growth, and income elasticity of his product will enable him to get the answer. In this connection the two useful rules are as under:

(1) If income elasticity is greater than zero but less than one, sales of the product will increase but slower than the general economic growth;

(2) If income elasticity is greater than one, the sales of his product will increase more rapidly than the general economic growth.

Thus, if the economy is growing at 5% and $e_y$=0·5, firms in the industry can expect annual sales increase of $5\% \times 0{\cdot}5 = 2{\cdot}5\%$. But if $e_y$ =2.0, firms can expect sales to grow at the rate of $5\% \times 2{\cdot}0 = 10\%$ annually.

Similarly, in times of recession, credit squeeze, or other periods when the government may be trying to reduce the level of economic activity, decline in the sales of the firm will be slower or faster than the decline in economic activity, depending on whether $e_y < 1$, or $e_y > 1$ (assuming that $e_y$ is positive, that $e_y > 0$).

Although knowledge of income elasticities is useful in forecasting the effects of changes in economic activity on demand, such forecasting is limited by several difficulties. The relation between demand and income changes is not always straightforward; much will depend on the suddeness or permanence of a change in income. For, it often takes time to plan changes: some commitments such as hire-purchase repayments may remain fixed, or old consumption habits tend to die hard, particularly if a change in income is only expected to be temporary. As such, frequently there may be a lag between changes in income and changes in demand. Again, sales are influenced by factors other than income as well. Finally, the relationship may not persist in the future.

**Types of Income Concepts**

In practice, one of the problems faced in demand analysis is to decide which income concept to use. Though several income measures are in use, the most commonly used concept is the *personal disposable income per head, i.e.*, personal income after tax divided by population, symbolically expressed as $\frac{Y-t}{P}$ Alternatively, *personal disposable income per family* may be used where the commodity concerned is purchased for the use of the family as a whole.

Yet other income concepts important for durable goods are that of *'transitory income'* and *'discretionary income'*. Transitory income includes any fluctuations in the short-run income which are not expected to persist in the long run. For this purpose, current income is d[illegible] transitory income and permanent income. An increase in transitory inco[illegible] is likely to go to the purchase of durable goods. Discretionary income is t[illegible]at part of the income which is left over after deduction of regular, recurrent expenses; it is usually



is in drawing a dividing line between permanent income on the one hand and transitory or discretionary income on the other.

The expenditure of discretionary income has begun to play a very important role in sustaining production in the developed countries. Professor Katona of the University of Michigan has outlined three important features of discretionary expenditure: *(a)* There is no compelling need to make these expenditures at a given time. *(b)* These expenditures are usually not governed by habit. *(c)* These expenditures are not usually made on the spur of the moment, but rather after considerable deliberation and discussion among members of the family.[1]

**Income Sensitivity and Income Elasticity**

Another concept used for measuring the effect of income changes on the demand for various commodities is that of *Income Sensitivity of Demand*.[2] It refers to the *ratio of percentage changes in expenditure (in money terms) to percentage changes in income*. In contradistinction, income elasticities measurre the ratio of percentage changes in *quantity* demanded to percentage changes in income.

A positive income sensitivity suggests a more than proportionate increase in expenditure with an increase in income. If income sensitivity is negative, it implies that the commodity is inferior. For example, negative income sensitivity for bus services would mean that as income increases, people prefer more expensive automobile service, say, a taxi service over the bus service, for which the demand goes down. Other examples can be coarse foodgrains and coarse cloth.

## C. PRICES OF RELATED GOODS AND DEMAND

The demand for certain commodities may be influenced by changes in the prices of related goods. These may be of two kinds: substitutes and complements. Commodities are substitutes when one can be replaced by another. Here a change in the price of one commodity would lead to a change in the demand for the commodity at the cost of some other commodity, *e.g.*, an increase in the demand for Philips radios may be at the cost of HMV radios or an increase in the demand for coffee due to a reduction in its price may be at the cost of tea. Commodities are complements when a change in the demand for one commodity leads to a change in the demand for some other commodity in the same direction. For example, an increase in the demand for transistors will lead to an increase in the demand for dry battery cells. The change in the price of a product may lead to an inverse change in its demand and hence a change in the demand for a complement in the same direction. A decline in prices of fountain pens may lead to an increase in their demand leading to an increase in the demand for fountain-pen ink. An increase in the price of petrol has affected the demand for motor cars adversely. Due to persistent scarcity and consequent high price of sugar, the offtake of tea dropped despite the fact that festive season had then begun[3]

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1. Quoted by Mandell in "The Changing Role of the American Consumer', *Michigan Business Review*, January 1972, p. 23.
2. In the U.S.A., the Department of Commerce has used this concept.
3. *The Economic Times*, October 27, 1980.

**Cross Elasticity of Demand**

The effect of a change in the prices of related goods upon the demand for a particular commodity may be determined by measuring the 'cross elasticity of demand'. Cross elasticity of demand may be defined as 'the *proportionate change in the quantity demanded of a particular commodity in response to a change in the price of another related commodity.*' Thus the price of one commodity, say *Z*, is the independent variable whereas the quantity of another commodity, say *X*, is the dependent variable. The cross elasticity of demand can be measured by the following formula, *viz.*,

$$e_c = \frac{\frac{Qx_2 - Qx_1}{Qx_2 + Qx_1}}{\frac{Pz_2 - Pz_1}{Pz_2 + Pz_1}}$$

or $$e_c = \frac{\text{Proportionate change in the quantity purchased of X}}{\text{Proportionate change in the price charged for Z}}.$$

If cross elasticity is positive., the goods are said to be substitutes; if negative, the goods are complements.

**Cross-Elasticity of Prices**

If commodities are interrelated, a change in the price of one commodity may cause a change in the price of the other. The formula for measuring cross-elasticity of price may be stated as under:

$$P_xE_{py} = \frac{\frac{P_{y_2} - P_{y1}}{P_{y_2} + P_{y_1}}}{\frac{P_{x_2} - P_{x_1}}{P_{x_2} + P_{x_1}}}$$

For substitutes, the cross-elasticity of prices is positive and for complements, it is negative. Theoretically, the value of cross-elasticity of prices should range from +1 for commodities which are perfect substitutes to –1 for those which are perfect complements. In reality, however, the measure may go a bit beyond these limits, due to errors in data and to various extraneous factors that may be at work and which are not usually taken into account in simple studies.[1]

## D. ADVERTISING AND DEMAND

Advertising consists of those activities by which visual or oral messages are addressed to selected respondents for the purpose of informing and influencing them to buy products or services or to act or be inclined favourably toward ideas, persons, trade marks, institutions or associations featured. There are two important functions of advertising: *(a)* to shift the demand curve to the right and *(b)* to reduce the elasticity of demand. However, advertising has a cost and involves payment of requisite dues to publishers, broadcasters and others whose media are employed by the advertisers for services rendered.

The various activities included in advertising are the forms of messages carried in newspapers and magazines, on outdoor hoardings, on buses and trains, and in radio and television broadcasts. Also included are circulars of all kinds whether distributed by mail, by person, through tradesmen, or

1. Spencer, M.H., *Op. cit.*, p.140.

in the quantities demanded. The elasticity is more [illegible]



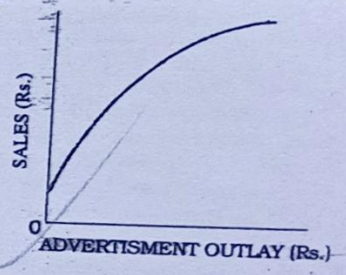
inserts in packages. Other forms are dealer help materials, window display and counter display materials and efforts, store signs, advertising motion pictures, novelties carrying advertising messages, labels and tags, etc.

The salient features of the advertising-sales relationship are:

1. A certain amount of sales is possible even without any advertising.

2. Other things, *i.e.*, price, quality, channels of distribution and similar factors affecting sales remaining the same, there is a direct relationship between the extent of advertisement and the volume of sales. Thus an increase in the expenditure on advertisement is likely to lead to an increase in sales.[1]

3. Up to a point, an increase in advertisement will lead to a more than proportionate increase in sales. But beyond this point, an increase in advertisement will lead to a less than proportionate increase in sales till the saturation point is reached after which there will be no increase in sales.[2]




The above features can be examined with the help of a digram. It will be seen that sales are positive even when the expenditure on advertisement is zero indicating that a certain amount of sales is taking place even without advertisement. With successive doses of expenditure on advertisement, the advertising-sales curve moves upwards. After a certain point, it is seen that the growth of the curve is at a declining rate, indicating that each successive increase in the expenditure on advertisement gives a diminishing return. Ultimately, the curve becomes flat indicating that the saturation point has been reached and there is no increase in sales due to an increase in the expenditure on advertisement. Advertisement beyond this point may even give negative results.

**Advertising Elasticity of Demand**

The expansion of demand by means of advertisement and other promotional efforts may be measured by advertising elasticity of demand, also called *promotional elasticity*. The promotional elasticity measures the responsiveness of demand to changes in advertising or other promotional expenses. The formula for its measurement is as given below:

$$e_a = \frac{\text{Proportionate change in Sales}}{\text{Proportionate change in Advertisement Expenditure}}$$

or $$e_a = \frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{A_2 - A_1}{A_2 + A_1}}$$

where $Q$ and $A$ stand for sales and Advertisement Outlays respectively.

**Factors Affecting Advertising Elasticity of Demand**

The advertising elasticity of demand would be affected by a number of factors, the important ones being:

1. The basic purpose of advertising is to create demand by information and persuasion and at times by trying to change people's taste. There is little doubt that advertisement very often succeeds in its attempt.
2. In fact, advertisement helps to increase sales more when a product is launched.

1. The stage of the product's market development, that is, whether it is a new product or a product with a growing market or with an established market.

2. The extent to which competitors react to the company's advertisement either by further advertising or by increased sales efforts.

3. The quality and quantity of the company's past and present advertising relative to that of the competitors, because variations in qualitative factors, say, the selection of advertising media, may obscure the effects of quantitative variations in advertising outlays. For example, Company *A* may increase its outlay on advertisement. At the same time, a competitor, Company *B*, changes its medium of advertisement from the local press to cinema slides in local picture houses. As a result, there has been an increase in the sales of company *B*. In the absence of this change, there might not have been an increase in Company *B*'s sales. On the other hand, the effect on Company *A*'s sales would have been different had company *B* not changed its medium of advertisement. But now it is not possible to isolate the effect of an increase in the advertisement outlay by Company *A* on its sales.

4. The influence of non-advertising determinants of demand such as growth trends, prices, incomes, etc., and the extent to which these can be successfully determined with a view to eliminate their effect in demand analysis.

5. The time interval that elapses between the advertisement expenditure and response of sales to the expenditure, which is difficult to predict because it depends upon the type of the product, the methods of advertisement, etc.

6. The delayed effect of company's past advertisement and the extent to which it affects current and future sales.

Since the objective of determining the advertisement elasticity of demand is to find out the effect of advertisement on sales as compared to the sales that would have been achieved without advertisement, it is necessary to isolate and eliminate the effect of these factors.

**Determining Advertisement Outlays**

Joel Dean has identified several ways in which advertising outlays are determined by businessmen in practice.[1]

(1) *Percentage of sales Approach.* Under this approach, the advertising outlay is determined as a fixed percentage of sales, past, current or expected, or the sales price.[2] The method is a convenient working formula. Also, this

1. *Managerial Economics*, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1951, pp. 364-375.

2. A study of 100 companies with aggregate sales of Rs.15,367 crores showed that they spent 1.61 per cent of the total net sales. The industrywise break-up of the advertising intensity shows soaps, toileteries, etc. at the top with 3.78 per cent. It was follwed by the miscellaneous group with 2.39 per cent and drugs with 1.64 per cent. Among the companies selected for the study, Hindustan Lever had the largest absolute expenditure on advertising— Rs. 40.28 crores, followed by Brooke Bond, Colgate-Palmolive, Pieco Electronics, Glaxo and Bajaj Auto. There were just 8 companies whose expenditure on advertising accounted for more than 5 per cent of the net sales. *Business and Political Observer*, September 16, 1991.

Balsara group spends up to 20-25 per cent of their sales turnover on advertising, yet they are not able to advertise as intensively as the established multinationals who spend only 3-4 per cent of their much larger sales turnover to advertise much more effectively. *Business India, April 25-May 11, 1989, p. 35.*

Faced with a demand recession, many durable consumer goods manufacturers kept on spending money on advertisement rather than reduce advertising. Reason—If you cut advertising during a recession, when things turn better, your



approach encourages competitive stability to the extent that rival firms tacitly agree to let advertising follow a close percentage of their sales, and thereby avoid costly advertising wars. However, it does not always have a sound economic basis, because past or present sales may not have much to do with the cost or worth of expanding sales further. It uses circular reasoning in viewing sales as the cause of advertising rather than as the result. It leads to determining advertising outlay by availability of funds rather than opportunities. It discourages an aggressive advertising policy. The advertising outlay will have to fluctuate according to year-to-year variations of sales militating against long-range advertising programmes. Finally, it does not encourage determining advertising outlays on a product-by-product basis or territory-by-territory basis but instead suggests that all outlays be determined on the basis of the same percentage of sales.

(2) *'All you can afford' Approach.* According to this approach, also known as 'Affordable Approach', the more profitable and more liquid the financial position of the business, the more advertising should be undertaken. Here, the advertisement outlay is determined as a percentage of profits or cash funds.

The method can be criticized on the ground that liquid resources have many possible uses both within and outside the business and other things being equal, they should be employed where they yield the highest return and not be blindly and arbitrarily earmarked for advertising.

(3) *'Return on Investment' Approach.* This approach recognizes that advertising increases immediate sales and, at the same time, contributes to the goodwill of the business by increasing future earning power. The expected stream of future cash flows resulting from today's advertising expenditure discounted at an appropriate rate of interest, enables its present value to be determined. Here, the difficulty remains, however, of identifying which of a business's cash flows are attributable to advertising. Another difficulty is that of separating the short-term effects of adevertising from the long-term. For instance, advertisements like, 'Det Washes Whitest' are principally designed to create a favourable brand image and to build up consumer loyalty from the long-run viewpoint as well.

(4) *'Competitive Parity' Approach.* This approach bases the firm's advertisement outlay on what other firms in the industry are spending, *e.g.*, the proportion of total industry advertising expenditure incurred by a particular firm would depend on its share of the total market. One argument in favour of this approach is that competitors' expenditures represent the collective wisdom of the industry. Another argument is that maintaining a competitive parity helps to prevent advertising wars. In oligopolistic market where rivalry is intense, such methods can be said to help towards stabilizing *market shares* and preventing dangerous competitive retaliation. The weakness of this method is that what rivals spend need not be relevant to the size of advertising outlays a particular firm should make in view of the firm's resources, opportunities, objectives and reputation.

(5) *'Objective and Task' Approach.* Under this approach, the amount to be spent on advertising is determined keeping in view the pre-determined objectives. This involves three steps: *(i)* define the objective, *i.e.*, the sales target to be achieved, or increasing brand awareness, say, by 26 per cent. *(ii)* outline the tasks, *i.e.*, the specific means and media of attaining the objective, and *(iii)* determine the cost of accomplishing these tasks. This

approach seems to be logical and on the basis of post-war survey in the U.S.A., was found to be the most widely used by the advertisers.[1] However, the most important problem is to determine what objectives are worth the cost of attaining them.

(6) *Marginal approach.* It is possible to apply the basic principles of marginal analysis to selling expenses including all forms of advertising, direct mailing, calls from salesmen, etc. In other words, it will pay to increase spending on sales promotion so long as the added cost of each increment of sales promotion effort is less than the additional gross profit it adds. This method of determining sales promotion expenditure is much superior to the crude rule of thumb methods still in common use.

The marginal approach can be explained with the help of a simple illustration.

*TABLE 7:* **Incremental Revenue from Selling Expenses**

| *Selling Expenses* | *Incremental cost* | *Units sold* | *Total Revenue* | *Cost of production* | *Total cost* | *Profit* | *Incremental Revenue from Selling Expenses* |
|---|---|---|---|---|---|---|---|
| (Rs.) | (Rs.) | (Rs.) | (Rs.) | (Rs.) | (Rs.) | (Rs.) | (Rs.) |
| 0 | — | 40 | 280 | 220 | 60 | — | |
| 100 | 100 | 80 | 560 | 340 | 440 | 120 | 160...(1) |
| 200 | 100 | 110 | 770 | 430 | 630 | 140 | 120...(2) |
| 300 | 100 | 130 | 910 | 490 | 790 | 120 | 80...(3) |

The illustration is based on the following assumptions:

*(a)* Price is fixed at Rs. 7 per unit;

*(b)* Fixed Cost is Rs. 100; and

*(c)* Marginal Cost is Rs. 3 per unit.

Now, 'Incremental Revenue' is determined as follows:

*IR* = (Price per unit × Additional units sold)—

(Marginal Cost × Additional units sold)

or (7× 40) - (3 × 40)=280-120=160 ...(1)

(7× 30) - (3 × 30)=210-90=120 ...(2)

(7 × 20) - (3× 20)=140-60=80 ...(3)

It will thus be seen that when advertisement outlays are made to the extent of Rs. 200, profits increase and Incremental Revenue is more than Incremental Cost. But, thereafter, the position is reversed.[2]

*Curb on Advertisement Expenditure.* The Government of India feel that extravagant and socially wasteful expenditure is often incurred on advertisement, publicity and sales promotion. In orde. to put a curb on such an expenditure, the Government of India decided to disallow a part of such expenditure in the computation of taxable profits during 1977-78 to 1980-81 and 1983 to 1986. Thus it is clear that the managerial discretion on

1. Dean, *op. cit.*, p. 370.

2. The term *marginal* is used where the increase in output takes place by *one* unit. Where, however, change in output occurs in terms of larger size, the term *"incremental"* is used. Also the term 'increment' is used where change takes place not in terms of output but in some other form, say, change of process, and as a result, revenue or cost changes.



advertisement expenditure may be limited by the Government. The managements may not be free to spend whatever they like on advertisement. It may not be out of place to mention here that India's expenditure on advertisement, as a proportion of GNP, is among the lowest in the world.

**Economic Implications of Advertising**

Advertising has a number of economic implications. Some of these are good and favourable but others are adverse and undesirable. Advertising therefore, has often become a matter of controversy.

*Informing Consumers.* Informative advertising makes markets more perfect than they would otherwise be. Such an advertisement informs the consumer about the market conditions, namely, the goods available in the market, their characteristics, the model best suited to the needs of the consumer, where to go for the lowest price, and so on. The consumer is thus helped to make more rational purchase decisions.[1]

*Broadening Market.* Further, advertising broadens the market by familiarising the consumer with new products, facilitating the task of the sales force and increasing the number of dealers prepared to deal in the products and stock them. All these tend to encourage further investment and innovation by businessmen resulting in a larger scale of operations and hence lower cost of mass production. Moreover, by making product information available to a larger number and wider distribution of consumers, advertising reduces the scope for earning local monopoly profits.

*Lowering Selling Costs.* One big advantage of advertising is its relatively low cost per contact. One newspaper advertisement, for example, frequently places the product before the eyes of many more prospective buyers than the equivalent expenditure on salesmen. Moreover, through advertising, expenditure on other forms of selling, say, salesmen, is rendered less necessary. By so reducing retail sales efforts per unit of retail sales, advertising leads to a reduction in selling costs.

*Encouraging Competition.* Advertising further tends to encourage competition. First, it enables firms both young and old to introduce new products and secure market acceptance for them much more rapidly than would be possible without advertising. Secondly, advertising may enhance effective entry of new product lines. Thirdly, advertising breaks monopolies by announcing the existence of alternative suppliers/products.

*Waste of Resources.* Advertising has, however, been criticized on several counts. In many cases, the cost of advertising far exceeds the cost of research and the cost of manufacturing. Again, a good deal of advertising aims not to inform but to misinform the consumer. It seeks to change their preference patterns through creating psychological obsolescence for certain products. It often aims at making the customers believe statements which may be scientifically unverifiable or even false. In India, this is particularly found in case of advertisements of baby foods, health tonics and cosmetics. For example, a food maker projected a brand name in an advertisement claiming that what

1. Advertising cost of baby food was estimated at 10 paise a kilo (priced Rs. 15 a kilo) and this included the cost of free copies of highly ionformative baby books which told mothers in unmistakable language that breast-feeding was far superior. *The Economic Times*, December 16, 1973.

he offers is equal to 3·9 litres of milk, or 1 kg. of mutton or 24 eggs. Advertising is also employed to sustain artificial product differentiation among goods which are physically similar. At the point where advertising departs from its real function of informing consumers and seeks to deceive people, it tends to become a waste of resources.

*Oligopoly and Market Concentration.* Critics of advertising further argue that it facilitates growth of oligopoly and market concentration. First, heavy expenditure heightens the barriers a new firm must overcome to enter an industry. A new firm without the resources to advertise heavily and overcome established preferences, is kept out of the business, no matter how good its product may be. Secondly, the costs of advertising exposures per unit of product sold are lower for firms with large sales volumes than those with small sales volumes. Thirdly, successive exposures are usually necessary for advertising to be effective but the ensuing advertising bill may not be within the means of small size firms. Finally, many advertising agencies allow substantial quantity discounts, say, as high as 30 per cent, to big advertisers, with the discount rate applying to advertiser's total advertising rather than to advertising of a particular product. For all these reasons, advertising tends to favour big size multi-product firms whose growth in revenues is substantial enough to support continuous heavy advertising but small firms seeking market acceptance for their products are at a handicap.

**Conclusion.** The various criticisms apart, advertising has come to occupy a significant role in modern economies. This is not to deny that in practice a good deal of advertising is irresponsible, mischievous and wasteful. Management, therefore, has a social responsibility towards minimising the undesirable implications of advertising. They must realise that advertising cannot sell a defective product or a poorly designed product. It is, however, necessary that deceptive advertisements are curbed through a proper legislation. For example, the Federal Trade Commission in the USA deals with all advertisements to ensure that claims are first proved before the advertisements are released for publication. In India, the M.R.T.P. Commission has very often restrained firms from making false claims in their advertisements. The Advertising Standards Council of India also examines complaints, pronounces judgement and takes follow-up action regarding misleading and objectionable advertisements.

1. *Economic Times*, Nov. 30, 1979.

# 5

# *Demand Distinctions*

Demand analysis must be designed for specific purposes. Conceptual distinctions help formulate both the purposes and the methods of empirical analysis and educated guesses. Certain important demand distinctions are:

1. Producers' goods and consumers' goods.
2. Durable goods and non-durable goods.
3. Derived demand and autonomous demand.
4. Industry demand and company demand.
5. Short-run demand and long-run demand.
6. Short-term demand fluctuations and long-term trends.
7. Total market and market segment.

## PRODUCERS' GOODS AND CONSUMERS' GOODS

Producers' goods are those which are used for the production of other goods—either consumer goods or producr goods themselves. Examples of such goods are machines, looms, tools and implements, locomotives, ships, etc.

Consumers' goods can be defined as those which are used for final consumption. They satisfy the consumers' wants directly. Examples of consumers' goods can be ready-made clothes, prepared food, residential houses, etc. Consumer goods may be further sub-divided into durable and non-durable goods. The non-durable consumer goods are those which cannot be consumed more than once; for example, sweets, bread, milk, a bottle of Campa-Cola, photoflash bulb, etc.[1] They are also called 'single use goods'. On the other hand, durable consumer goods are those which go on being used over a period of time, *e.g.*, a car, a refrigerator, a ready-made shirt, an umbrella and an electric bulb. Of course, the lengths of time for which they can go on being used vary a good deal. A shirt may last a year or two. A car or a refrigerator may provide fairly useful service for 10 to 15 years. Old furniture can go on being used almost indefinitely so long as it is properly looked after. Durable goods are necessarily durable but not all non-durable goods are perishable. For example, coal can be stored indefinitely.

Some of the distinctive characteristics of durable consumers' goods are given below:

1. Certain durable consumer goods require the existence of special facilities for their use, *e.g.*, the use of cars and trucks requires the existence of petrol pump stations and the use of television sets requires the prior establishment of telecasting stations. This characteristic, therefore, makes the demand for these goods dependent upon the existence of these facilities. For

1. A particular medicine may save a man's life so that its effects remain as long as he lives. Yet the medicine is a non-durable good. So also, you always remember your stay in a particular hotel, yet the service provided by the hotel is non-durable.

example, television sets can be sold in India in the vicinity of telecasting centres only, and not in places far removed from these centres.

2. Consumer durables are often consumed by more than one person. For example, several members of a family can use a car, radio or refrigerator. The significance of this distinctive feature lies in that the demand for these products also depends upon family needs and characteristics like size, age distribution, etc.

3. While purchases of most non-durable consumer goods are made at fairly regular intervals, purchases of durable consumer goods are made at irregular intervals.

Producers' goods can also be classified into two categories: consumable and durable. The examples of the former are: coal, oil, etc., whereas examples of the latter are machines and equipment.

For consumer's goods, buyer's income is the factor most nearly universal, since it determines the amount of cash in the buyer's hands and strongly affects their expectations of future income. The relation of demand to price, advertising, competition and speculation hinges more on the nature of the product. Again, factors that are dominant for some products may be quite irrelevant or unimportant for others.

The measurable determinants of demand for producers' goods usually differ from those of consumers' goods. They also vary considerably among products. Typically, personal income is displaced by business profits or by business activity. For example, there is a close relation between construction activity and the demand for cement.

Generally speaking, the reason for expecting distinctive demand behaviour for producers' goods are three:

1. Buyers are professionals and hence more discriminating price-wise, quality-wise and sensitive to substitutes.

2. Their motives are more purely economic; products are bought not for their own sake but for their profit prospects. As such,their purchase are less susceptible to "pressure advertising" but more sensitive to small price differences.

3. Demand, being derived from consumption or from production, fluctuates differently and generally more violently.

Though this distinction between producers' and consumers' goods serves a useful purpose, it is purely arbitrary. Whether a particular commodity is a producer good or consumer good depends upon who buys and why and hence the distinction is bound to be indistinct. For example, sugar in the case of a confectioner is a producer good, whereas in the case of a householder, it is a consumer good. However, not every purchase is made on grounds of economics alone. For example, while purchasing a table and a chair for the top executive, the question of prestige becomes more important than that of cost. Similarly, many consumers' goods such as cars, refrigerators, air-conditioners, etc., have many of the important characteristics of producers' goods in that they are durable and technically complex.

## DURABLE GOODS AND NON-DURABLE GOODS

Durable products present more complicated problems of demand analysis than products of non-durable nature. Sales of non-durables are made largely to meet current demand which depends on current conditions. Sales of durables, on the other hand, add to the stock of existing goods that are still



serviceable and are subject to repetitive use. Thus it is a common practice to segregate current demand for durables in terms of replacement of old products and expansion of total stock.

Demand analysis for durable goods is not simple. Both replacement and expansion have manifold sets of demand determinants. When expansion demand spurts, the value of used equipment goes up; and replacement demand falls. If the expansion demand falls, scrappage rate is higher than the level of new production. The most important determinant for replacement is obsolescence due to technological developments. Physical deterioration is less important in cases where there is a race for modernization.

For consumer products, and to a certain extent for producer goods too, style, convenience and income play a dominant role in demand. *For major innovations*, demand depends upon financial exigencies and rivalry of alternative investments.

While purchasing a durable good, besides current prices and incomes, the consumer thinks of maintenance and operating costs in relation to his future income and his other demands along with expectation about improved product designs. This is why price concessions are offered to clear out stocks likely to become obsolete and unsaleable when faced with new models. For example, in the U.S.A., old models of cars and sold at heavy discounts.

One characterstic of the demand for durables is a volatile relation to business conditions; since current output of a durable product provides only a small fraction of the total current services demanded of that kind of product, sales are hyper-sensitive to small changes in the demand for the service. If we assume, for example, that normal automobile production is uded (1) to replace 10 per cent of the existing stock of cars, and (2) to expand car population by 5 per cent, then a 3 per cent increase in the demand for motor transaction will raise the new car demand by about 20 per cent.[1] This phenomenon is known as the Acceleration Principle.

Besides durable consumers' goods, the acceleration principle is also applicable to durable producers' goods.

*Producers' Goods.* Suppose the demand for consumer goods expands.Then there will be a need to expand the production of capital goods in order to produce the consumer goods. This, if more bicycles are demanded, more machinery will be required to produce bicycles.

Now, suppose that in a certain year there exist 10 lakh cycles with an average life of twenty years. This means 50,000 cycles will be produced in that year for replacement. If the demand for cycles goes up to 11 lakhs in the next year, 50,000 cycles will be produced for replacement *plus* 1 lakh to meet the increase in demand. Thus a10 per cent increase in demand for cycles (from 10 lakhs to 11 lakhs) leads to a 200 per cent increase in the demand for machinery required for cycle manufacture.

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1. To explain, suppose that the exisiting number of cars in use is 10,000. The replacement demand at the rate of 10 per cent would be 1,000. Further, the expansion in demand for cars at the rate of 5 per cent would amount to 500 cars. Thus the existing total production of cars would be 1,500. Now if there is an extra 3 per cent rise in the demand for cars, the additional demand for cars would amount to 300 cars, *i.e.*, 20 per cent of the existing production of 1,500 cars.

## DERIVED DEMAND AND AUTONOMOUS DEMAND

When the demand for a product is tied to the purchase of some parent product, its demand is called 'derived'. For example, the demand for cement is derived demand, being directly related to building activity. Demand for all producers' goods, raw materials and components is derived. So also, the demand for packaging material is a derived demand. However, it is hard to find a product in modern civilization whose demand is wholly independent of all others. Hence this distinction is one of degree only. Derived demand is generally supposed to have less price elasticity than autonomous demand. This is because of dilution by other components whose prices are sticky. A 10 per cent cut in the price of steel would cause only about 1 per cent cut in the price of car, other costs remaining the same (assuming that steel accounts for 10 per cent of the cost of the car). Further, the less costly the component is in relation to the total cost of the final goods, the lower is the price elasticity likely to be in the case of the component with derived demand. To illustrate, the demand for glue used for book binding is perhaps quite inelastic as a big change in the price of glue will have only insignificant effect on the total binding cost. Some products are *so closely tied* to others in their use that they have *no distinctive demand determinants* of their own. For example, antennas are exclusively used with T.V.s and that too in the proportion of one to one. As such there are no distinctive determinants of the demand for antennas.

*Derived demand facilitates forecasting* when proportions of the two products are fairly fixed. Yet, in some cases, derived demand may not provide a very reliable basis. For example, capital goods (plant and equipment) have a derived demand, but variations in the actual (expected) intensities of use are so wide that analysis in terms of finished product demand is either too broad or too approximate to be of much help. For example, the demand for looms in the cotton textile industry would normally be determined by the demand for cotton textiles. Yet it may not give the correct indicator as the looms may be used in double or triple shifts and the number of looms required may be reduced roughly to half or one-third. The recession in motor car industry forced tyre manufacturers to cut production and reduce stocks.[1]

In cases where the proportion between the parent and the dependent goods is not fixed, it is more difficult to determine the derived demand for the dependent goods on the basis of the demand for parent goods. So also, if the number of uses to which a particular product can be put fluctuates, it is difficult to estimate the derived demand on the basis of the demand for parent product. Electric motors and sulphuric acid provide good examples as they can be used in a number of industries.

## INDUSTRY DEMAND AND COMPANY DEMAND

The term industry demand is used to denote the total demand for the products of a particular industry, *e.g.*, the total demand for steel in the country. On the other hand, the term company demand denotes the demand for the products of a particular company, *e.g.*, demand for steel produced by TISCO.

It may be noted here that within an industry, the products of one manufacturer can be substituted by products of another manufacturer even though the products themselves might be differentiated by brand names. Thus

1. *The Economist*, January 10, 1981.



an industry covers all the firms producing similar products which are close substitutes to each other irrespective of differences in trade names, *e.g.*, Dalda, Rath, Panghat and No.1. Obviously, firms producing distant substitutes would be excluded from the purview of the industry. Ghee and groundnut oil, being used as cooking media, can be substituted for vanaspati, yet they are only distant substitutes and will be excluded from vanaspati industry as such.

An industry demand schedule represents the relation of the price of the product to the quantity that will be bought from all the firms. It has a clear meaning when the products of the various firms are close substitutes. It becomes vague when there is considerable product differentiation within the industry.

Industry demand can be classified customer group-wise; for example, steel demand by construction and manufacture, airline tickets by business or pleasure and geographic areas by States and districts.

From the managerial point of view, mere industry demand is not enough. What is more important is the company's share in the total industry demand and the relationship between the two, as also the relationship between the company's share of the demand and that of the competing firms. However, projection of the industry demand is the first step in forecasting company's sales.

The industry demand schedule is a useful guide for studying the demand for a company's products. The relation of the individual company's sales to its price should be determined by the industry demand schedule. The degree of relationship will depend upon the competitive structure of the industry.

*(i) In a single firm monopoly*, the company demand curve would be the same as the industry demand curve. However, anything resembling a single firm monopoly is hard to find in modern industry.

*(ii) In homogeneous oligopoly*, when sellers are few and their products are standardized, business is highly transferable among rivals, *e.g.*, aluminium, steel and cement producers. The company's own *demand curve could be uncertain*, depending upon what its rivals do. What usually happens is that the sellers charge the same price to stay in the market. However, it must be noted that though there are many industries where a few large sellers dominate, very often their products are not uniform enough.

*(iii) In differentiated oligopoly where there are a few sellers with differentiated products* (e.g., radios, refrigerators and cars), the demand for an individual company's product is less closely related to the industry demand, and it has got more leeway in manipulating its price differentials. The company may have an independent demand function which reflects the impact of variation in price-spreads, product superiority and/or relative efficiency or the amount of promotional outlay on the company's share of the market.

*(iv) In pure competition*, the industry demand curve is *completely divorced* from that of the individual seller. He has no choice but to follow the market price of the rivals. Hence *his demand curve would be a horizontal straight line at the level of the market price.*

*(v) In monopolistic competition* (which includes all competitive situations except pure competition), where there are many sellers with differentiated products, *the industry demand curve has little meaning.* When the degree of product differentiation is large, the individual seller's demand function is like that of a single-firm monopolist (he does not worry about the effect of the prices his

which is a prerequisite for the use of the commodity. Frozen fruits and vegetables may be cheaper and more convenient than tinned ones. But to take advantage of the lower price of frozen food, one has to invest money in purchasing a refrigerator with freezer compartments.

Thus, it can be seen that long-run growth is not wholly dependent on price-cuts. Yet price-cuts can accelerate the rate of demand considerably.

## SHORT-TERM DEMAND FLUCTUATIONS AND LONG-TERM TRENDS

From managerial viewpoint, it becomes useful to analyse time series of demand into two parts, *viz.*, trend and demand fluctuations.

Factors affecting the two types of changes are different. In short-term or year-to-year fluctuations, much of the setting stays constant, *e.g.*, competitive structure, market position, quality and sometimes even prices (relative to substitutes and competitors, if not absolutely). The problem can then be narrowed down to the relation between changes in sales and a few strategic variables, such as income, business activity and competitive price differentials. For the long-term trend, in contrast, everything is fluid, and the effects of year-to-year determinants are buried by basic changes in the framework, *e.g.*, shifts in tastes, technology and way of life.

Forecasts of year-to-year swings provide the basis for planning the firm's operations, *i.e.*, production, purchasing, manpower, inventory, cash, etc. Projections of long-range demand trends are useful primarily for planning investments and other long-term commitments, *e.g.*, the decision to expand capacity. It requires the estimation of future growth. Though the margins of uncertainty are wide and are accentuated by unknown expansion plans of rivals and by risks of obsolescence of products and methods, the decision hinges on the projection of a growth trend through extrapolating the past into the future.

## TOTAL MARKET AND MARKET SEGMENT

Demand for a certain product has to be studied not only in its totality but also by breaking it into different segments, *viz.*, geographical areas, sub-products, uses of the product, sensitivity to price, distribution channels, size of the customers, etc. This division of demand into different segments gives rise to the concept of market segment as distinguished from the total market. Thus 'total market' refers to the total demand for a product whereas 'market segment' signifies a part of it.

Some problems, such as sales forecasting, call for an analysis of the total market. Other problems, notably those of pricing, promotion and distribution, call for analysis of separate market segments that have homogeneous demand characteristics. Each of these market segments may differ significantly in respect of delivered prices, net profit margins, substitutes, competition, seasonal patterns and cyclical sensitivity. For manipulating prices, promotion, product or distribution channels in order to meet or exercise sales competition, a segment concept of demand is often more appropriate than the 'total market' concept that has greater coverage.

## DISTINCTIVE TYPES OF ELASTICITY

From the managerial viewpoint, it is considered useful to distinguish certain sub-types of the elasticity of each demand determinant. The important



ones are: industry elasticity, market share elasticity and expectations elasticity.

1. *Industry elasticity* refers to the change in total industry sales with a change in the general level of process for the industry as a whole. The industry demand has elasticity with respect to competition from other industries, *e.g.*, oil, gas and coal.

2. *Market share elasticity* relates the change in company's share of the industry-wide sales to the price differential between the company's price and the industry-wise price level.

3. *Expectations elasticity* refers to the responsiveness of sales to buyers' guesses about the values of demand determinants, such as the future price of a commodity or of its substitutes, future incomes of buyers, prospects of easy availability or otherwise in the future, or future promotional outlays. Price and income expectations are perhaps the most important of them. But in the context of scarcity economy as in India, the future availability tends to become very important in the case of certain commodities like wheat and sugar.

From the viewpoint of a particular firm, the market share elasticity is perhaps the most important. It is influenced by a number of factors like rivals' changes in price and promotional efforts—qualitative as well as quantitative. Rivals may constitute a single competitor or several of them together.

rivals charge upon his price). It differs from the monopolist in that the demand for any single seller may be affected by the number of rivals, their products and prices. Thus the demand curve for a firm in such a cometitive situation has more price elasticity than the industry demand curve. An important example would be that of drycleaners.

**Market Share Concept of Demand**

The company demand may also be expressed as a percentage of the industry demand. The percentage so arrived at would denote the company's market share for the product. The company demand expresses the quantity demanded in absolute terms while market share expresses it in relative terms. Suppose that at a given price, the demand for petrol in the country is 5 million litres, and Indian Oil supplies 2 million litres, *i.e.*, 40 per cent of the total demand for petrol. The industry demand at that price is 5 million litres, the company demand is 2 million litres and market share of the company is 40 per cent.M/s Harbans Lal Malhotra controls 81 per cent of the razor blade market.[1] The concept of market share becomes important because the industry demand being the result of vast impersonal economic forces, is usually beyond the control of the individual company, but the market share enjoyed by it is subject to manipulation.[2] Market share information can also be helpful in persuading people to buy a company's shares.

This concept of demand is most usable in mature, well-defined industries with relatively homogeneous products, *e.g.*, steel and cement. The objective of any firm is to improve the market share of the company or at least to maintain it. The first step is to forecast industry sales. The next step is to plan a market strategy to improve or at least maintain the market share. This is largely done by keeping abreast of competitive developments, *e.g.*, overtaking product innovators, meeting price-cutters and countering aggressive advertising.

*The factors* which determine the market share are:

1. *Price-spread or price differential.* It means the differences between the price charged by one company and the prices charged by other companies. If a company's price is lower than the prices charged by other companies, it would to able to capture a greater market share of the industry demand. Therefore, the higher the price differential, the greater the market share.

It may, however, be noted that the responsiveness of the market share to price differential will be insignificant up to a point due to the stickness of the buyers to a certain extent. But as the price differential increases, there will be a tendency for the market share to increase. And the responsiveness of the market share rises sharply when the price differential increases beyond a critical point. The critical point varies with areas and possibly also with the buyers' affluence. Responsiveness of the market share also depends upon how well publicised and easily available the lower price is.

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1. *India Today*, March 1-15, 1980.
2. In developed countries, monthly market share of leading producers of important prodı ıcts is widely reported in the press. For example,the market share of different car prod ıcers in the British market in February 1977 was reported to be as follows: British Leyland—27.7 per cent, Ford—25.5 per cent, Vauxhall—10.6 per cent, and Chrysler—6.1 per cent. *Daily Telegraph*, March 5,1977.



2. *Promotional expenditure.* It denotes the amount spent for the promotion of sales by a particular company. As we have already seen, there is a tendency for the sales to increase with an increase in promotional outlays. As a result, the market share is likely to go up with an increase in promotional outlays.

Very often a particular industry may undertake collective advertisement to promote the sales of the industry as a whole, *e.g.*, advertisement on behalf of the cigarette industry. To maintain its market share, a particular producer will undertake an individual advertisement in addition to the aggregate advertisement.

3. *Product improvement.* It may also be adopted to increase the market share. The improvement may be real or illusory. Sometimes, the improvement may take the form of more attractive packaging though the real contents may be the same.

Asian Paints made a consistent endeavour to increase its market share not only by continuous product innovation but by undrtaking higher promotional campaigns. It spent Rs.37 lakhs in 1977 as against Rs. 20 lakhs in 1973.[1] Chemicals and Fibres of India tried to retain its market share by concentrating its attention on improvement of the fibre and on textile technology.[2]

**SHORT-RUN DEMAND AND LONG-RUN DEMAND**

Short-run demand refers to the demand with its immediate reaction to price changes, income fluctuations, etc. Long-run demand is that which will ultimately exist as a result of the changes in pricing, promotion or product improvement, after enough time has been allowed to let the market adjust itself to the new situation. For example, if electricity rates are reduced, in the short run *existing* users of electrical appliances will make greater use of these appliances but in the long-run, *more* and *more people* might be induced to use these appliances ultimately leading to a still greater demand for electricity. The distinction is important in a competitive situation. In the short-run, the question is whether competitors will follow suit; while in the long-run, entry of potential competitors, exploration of substitutes, and other complex and unforeseeable effects may follow.

The factors responsible for causing differences between short-run demand and long-run demand fall in *two* categories:

1. *Time-lags in information and experience.* There may be delay in knowing about relative changes in the prices of substitutes. There may also be delayed action on the purchasers in response to the price-changes, because, in practice, consumers' use-patterns are sticky and sometimes additional research and alteration in the product becomes necessary before advantage of new prices can be taken. These lags are greater in cases where the products whose prices have changed are new. Hindi telegrams are cheaper than the telegrams in English. Yet most people still continue to send telegrams in English partly because of their ignorance of the fact that it is economical to send a telegram in Hindi and partly because of sheer habit of sending telegrams in English.

2. *Capital investments required on the part of consumers to change their consumption patterns.* Quite often, to take advantage of a price change, investment has to be made in acquiring additional equipment or installation

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1. *The Economic Times*, November 15,1978.
2. *The Economic Times*, August 28,1979.

# 6

# Demand Forecasting

Accurate demand forecasting is essential for a firm to enable it to produce the required quantities at the right time and arrange well in advance for the various factors of production, *viz.*, raw materials, equipment, machine accessories, labour, buildings, etc. Some firms may as a policy produce to order but, generally, firms produce in anticipation of future demand. Forecasting helps a firm to assess the probable demand for its products and plan its production accordingly. In fact, forecasting is an important aid in effective and efficient planning. It can also help management in reducing its dependence on chance.

Demand forecasting is also helpful in better planning and allocation of national resources. Because of unrealistic estimate of projected demand and production, India had to spend in 1978 Rs. 1,000 crores on imports of even essential goods.[1]

Demand forecasting is very popular in industrially advanced countries where demand conditions are always more uncertain than the supply conditions. In developing countries, however, instead of the demand, supply is often the limiting factor. High prices and black markets point to supply bottlenecks. Naturally, in a country like India supply forecasting seems to be more important than demand forecasting. However, with the relaxation of industrial licensing regulations and economic liberalization in general in recent years, increasing competition has already begun to change the situation in India as well. Competition has spread to most areas except those where massive investment is required. In such areas, supply is far in excess of demand and the producers have begun to battle for the market place. Thus, demand forecasting is bound to become important in India also.

The National Council of Applied Economic Research has made demand forecasts for a number of products (consumer as well as industrial) on a macro-level. These forecasts can be helpful in determining industry demand.

## FACTORS INVOLVED IN DEMAND FORECASTING

There are at least six factors involved in demand forecasting:

1. How far ahead? The problem is solved by having both short-run forecasting, usually defined as covering any period up to one year, and long-run forecasting covering a period of 5, 10 or even 20 years.

How far ahead can the long-term forecast go, depends upon the nature of the industry but, beyond ten years, the future becomes so uncertain that the projection becomes rather dubious. However, because of the close link with capital expenditure forecasting, it may be necessary to look 20 years ahead

1. George, Fernandes, former Union Minister of Industry, *The Economic Times*, January 7, 1979.



in case of certain industries. For example, petroleum companies, shipping companies and paper mills, in view of the long life of the fixed assets, the very high capital costs involved and the possibility of profit only in the distant future, do have to forecast well deep into the future.

Short-term forecasting may cover a period of three months, six months or one year, the last being the most usual. Which period is chosen depends upon the nature of the business; when demand fluctuates from one month to another, a very short period should be taken. However, here too, depending upon the nature of the business, if stocks can be built up in the slack sales period, this may be preferable to a fluctuating level of production. The latter may cause problems of labour and machine utilization which could be avoided if production is continued during the slack period.

Instead of defining short-term and long-term forecasting in terms of different periods of time,[1] an alternative method is to associate them with certain types of decisions or objectives to be met. Accordingly, *short-term forecast* is one which provides information for tactical decisions; it is, therefore, concerned with day-to-day operations *within the limits of resources currently available*. A *long-term forecast* is one which provides information for major strategic decisions; it is concerned with *extending or reducing the limits of resources*.[2] For example, if it is intended to establish a factory, and it is thought that the time required to build, equip and bring it into operation will be five years, then the forecast of the demand for the products to be made in the factory must start five years ahead, and may be projected for a further five-year period in order to establish the viability of the project. Thus the time period involved will be ten years.

When it is intended to replace plant or to buy new or improved machines, the period chosen will depend upon the expected life of the plant or machinery, the time required to purchase and to bring it into use, and the time required for the capital outlay to be recovered.[3]

2. Demand forecasting may be undertaken at three different levels:

(a) *Macro-level* concerned with business conditions over the whole economy measured by an appropriate index of industrial production, national income or expenditure. Such external data constitute the basic assumptions on which the business must base its forecasts.

(b) *Industry-level* prepared by different trade associations.

(c) *Firm-level* which is the most important from managerial viewpoint.

3. Should the forecast be general or specific? The firm may find a general forecast useful, but it usually needs to be broken down into commodity/product-wise forecasts and forecasts by areas of sale.

4. Problems and methods of forecasting are usually different for *new* products from those for products already *well established* in the market, for which sales trends are known and the competitive characteristics of the product well understood.

1. Different periods of time may also be referred to as 'horizons' in business planning.
2. Albert Battersby, *Sales Forecasting*, 1970, Pelican Books, pp. 7-8.
3. Reginald May, 'Forecasting, Planning and Pricing', in *Business Economics*, M.H. Cadman, (Ed.), p. 31.

5. It is important to classify products as producer goods, consumer durables, or consumer goods and services. Economic analysis indicates distinctive patterns of demand for each of these different categories.

6. Finally, in every forecast, special factors peculiar to the product and the market must be taken into account. The nature of the competition in the market, how far the situation is complicated by uncertainty or non-measurable risk and the possibility of error of inaccuracy in the forecast must be seriously considered. Political developments such as general elections are also important.[1] Sociological factors are of great importance in some markets, *e.g.*, in the case of women's dresses. Likewise, the role of psychology in demand can hardly be understated. What people think about the future, their own personal prospects and about products and brands are vital factors for firms and industries.

## PURPOSES OF FORECASTING

The purposes of forecasting differ according to types of forecasting: short-term forecasting and long-term forecasting.

### Purposes of Short-term Forecasting

*(i)* Appropriate *production scheduling* so as to avoid the problem of over-production and the problem of short supply. For this purpose, production schedules have to be geared to expected sales.

*(ii)* Helping the firm in *reducing costs of purchasing raw materials* and controlling inventory by determining its future resource requirements.

*(iii) Determining appropriate price policy* so as to avoid an increase when the market conditions are expected to be weak and a reduction when the market is going to be strong.

*(iv) Setting sales targets and establishing controls and incentives.* If targets are set too high, they will be discouraging salesmen who fail to achieve them; if set too low, the targets will be achieved easily and hence incentives will prove meaningless.

*(v)* Evolving a suitable advertising and promotion programme.

*(vi) Forecasting short-term financial requirements.* Cash requirements depend on sales level and production operations. Moreover, it takes time to arrange for funds on reasonable terms. Sales forecasts will, therefore, enable arrangement of sufficient funds on reasonable terms well in advance.

### Purposes of Long-term Forecasting

*(i) Planning of a new unit or expansion of an existing unit.* It requires an analysis of the long-term demand potential of the products in question. A *multi-product firm* must ascertain not only the total demand situation, but also the demand for different items separately. If a company has better knowledge than its rivals of the growth trends of the aggregate demand and of the distribution of the demand over various products, its competitive position would be much better.

1. For instance, in 1989, elections came as a big boost to the State-owned Hyderabad Allwyn with orders worth Rs. 7·9 crores for ballot boxes. It meant doubling of turnover of company's Appliances Division which recorded just Rs. 7 crores in the previous year. *Economic Times*, November 13, 1989, p. 15.



*(ii) Planning long-term financial requirements.* As planning for raising funds requires considerable advance notice, long-term sales forecasts are quite essential to assess long-term financial requirements.

*(iii) Planning man-power requirements.* Training and personnel development are long-term propositions, taking considerable time to complete. They can be started well in advance only on the basis of estimates of manpower requirements assessed according to long-term sales forecasts.

The demand forecasts of particular products may also provide a guideline for demand forecasts for related industries. For example, the demand forecast for cotton textiles may provide an idea of the likely demand for the textile machinery industry, dyestuff industry as also for ready-made garments industry. At the macro-level, demand forecasts may also help the government in determining whether imports are necessary to meet any possible deficit in the domestic supply, or in devising appropriate export promotion policies if there is a surplus. Thus, demand forecasts are useful to the industry as also to the government.

## DETERMINANTS OF DEMAND

1. **Non-durable consumer goods.** There are three basic factors influencing the demand for these goods:

(A) *Purchasing power.* This is determined by *disposable personal income* (personal income – direct taxes and other deductions). Data on aggregate personal income and personal disposable income are published by the Central Statistical Organization (C.S.O.). Some people suggest the use of *discretionary income* in place of disposable income. Discretionary income can be estimated by subtracting three items from disposable income, *viz.*, imputed income and income in kind, major fixed outlay payments such as mortgage debt payment, insurance premium payments and rent, and essential expenditures such as food and clothing and transport expenses based upon consumption in a normal year. Discretionary income can be quite an important determinant in case of consumer non-durables which are luxuries.

(B) *Price.* The price factor is another important variable to be included in demand analysis. Here, one has to consider the prices of the product and also its substitutes and complements. One may also consider the price differences between the product concerned and its substitutes and complements.

Price as a determinant of the volume of sales of consumer non-durables is sometimes more important through cross-elasticity (involving substitute products) than it is directly in terms of price elasticity. Direct price elasticity can be expected to be more important with respect to those consumer non-durables which are capable of storage and are free from risks of changes in styles.

(C) *Demography.* This involves the characteristics of the population, human as well as non-human, using the product concerned. For example, it may pertain to the number and characteristics of children in a study of the demand for toys or the number and characteristics of automobiles in a study of the demand for tyres or petrol. In fact, it involves distinguishing between the total market demand and market segments. Such segments may be derived in terms of income, social status, sex, age, male-female ratios, urban-rural ratios, educational level, geographic location, etc. The segment, when quantified, can be used as an independent variable affecting the demand for the product in question.

Demand can be forecast by employing the following formula:

$$d = f(Y, D, P)$$

where $d$ is demand, $Y$ is disposable income, $D$ is demography, and $P$ is price.

The various determinants of the demand for cotton textiles can provide a good illustration. The demand for cotton cloth is a function of the price of cotton cloth, prices of substitute commodities and the income of consumers. It bears a negative relationship with the price of cotton cloth and with the prices of complementary commodities; on the other hand, a positive relationship exists with the prices of substitute commodities and with income. However, over a period of time, a change may take place in some or all of these factors. For example, population may increase and fashions and consumer preferences may undergo a change. But in a developing country like India, prices of foodgrains constitute an important determinant of the demand for cloth. Since the demand for food is inelastic, any increase in the food prices leads to a corresponding increase in the expenditure on food reducing the part of income available for purchasing other goods including cotton cloth. This leads to a cut in the demand for cloth. Thus food prices exert a negative influence on the demand for cloth.

2. **Durable Consumer Goods.** The important considerations in the forecasting of demand for durable consumer goods are as under:

(A) The consumer has to make a choice between: *(a)* using the goods longer by repairing it, if necessary, or *(b)* disposing it of and replacing it with a new one. For example, a person may replace his black and white TV by selling it or just exchanging it for a colour TV after paying the difference in prices. The choice may depend upon non-economic factors like social status, prestige, etc., or on economic factors like income and obsolescence. In periods of shortage, there is no alternative but to continue using the old product.

(B) These goods require special facilities for their use, *e.g.*, roads for automobiles, and electricity for refrigerators and TVs. The existence and growth of such facilities is an important variable for determining their demand.

(C) To the extent that the consumer durable is used by "household" rather than on an individual basis, the total household figures are more important than total population figures (and changes therein). The few consumer durables (for example, electric shavers) that are used individually could be expected to depend more on population than on households. Disintegration of joint Hindu family has led to an increase in the number of households.[1]

(D) As consumer durables are used by more than one person, the decision to purchase may be influenced by family characteristics, such as the size of families and the age distribution of adults and children as well as price, income and other considerations.

(E) The total demand consists of: *(a)* a new-owner demand, and *(b)* a replacement demand. The replacement demand tends to grow with the growth in the total stock with the consumers. Once a person gets used to a thing, he is unlikely to give it up at some future date. This makes replacement demand regular and predictable. For certain well-established products, life expectancy tables have been prepared in advanced countries in order to estimate the average replacement rates. When purchasing power increases, the scrappage rate tends to be high and *vice versa*.[2] Again, when demand exceeds production, scrappage rate is lower.

1. The number of households in India was 13·43 crores in 1988.
2. The boom in stock market in 1992 led to an increase in incomes and people flush with funds preferred new cars rather than used ones.



But as production catches up, the scrappage tends to increase. The total demand is symbolically stated as $d = N + R$, where $N$ is New-owner Demand and $R$ is the Replacement Demand. Each of these independent variables may be forecast separately. The purchasing power, the number of families, and some other factors depending on the product concerned, set an upper limit to the maximum or the optimum ownership level. It is the level towards which the actual volume of consumer stock tends to gravitate. The difference between optimum and the actual stock shows the growth potential of the demand for durable goods.

(F) *Price and credit conditions.* The ratio of price to the average life of the product should be considered. If the average life is high, the principal effect would be to dampen the influence of price. Again, changes in credit terms can offset a price increase: lowering the cash-down payment or extending the credit period or reducing the rate of interest.[1]

The availability of hire-purchase facility tends to push up the demand for consumer durables. Western countries have had this facility as a matter of routine. In fact, extension of credit is used as a sales promotion measure. This facility has now been extended in India as well. Many firms specialise in selling goods on hire-purchase. The names of Zarapkars of Bombay and V.G. Paneerdas of Madras need a special mention in this respect. Among the manufacturers, the Indian Sewing Machine Company, the manufacturers of Singer, claim to have pioneered hire-purchase in India.[2] Hawkins Pressure Cookers are also available on hire-purchase basis. The intensified competition between car and two-wheeler manufacturers has led to many firms extending credit for their purchase.

The relative importance of these various factors will vary from country to country. For example, the demand for refrigerators in India is mainly a function of income while in the U.S.A., it is a function of new houses built.

Forecasting demand for consumer durables presents some difficult problems. Purchases of consumer durables are rather discretionary. They are not made on the spur of the moment but after considerable deliberations among members of the family. These deliberations very often involve choice among many competing consumer durables. Again, usually several months elapse between the formation of the idea and the culmination of the purchase decision. Thus durables are bought sporadically. Moreover, there is no compelling need to make these discretionary purchases at any given time.[3] They are very often made at unevenly spaced intervals of time. If there are expectations of prices going up, these purchases may be speeded up or else they may be postponed. So also, the discretionary purchases may be postponed if there are reports of impending product improvements, which is particularly the case in automobiles in foreign countries.

3. **Capital Goods.** Capital goods are used for further production. (A particular commodity may be a producer good for one but consumer good for the other). As the demand for capital goods is a derived one, it will depend upon the *profitability of industries* using the capital goods (called user industries), *the ratio of production to capacity* in the user industries, and *the level of wage rates*. When

1. The easy availability of credit from financial institutions has boosted the demand for new cars. By paying around Rs. 35,000 cash down, a customer could drive a new car and pay approxmately Rs. 4,000 a month for the next 4 years.
2. *Business India*, December 8-21, 1980, p. 26.
3. See Professor Katona's study referred to on page 49.

wage rates rise in relation to other costs, the management will seriously consider further investment in labour-saving equipment.

In the case of particular capital goods, demand will depend upon *the specific markets they serve and the end uses for which they are bought.* The demand for textile machinery will, for example, be determined by the expansion of textile industry in terms of new units and replacement of existing machinery. New demand as well as replacement demand will have to be considered. The demand for commercial vehicles depends upon: *(i)* The scrappage rate, *(ii)* the availability of vehicles, *(iii)* economics of movement by road *vis-a-vis* rail, *(iv)* availability of bank finance to the prospective customers, and *(v)* growth pattern of the economy.

The demand for cable extruders would depend primarily on the demand for cables which in turn would be linked to electrification programmes, Government spending, etc. For estimating the demand for aeroplanes, the points to be considered are: expected passenger demand and traffic growth, airport congestion and landing fees, air and noise pollution, operating costs per seat mile and the nature and extent of competition (for an individual firm).

The data required for estimating the demand for capital goods are:

*(a) The growth prospects of the user industries* (demand estimates for the end-use products in the case of intermediate goods).

*(b) The norm of consumption of capital goods per unit of installed capacity* (per unit of each end-use product in the case of intermediate products). It is assumed that *norms of consumption would remain stable.* However, in some cases the present norms may reflect *shortages* (for instance, in the case of imported spares subject to import controls). For construction of bridges, for example, mild steel may be in use in place of construction steels which are more suitable, because of the latter's non-availability or high costs. In such cases, as the pattern of availability changes, norms of consumption would also change.

*(c)* The velocity of their use.

## METHODS OF FORECASTING

It should first of all be emphasised that there is no easy method or simple formula which enables an individual or a business to predict the future with certainty or to escape the hard process of thinking. Moreover, two dangers must be guarded against. First too much emphasis should not be placed on mathematical or statistical techniques of forecasting. *Though statistical techniques are essential in clarifying relationships and providing techniques of analysis, they are not substitutes for judgement.* The other danger is that we may go to the opposite extreme and regard forecasting as something to be left to the judgement of the so-called experts. *What is needed is some commonsense mean between pure guessing and too much mathematics.* The more commonly used methods of demand forecasting are discussed below.

### I. Survey of Buyers' Intentions

The most direct method of estimating demand in the short run is to ask customers what they are planning to buy for the forthcoming time period—usually a year. This method, also known as Opinion Surveys, is most useful when bulk of the sales is made to industrial producers. Here the burden of forecasting is



shifted to the customer.[1] Yet it would not be wise to depend wholly on the buyers' estimates and they should be used cautiously in the light of the seller's own judgement. A number of biases may creep into the surveys. If shortages are expected, customers may tend to exaggerate their requirements. The customers may know what their total requirements are but they may misjudge or mislead or may be uncertain about the quantity they intend to purchase from a particular firm. This method is not very useful in the case of household customers for several reasons, *viz.*, irregularity in customers' buying intentions, their inability to foresee their choice when faced with multiple alternatives, and the possibility that the buyers' plans may not be real but only wishful thinking. Again, household customers are numerous making this method rather impracticable and costly. A basic limitation of this method is that it is passive and "does not expose and measure the variables under management's control".[2]

**Delphi Method.** A variant of the opinion poll and survey method is Delphi method. It consists of an attempt to arrive at a consensus in an uncertain area by questioning a group of experts repeatedly until the responses appear to converge along a single line or the issues causing disagreement are clearly defined.[3] The participants are supplied the responses to previous questions from others in the group by a coordinator or leader of some sort. The leader provides each expert with the responses of the others including their reasons. Each expert is given the opportunity to react to the information or considerations advanced by others but interchange is anonymous so as to avoid or reduce the 'halo effect', 'bandwagon effects' and 'ego involvements' associated with publicly expressed opinions.[4] Delphi method was originally developed at Rand Corporation of the U.S.A. in the late 1940s by Olaf Helmer, Dalkey and Gordon and has been successfully used in the area of technological forecasting, *i.e.*, predicting technical changes. It has proved more popular in forecasting non-economic rather than economic variables.

The Delphi method has some exclusive advantages. First, it facilitates the maintenance of anonymity of the respondent's identity throughout the course. This enables the respondent to be candid and forthright in his/her view. Secondly, Delphi renders it possible to pose the problem to the experts at one time and have their response. This is nearly as good as having the panelists physically pooled together for the exercise. Thus, this technique saves time and other resources in approaching a large number of experts for their views. In one case, for example, about 620 experts with different backgrounds such as policy-makers, technologists, scientists, economists, administrators and advisers were solicited.[5]

However, the Delphi method presumes the following two corditions : First, the panelists must be rich in their expertise, possess wide knowledge and

1. *The Economic Times* very often publishes surveys of 'Private Sector Investment Intentions'.

The Centre for Monitoring Indian Economy (CMIE) makes an annual survey of the 'Investment Intentions of the Industry'. For example, according to the CMIE, 2,600 projects costing Rs. 3,93,000 crores were to be taken up in the Eighth Plan. The Economic Times, December 11, 1991.

The Reserve Bank of India also makes occasional studies of the Corporate Expenditure. For example, in 1992-93, the corporate sector was likely to incur a total expenditure of Rs. 22,343 crores. *The Political and Economic Observer*, September 23, 1992.

2. Dufty, *Managerial Economics*, 1966, p. 30.
3. Haynes and Henry, *Op. cit.*, p. 491.
4. *Ibid.*, p. 492.
5. *Economic Times*, September 24, 1982, p. 5.

experience of the subject and have an aptitude and earnest disposition towards the participants. Secondly, the Delphi presupposses that its conductors are objective in their job, possess ample abilities to conceptualise the problems for discussion, generate considerable thinking, stimulate dialogue among panelists and make inferential analysis of the multitudinal views of the participants. Most often, the complexity of the subject under debate determines the degree of these qualities on the part of the conductors.

**II. Collective Opinion**

Under this method, also called sales-force polling, salesmen are required to estimate expected sales in their respective territories and sections. The rationale of this method is that salesmen, being the closest to the customers, are likely to have the most intimate feel of the market, *i.e.*, customer reaction to the products of the firm and their sales trends. The estimates of individual salesmen are consolidated to find out the total estimated sales. They are then reviewed to eliminate the bias of optimism on the part of some salesmen and pessimism on the part of others. These revised estimates are further examined in the light of factors like proposed changes in selling prices, product designs and advertisement programmes, expected changes in competition, changes in secular forces like purchasing power, income distribution, employment, population, etc. The final sales forecast would emerge after these factors have been taken into account. This method is known as the 'collective opinion method' as it takes advantage of the collective wisdom of salesmen, departmental heads like production manager, sales manager, marketing manager, managerial economist, etc. and the top executives.

*Advantages.* (1) The method is simple and does not involve the use of statistical techniques. (2) The forecasts are based on first-hand knowledge of salesmen and others directly connected with sales. (3) The method may prove quite useful in forecasting sales of new products. Of course, here salesmen will have to depend more on their judgement than in the case of existing products.

*Disadvantages.* (1) It is almost completely subjective as personal opinions can possibly influence the forecast. Salesmen may even understate the forecast if their sales quotas are to be based on it. (2) The usefulness of this method is restricted to short-term forecasting, *i.e.*, for a period of about one year. These forecasts may not be useful for long-term production planning. (3) Salesmen may be unaware of the broader economic changes likely to have an impact on the future demand. Their jobs usually require full-time attention to the present so that they do not get time to think about the future. In many cases, they may lack the necessary breadth of vision for looking into the future, say, five years ahead or more.

**III. Analysis of Time Series and Trend Projections**

A firm which has been in existence for some time, will have accumulated considerable data on sales pertaining to different time periods. Such data when arranged chronologically yield 'time series'. The time series relating to sales represent the past pattern of effective demand for a particular product. Such data can be presented either in a tabular form or graphically for further analysis. The most popular method of analysis of time series is to *project the trend* of the time series. A trend line can be fitted through a series either visually or by means of statistical techniques such as the method of least squares. The analyst chooses a plausible algebraic relation (linear, quadratic, logarithmic, etc.) between *sales* and the independent variable, *time*. The trend line is then projected into the future by extrapolation.



This method is popular because it is simple and inexpensive and partly because time series data often exhibit a persistent growth trend. The basic assumption of the trend method is that the past rate of change of the variable under study will continue in the future. This technique yields acceptable results so long as the time series shows a *persistent tendency to move in the same direction.* Whenever *a turning point occurs,* however, the *trend projection breaks down.* Nevertheless, a forecaster could normally expect to be right in most forecasts especially if the turning points are few and spaced at long intervals from each other.

The real challenge of forecasting is in the prediction of turning points rather than in the projection of trends. It is when turning points occur that management will have to alter and revise its sales and production strategies most drastically. Many analysts have, therefore, given much thought to the turning points.

There are primarily *four sets of factors* which are responsible for the characterisation of time series by fluctuations and turning points in a time series: trend, seasonal variations, cyclical fluctuations and irregular or random forces. The problem in forecasting is *to separate and measure each of these four factors.*

The basic approach is to treat the original time series data (*O* or observed data) as composed of four parts: a secular trend (*T*), a seasonal factor (*S*), a cyclical element (*C*) and an irregular movement (*I*). It is generally assumed that these elements are bound together in a multiplicative relationship expressed by the equation $O = TSCI$. The usual practice is to first compute the trend from the original data. The trend values are then eliminated from observed data (*TSCI/T*). The next step is to calculate the seasonal index which is used to remove the seasonal effect (*SCI/S*). A cycle is then fitted to the remainder which also contains the irregular effect.

The foregoing approach to the decomposition of time series data is a useful analytical device for understanding the nature of business fluctuations. However, it is of limited value in actual business forecasting. The trend and the seasonal factor can be forecast, but the prediction of cycles is hazardous for the simple reason that there is no regularity in the cyclical bahaviour.

However, there are two assumptions underlying this approach: (1) The analysis of movements would be in the order of trend, seasonal variations and cyclical changes; and (2) The effects of each component are independent of each other.

**IV. Use of Economic Indicators**

The use of this approach bases demand forecasting on certain economic indicators, *e.g.*,

*(i)* Construction contracts sanctioned for the demand of building materials, say, cement;

*(ii)* Personal income for the demand of consumer goods;

*(iii)* Agricultural income for the demand of agricultural inputs, implements, fertilizers, etc.; and

*(iv)* Automobile registration for the demand of car accessories, petrol, etc.

These economic indicators are published by specialised organisations like the C.S.O. which publishes national income estimates.

For the use of economic indicators, the following steps have to be taken:

1. See whether a relationship exists between the demand for a product and certain economic indicators.

2. Establish the relationship through the method of least squares and derive the regression equation. Assuming the relationship to be linear, the equation will be of the form $Y = a + bx$. There can be curvilinear relationships as well.

3. Once regression equation is derived, the value of Y, i.e., demand, can be estimated for any given value of $x$.

4. Past relationships may not recur. Hence the need for value judgement as well. New factors may also have to be taken into consideration.

*Limitations*

1. Finding an appropriate economic indicator may be difficult.

2. For new products, it is inappropriate as no past data exist.

3. This method of forecasting works best where the relationship of demand with a particular indicator is characterized by a time lag. For example, construction contracts will result in a demand for building materials but with a certain amount of time lag. However, where the demand does not lag behind the particular economic index, the utility is limited because forecast may have to be based on projected economic index itself which may not come true.

*Illustration*

Let us now illustrate how demand is forecast on the basis of an economic indicator. Suppose, a company manufacturing tractors finds that a relationship exists between its sale of tractors and the Farm Income Index. Table 1 shows the number of tractors sold and the corresponding farm income index over the years 1988 to 1992. The regression equation will be calculated as follows:

**Table 1—Farm Income Index and Sales of Tractors**

| Year | Farm Income Index ($x$) | Sales of Tractors ($y$) | $x_1$ | $y_1$ | $x_1 y_1$ | $x_1^2$ |
|---|---|---|---|---|---|---|
| 1988 | 100 | 110 | 10 | 11 | 110 | 100 |
| 1989 | 110 | 130 | 11 | 13 | 143 | 121 |
| 1990 | 140 | 150 | 14 | 15 | 210 | 196 |
| 1991 | 150 | 160 | 15 | 16 | 240 | 225 |
| 1992 | 200 | 180 | 20 | 18 | 360 | 400 |
| $n=5$ | | | $\Sigma x_1 = 70$ | $\Sigma y_1 = 73$ | $\Sigma x_1 y_1 = 1,063$ | $\Sigma x_1^2 = 1,042$ |

The equations to be solved simultaneously are:

$$\Sigma y_1 = n.a + b\Sigma x_1 \quad \ldots(1)$$

$$\Sigma x_1 y_1 = a\Sigma x_1 + b\Sigma x_1^2 \quad \ldots(2)$$

If we substitute the various values of $\Sigma x_1$, $\Sigma x_1 y_1$, $\Sigma x_1^2$ and $n$ in the equations (1) and (2), we get



$$73 = 5a + 70b \quad \ldots(3)$$

$$1,063 = 70a + 1,042b \quad \ldots(4)$$

Solving these equations,

$$1,022 = 70a + 980b$$
$$1,063 = 70a + 1,042b$$
$$- \quad - \quad -$$
$$-41 = -62b$$

or $$b = \frac{41}{62} = 0.66$$

Substituting value of $b$ in equation (3),

$$73 = 5a + 70\,(0.66)$$
$$= 5a + 46.2$$

or $$5a = 73 - 46.2$$
$$= 26.8$$

or $$a = \frac{26.8}{5}$$
$$= 5.36$$

So,

$$a = 5.36$$
$$b = 0.66$$
$$y_1 = 5.36 + 0.66x_1$$

or $$\frac{Y}{10} = 5.36 + 0.66\left(\frac{X}{10}\right)$$

or $$Y = 10\,(5.36) + 0.66\left(\frac{X}{10}\right)10$$
$$= 53.6 + 0.66X$$

Now, if the index of farm income is expected to be 210, sales of tractors will be:

$$Y = 53.6 + 0.66\,(210)$$
$$= 53.6 + 138.6$$
$$= 192 \text{ tractors.}$$

**Regression Equations and Forecasting**

Let us see how demand forecasting is done with the help of regression equations.[1]

(1) Suppose the equation is:

$$Y = 0.1 + 0.109X$$

where $Y$ = Sales of tractors in thousands of units

and $X$ = Index of farm income.

1. For a study of how regression equation is estimated, a study of some standard treatise on Statistics is recommended.

Now, if $X = 200$

$Y = 0.1 + 0.109\ (200)$

$= 0.1 + 21.8$

$= 21.9.$

This means the sales of tractors would be 21,900 units.

(2) Suppose the equation is:

$$Y = 500+3X$$

where $Y$ = Sales of electric fans,

and $X$ = Advertisement expenditure.

Now, if proposed expenditure on advertisement is Rs. 200

$Y = 500 + 3\ (200)$

$= 500 + 600$

$= 1,100$ electric fans.

(3) Suppose the equation is:

$$Q = 185 - 4.29P + 0.5Y$$

where $Q$ = Quantity demanded

$P$ = Price

$Y$ = Index of Income.

*(i)* Now, if $P$ = Rs. 10 and $Y = 100$

$Q = 185 - 4.29\ (10) + 0.5\ (100)$

$= 185 - 43 + 50$

$= 192$ units.

*(ii)* If price increases to Rs. 20, whereas income remains unchanged:

$Q = 185 - 4.29(20) + 0.5\ (100)$

$= 185 - 85.8 + 50$

$= 235 - 86$

$= 149$ units.

It will be seen that as price is expected to go up, demand will decline from 192 units to 149 units.

*(iii)* If Index of income is expected to rise to 200 and $P$ remains unchanged:

$Q = 185 - 4.29(10) + 0.5\ (200)$

$= 185 - 42.9 + 100$

$= 285 - 42.9$

$= 242$ units

*(iv)* If Index of Income rises to 200 and price rises to 20:

$Q = 185 - 4.29(20) + 0.5\ (200)$

$= 185 - 85.8 + 100$

$= 285 - 85.8$

$= 199$ units.



*Applying Seasonal Factors*

In a number of cases, an application of seasonal factors can considerably improve short-term demand forecasting. To take an example, if monthly sales data for a particular product show that on the average November sales are 10 per cent above the trend line, a seasonal adjustment factor of 1.10 can be applied to the trend projection to forecast sales in that month. Similarly, if it is found that February sales are on average 10 per cent below the trend line, an adjustment factor of 0.90 would be applied in projecting February sales. To illustrate, suppose the annual sales are predicted at Rs. 12 lakh, *i.e.*, Rs. 1 lakh per month. On applying the seasonal factor, November sales would be predicted at Rs. 1,10,000 ( *i.e.*, Rs. 1,00,000 × 1.10) and February sales would be projected at Rs. 90,000 (*i.e.*, Rs. 1,00,000 × 0.90).

**V. Controlled Experiments**

Under this method, an effort is made to vary separately certain determinants of demand which can be manipulated, *e.g.*, price, advertising, etc., and conduct the experiments assuming that the other factors remain constant. Thus, the effect of demand determinants like price, advertisement, packaging, etc., on sales can be assessed by either varying them over different markets or by varying them over different time periods in the same markets. For example, different prices would be associated with different sales and on that basis the price-quantity relationship is estimated in the form of regression equation and used for forecasting purposes. It must be noted that the market divisions here must be homogeneous with regard to income, tastes, etc.

Controlled experiments have often been conducted in the U.S.A. to gauge the effect of a change in some demand determinants like price, advertising, product design, etc. For example, the Parker Pen Co. used this method to find out the effect of a price rise on the demand for Quink Ink.

The method of controlled experiments is still relatively new and less tried. This is due to several reasons. *First*, such experiments are expensive as well as time-consuming. *Secondly*, they are risky too because they may lead to unfavourable reactions on dealers, consumers and competitors. *Thirdly*, there is a great difficulty in planning the study inasmuch as it is not always easy to determine what conditions should be taken as constant and what factors should be regarded as variable so as to segregate and measure their influence on demand. *Fourthly*, it is difficult to satisfy the condition of homogeneity of markets. Despite these limitations, controlled experiments have sufficient potentialities to become a major method for business research and analysis in future.

**VI. Judgemental Approach**

Management may have to use its own judgement when: *(i)* analysis of time series and trend projections is not feasible because of wide fluctuations in sales or because of anticipated changes in trends; and *(ii)* use of regression method is not possible because of lack of historical data or because of management's inability to predict or even identify causal factors. Even when statistical methods are used, it might be desirable to supplement them by use of judgement for the following reasons: *(a)* Even the most sophisticated statistical methods cannot incorporate all the potential factors affecting demand as, for example, a major technological breakthrough in product or process

design. *(b)* For industrial products, demand may be concentrated in a small number of buyers. If the management anticipates loss or addition of a few such large buyers, it could be taken into account only through the judgemental approach. *(c)* Statistical forecasts are more reliable for larger levels of aggregations. Thus while it may be possible to forecast the total national demand more or less accurately, it may be more difficult to accurately forecast demand by sales territory, sizes and models. In such cases, there is no alternative but to depend upon judgement for developing more detailed forecasts.

## APPROACH TO FORECASTING

1. *Identify and clearly state the objectives of forecasting*—short-term or long-term; *market share* or industry as a whole.

2. *Select appropriate method of forecasting.*

3. *Identify the variables* affecting the demand for the product and express them in appropriate forms.

4. *Gather relevant data* or approximations to relevant data to represent the variables.

5. Through the use of statistical techniques, *determine the most probable relationship* between the dependent and the independent variables.[1]

6. Prepare the forecast and interpret the results. Interpretation is more important to the management.

7. For forecasting the company's share in the demand, two different assumptions may be made:

*(a)* The ratio of the company sales to the total industry sales will continue as in the past.

*(b)* On the basis of an analysis of likely competition and industry trends, the company may assume a market share different from that of the past.

It would, however, be useful to prepare alternative forecasts. They are more meaningful than a single forecast. As forecasts are based on certain assumptions, forecasts must be *revised* when improved information is available. In long-term forecasts, the projections may be revised every year. These are sometimes known as rolling forecasts.

8. Forecast may be made either in terms of physical units or in terms of rupees of sales volume. The latter may be converted into physical units by dividing it by the expected selling price.

9. Forecasts may be made in terms of product groups and then broken for individual products on the basis of past percentages. Product group may be divided into individual products in terms of sizes, brands, labels, colours, etc. (*See* illustration below.)

10. Forecasts may be made on annual basis and then divided month-wise or week-wise on the basis of past records.

11. For determining the month-wise break-up of the forecast sales of a new product, either: *(i)* use may be made of other firms' data, if available, or

1. The durability of the forecasting power of a demand function depends partly on the reasonableness and simplicity of functions fitted but primarily on the stability of the underlying relationship measured in the past.



*(ii)* some survey may be necessary. Similar will be the situation when the forecast sales of a product-line have to be divided product-wise.

*Illustration*

The following illustration shows how a sales forecast in terms of product groups can be divided into individual products:

**Table 2—Sales of Product A as Percentage of Product Group Sales**

| *Year* | *Product Group Sales* | *Product A Sales* | *Sales of Product A (In terms of percentage)* |
|---|---|---|---|
| 1990 | Rs. 80,000 | Rs. 16,000 | 20% |
| 1991 | Rs. 1,20,000 | Rs. 26,400 | 22% |
| 1992 | Rs. 1,00,000 | Rs. 24,000 | 24% |
| | Rs. 3,00,000 | Rs. 66,400 | 22% |

Suppose that the forecast product group sales for 1993 are Rs. 1,50,000. For calculating the forecast sales of Product A, we can take either the percentage revealed by the trend (which in this case would be 26 assuming that the same growth trend continues) or the average percentage which would be 22. Sales forecast for Product A on the basis of 22 per cent is Rs. 33,000 and on the basis of 26 per cent is Rs. 39,000.

The same method may be used to find out the company's share of industry sales when there is a close relationship between the industry sales and some economic indicators, but there is no relationship between company sales and the same economic indicators.

12. Sales may change over time by a constant proportion rather than by a constant absolute amount. For example, if a firm is projecting its sales for five years into the future and if it has determined that sales are increasing at an annual rate of 10 per cent, the projection would simply involve multiplying the 10 per cent growth factor for 5 years times present sales. Supposing present sales are Rs. 20 lakhs, the forecast of sales five years from now would be:

Sales in Year 5

$$= \text{Present Sales} \times (1 + \text{growth rate})^5$$
$$= \text{Rs. 20 lakhs} \times (1.10)^5$$
$$= \text{Rs. 20 lakhs} \times 1.61$$
$$= \text{Rs. 32,20,000}$$

## LENGTH OF FORECASTS

1. Short-term forecasts, involving a period up to twelve months, are useful for determining sales quotas, inventory control, production schedules, budgeting and planning cash flows.

2. Medium-term forecasts, involving a period from one to two years, are useful for determining the rate of maintenance, schedule of operations and budgetary control over expenses.

3. Long-term demand forecasts, involving a period of three to ten years, are useful for determining capital expenditures, personnel requirements,

financial requirements, raw material requirements and the size and scope of R & D progammes.

However, the longer the forecast period, the more uncertain is the future. In the absence of any other evidence, the long-term trend line will tend towards the horizontal. This is so for two reasons: (1) in the long-term, market forces such as competition, market situation, etc. will provide a barrier to continuous growth. (2) No company will allow a product to decline indefinitely without taking some action, either by increased promotion activity, new product development or by discontinuing the brand.[1]

## FORECASTING DEMAND FOR NEW PRODUCTS

Joel Dean has suggested a number of possible approaches to the problem of forecasting demand for new products:

1. Project the demand for the new product as an outgrowth of an existing old product.

2. Analyse the new product as a substitute for some existing product or service.

3. Estimate the rate of growth and the ultimate level of demand for the new product on the basis of the pattern of growth of established products.

4. Estimate the demand by making direct enquiries from the ultimate purchasers, either by the use of samples or on a full scale.

5. Offer the new product for sale in a sample market, *e.g.*, by direct mail or through one multiple shop organisation.

6. Survey consumers' reactions to a new product indirectly through the eyes of specialised dealers who are supposed to be informed about consumers' need and alternative opportunities.

These methods are not mutually exclusive and it would be desirable to try to combine several of them so that cross checking is possible. To some extent, the methods of forecasting demand for an established product may also be applied or adapted for new products.

## CRITERIA OF A GOOD FORECASTING METHOD

1. *Accuracy.* It is necessary to check the accuracy of past forecasts against present performance and of present forecasts against future performance. Some comparisons of the model with what actually happens and of the assumptions with what is borne out in practice are more desirable. The accuracy of the forecast is measured by: *(a)* the degree of deviations between forecasts and actuals, and *(b)* the extent of success in forecasting directional changes.

2. *Simplicity and Ease of Comprehension.* Management must be able to understand and have confidence in the techniques used. Understanding is also needed for a proper interpretation of the results. Elaborate mathematical and econometric procedures may be judged less desirable if management does not really understand what the forecaster is doing and fails to understand the procedure.

3. *Economy.* Costs must be weighed against the importance of the forecast to the operations of the business. A question may arise: How much

1. Also see in this connection an excellent article on 'Guesswork and Statistics in Sales Forecasting' by John G. Gold in *Marketing*, November 1970.



money and managerial effort should be allocated to obtain a high level of forecasting accuracy? The criterion here is the economic consideration of balancing the benefits from increased accuracy against the extra cost of providing the improved forecasting.

4. *Availability.* The techniques employed should be able to produce meaningful results quickly; techniques which take a long time to work out may produce useful information too late for effective management decisions.

5. *Maintenance of Timeliness.* The forecast should be capable of being maintained on an up-to-date basis. This has three aspects:[1]

*(a)* The relationships underlying the procedure should be stable so that they will carry into the future for a significant amount of time.

*(b)* Current data required to use these underlying relationships should be available on timely basis.

*(c)* The forecasting procedure should permit changes to be made in the relationships as they occur.

## PRESENTATION OF A FORECAST TO THE MANAGEMENT

In presenting a forecast to the management, a managerial economis should:

1. Make the forecast as easy for the management to understand as possible.
2. Avoid using vague generalities.
3. Always pin-point his major assumptions and sources.
4. Give the possible margin of error.
5. Avoid making undue qualifications.
6. Omit details about methodology and calculations.
7. Make use of charts and graphs as much as possible for easy comprehension.

## STATISTICAL MEASUREMENT OF DEMAND

Because of the key role which price plays as a determinant of the sales of a commodity, it is common to measure statistically the demand or the price-quantity relationship by using the time series data on price and sales. Generally speaking, it is a remote possibility that the price sales data would straightaway show the inverse relationship conforming to the economist's demand curve. This is because in real life, the influence of price factor on sales may be mixed up with that of the other factors like population growth, income changes, etc. It, therefore, becomes necessary first to eliminate the influence of these non-price factors from the sales-price data and then measure the price-quantity relationship. The various steps for doing so are:

1. Fit the trend to the time-series of sales;
2. Find out the deviations of sales from the trend; and

1. Barish, Norman N., *Economic Analysis*, McGraw-Hill Book Compay, Inc. 1962, p. 581.

3. Estimate the regression equation, $Y_1 = a + bX_1$ taking price series as independent variable ($X_1$) and corresponding sales deviations as dependent variable ($Y_1$).

The trend may be fitted freehand or by the method of least squares. In order to save time and acquire greater speed, it is often advisable to use the freehand method as a means of discovering the basic relationships and later, if it appears worthwhile, to rework the problem using the more accurate method of least squares. In the illustration given below, we have employed the method of least squares for fitting the trend.

*Illustration*

Let us illustrate the estimation of price-quantity relationship by using the hypothetical price-sales data given in Table 3.

**Table 3—Price Sales Data 1986-92.**

| Year | Base 1985 =0 X | Price (in Rs.) ($X_1$) | Quantity sold (Y) | Trend values of sales (physical units) approximately ($Y_t$) | Deviations of sales from trend values ($Y_1$) |
|---|---|---|---|---|---|
| 1986 | 1 | 8 | 60 | 51 | + 9 |
| 1987 | 2 | 7 | 85 | 75 | + 10 |
| 1988 | 3 | 14 | 75 | 100 | − 25 |
| 1989 | 4 | 9 | 120 | 124 | − 4 |
| 1990 | 5 | 6 | 160 | 149 | + 11 |
| 1991 | 6 | 13 | 160 | 173 | − 13 |
| 1992 | 7 | 8 | 210 | 198 | + 12 |

$$Y = 26.43 + 24.46\,X$$

$$Y_1 = 42.05 - 4.53\,X_1$$

It may be noted that $X$ is 1 for 1986, 2 for 1987, and so on. It will be seen that in their original form, there has been an upward trend in sales over the seven-year period so that the quantities sold increased even when the price rose. To eliminate the trend factor from total sales, a trend line is fitted to the time series of sales. The equation of the trend line is $Y = 26.43 + 24.46X$. Now the actual deviations of sales from trend value, i.e., $Y_1$ are shown in Col. 6. Fitting a regression line to the price series ($X_1$) and sales deviations ($Y_1$)[1], the regression equation would be:

$$Y_1 = 42.05 - 4.53\,X_1$$

1. Instead of using deviations from the trend line, it is also feasible to compute 'trend ratios' by dividing each actual sales figure ($Y$) by the trend value of sales ($Y_t$) for the same year. For example, the trend value of sales for the year 1986 is 51 and the actual sales are 60. Therefore, the trend ratio would be:

$$\frac{Y}{Y_t} = \frac{60}{51} = 1.18$$

or 118%

In other words, the actual sales were 118 per cent of the trend value of sales (or calculated sales). Now, a regression line may be fitted to the price series ($X_1$) and trend ratios. This method known as 'trend ratio method' or 'Ratio to Trend method' has been extensively used by Schultz.



To arrive at the demand schedules of various years, we will have to add the trend value of that year to the above equation and then calculate the quantities sold at various prices. Alternatively, the trend value of a particular year may be added to the computed deviation of sales. Table 4 illustrates the demand schedules for the years 1986, 1989 and 1992.

**Table 4—Demand Schedules—1986, 1989 and 1992**

| Price $X_1$ | Quantities Demanded 1986 (T.V.=51) | 1989 (T.V.=124) | 1992 (T.V.=198) |
|---|---|---|---|
| 8 | 57 | 130 | 204 |
| 7 | 61 | 134 | 208 |
| 14 | 30 | 103 | 177 |
| 9 | 52 | 125 | 199 |
| 6 | 66 | 139 | 213 |
| 13 | 34 | 107 | 181 |
| 8 | 57 | 130 | 204 |

The regression equations representing price-quantity relationships for these three years would be as follows:

$$Y_{1986} = 51 + 42.05 - 4.53X_1$$

$$Y_{1989} = 124 + 42.05 - 4.53X_1$$

$$Y_{1992} = 198 + 42.05 - 4.53X_1$$

One can also use the above method for forecasting purposes. The trend value of sales for the year 1995 in our example would be 271. The regression equation for 1995 will be:

$$Y_{1995} = 271 + 42.05 - 4.53X_1$$

$$= 313.05 - 4.53X_1$$

**Eliminating Trend—Other Methods**

In the illustration for isolating the effect of price changes on sales, the method followed is one of fitting the trend line to the sales data and then correlate the price series with sales deviations from the trend. However, where the number of observations is large, this technique is rather time-consuming. Instead, a quicker method is "Method of First Differences"; this involves finding the month-to-month or year-to-year changes in price and sales and then examining the relation between these changes. This method eliminates most of the trend in both series permitting the analyst to see whether a decrease in price actually stimulated sales to go up more than they were already increasing.

A closely related method is that of link relatives. Under this method, each sales figure is expressed as a percentage of the sales for the preceding period, month or year, and each price is similarly related to the previous period's price. This method eliminates much of the trend and may be somewhat more accurate than the first-difference method if consumers react more strongly, for example, to a one-rupee cut from a 15-rupee level than to a one-rupee cut

from 25-rupee level. The former cut would produce a larger change on the series of link relatives than would the latter.

## MULTIPLE REGRESSION AND DEMAND FORECASTING

When we are concerned with a relationship such that the predicted variable depends on two or more variables, we are involved with multiple regression. In multiple regression, it is assumed that we have a "dependent" variable $Y$ which is dependent upon $p$ "independent variables $X_1, X_2, \ldots, X_p$. Thus, the multiple regression would appear, in general form, as follows:

$$Y = f(X_1, X_2, \ldots, X_p)$$

The predictive equation can take any of the two forms: additive and multiplicative.

The additive equation follows the general form

$$Y = a + b_1X_1 + b_2X_2 + \ldots + b_pX_p$$

In such a case $Y$, the variable being predicted, is stated as determined by $a$, a constant, plus $b_1$ times the value of $X_1$ (the first indepdent variable) plus $b_2$ times the value of $X_2$ (the second independent variable), $b_1$ and $b_2$ being the coefficients of the independent variables $X_1$ and $X_2$. Obviously, if there are more than two independent variables, the process continues.

The multiplicative equation follows the general form:

$$Y = aX_1^{b}X_2^{0} \ldots Xn^{p}$$

In such a case, $Y$ the variable being predicted, is stated as determined by the product of $a$, a constant, $X_1$ (the first independent variable) raised to the power $b$ and $X_2$ (the second independent variable) raised to the power $c$. Obviously, if there are more than two independent variables, the process continues. When the predicting equation is in the multiplicative form, the exponent of each variable will be its elasticity. Thus, if the multiplicative predicting equation is as follows:

$$Y = 5.5X^{0.433}Z^{0.221}$$

a change of 1 per cent in $X$ is associated with a change of 0.433 per cent in $Y$, and a change of one per cent in $Z$ is associated with a change of 0.221 per cent in $Y$. Similarly, if the equation is $Y=X^{0.4}Z^{0.3}$, then, a 1 per cent change in $X$ would be associated with a 0.4 per cent change in $Y$ and a 1 per cent change in $Z$ with 0.3 per cent change in $Y$.

The multiplicative form of predicting equation can be expressed in additive form by stating it in logarithmic form. Thus, a predicting equation, $Y = aX^bZ^c$ can be stated in logarithmic form as under:

$$\text{Log } Y = \log a + b \log X + c \log Z.$$

In the above equation, the coefficients $b$ and $c$ represent the elasticities of variables $X$ and $Z$ respectively.

To take an example, we give below an estimated equation for predicting demand for vanaspati in India:

$$\text{Log } D = 15.25 - 0.60 \text{ Log } P_v + 3.90 \text{ Log } P_{op}$$

$D$ = demand for vanaspati

$P_v$ = price of vanaspati

$P_{op}$ = population.



From the above equation, we find that the elasticity of demand for vanaspati with respect to its price and that with respect to its population are 0.60 and 3.9 respectively, the corresponding coefficients of the estimated log function. This means that a 1 per cent increase in the price of vanaspati results in a decline of 0.6 per cent in the demand for vanaspati whereas 1 per cent increase in population brings about 3.9 per cent increase in the demand for vanaspati. This further means that if population increases by 2.5 per cent per year, price being constant, the demand will increase by $2.5 \times 3.9 = 9.75$ per cent.

The estimates of elasticities given by exponents in a multiplicative equation (or coefficients if it is stated in additive logarithmic form) are quite useful in policy-making decisions. For instance, demand for vanaspati could increase by about 10 per cent by an increase in population by about 2.6 per cent or by a decrease in price of vanaspati by about 16.67 per cent.

## ROLE OF MACRO-LEVEL FORECASTING IN DEMAND FORECASTS

Macro-level forecasting precedes micro-level demand forecasting for a firm or an industry. The macro-parameters such as Gross National Product (GNP), population growth, per capita income, aggregate savings, level of investment, etc. provide the boundaries within which projections of demand for an industry, a firm or a product fit in. For instance, if the level of national savings is projected to rise fast, the disposable consumer expenditure on products will in all probability decline. Thus savings parameter has a bearing on future demand for consumer goods, specially durable consumer goods. Likewise, rising population indicates that the market for various commodities is in general expanding. Various macro-parameters found useful for demand forecasting are as under:

*(i) National income and per capita income. Increase in these parameters indicates rising market potential for consumer goods.*

*(ii) Savings.* If the level of savings is high, this would dampen consumer goods demand.

*(iii) Investment.* An increase in investment would raise demand for intermediate goods or *vice versa.*

*(iv) Population Growth.* The future demand for all types of goods would rise with population growth.

*(v) Government Expenditure.* High level of public expenditure would stimulate investment in the private sector. In the context of Indian economy, the increase in public expenditure has a decisive role in stimulating private investment, aggregate demand and the level of spending in general.

*(vi) Taxation.* Taxation can also influence demand pattern. Certain taxes would depress the demand of commodities taxed. For example, high level of excise duties on semi-luxury and luxury goods such as electrical appliances, refrigerators, air-conditioners, etc. would depress the demand for these goods. Further this in turn would depress investment in these industries and as such demand for capital goods employed in these industries.

*(vii) Credit Policy.* Such policies influence cost of credit, credit availability and company finance. The time pattern of investment is largely affected by credit policies. Again, inventories are largely affected by credit policies through their effects on carrying costs of inventories. Credit policies affect holding capacities of all business sections—producers, dealers and retailers.

also called as *'negative slope'*.

It should thus be clear how forecasts regarding national parameters would influence and determine firm's demand projections. A good crop forecast and higher rural incomes would lower cost of materials and boost demand for various products. The data pertaining to national income, per capita income, production, prices, taxes, etc., present a reasonable basis for good forecasts.

In India, information and data about macro parameters are mostly available in various publications of Government organizations, National Council of Applied Economic Research and Central Statistical Organisation.

## RECENT TRENDS IN DEMAND FORECASTING

1. More firms are giving importance to demand forecasting than a decade ago.
2. Since forecasting requires closer co-operation and consultation with many specialists, a team spirit has developed.
3. Better kind of data and improved forecasting techniques have been developed.
4. There is a greater emphasis on sophisticated techniques such as using computers.
5. New products forecasting is still in infancy.
6. Forecasts are usually broken down in monthly forecasts.
7. However, in spite of the application of newer and modern techniques, demand forecasts are still not too accurate.
8. The usefulness of personal feel or subjective touch has been accepted.
9. Top down approach is more popular than bottom up approach.

Top down approach starts by analysing national economy, then the industry and finally the individual firm.

Bottom up approach is preferred by small firms because *(i)* they are closer to the customers, *(ii)* they cannot afford more sophisticated techniques, and *(iii)* very often, the small firms manufacture a single product.

## CONTROL OR MANAGEMENT OF DEMAND[1]

In practice, demand forecasting may not be enough. At times, what may be necessary is control or management of demand. In that case, demand forecasting may, of course, pave the way for effective demand management.

Bigger firms in the U.S.A. and other industrial countries usually plan their production well in advance. If there are uncontrolled price movements, there will be total uncertainty as to whether there will be profit or loss and in what dimension. Naturally there is a tendency to regulate (control) prices. It would, however, be quixotic for the firm to seek control over its prices and then leave purchases at these prices to the random fate of taste and accident. So the need arises to control what is sold at these prices. As a result, *the control or management of demand has become a vast and rapidly growing industry in itself.* The purpose of demand management is to *ensure that people buy what is produced.* Although advertising is certainly important as the central theme of this management, much more is involved. Included among the managers are those who *sell goods and design the strategies by which they are sold.*

1. This portion is based on J.K. Galbraith's *The New Industrial Estate*, Oxford and IBH, New Delhi, 1967.



The key to management of demand is the effective management of the purchases of final consumers. Again, the effective management of the consumer demand requires management not only of how income is spent but also of the amount of income that is available for spending on specific goods. *Though a hungry man cannot be persuaded as between bread and a circus, a well nourished man can be. And he can be persuaded between different circuses and different foods. The farther a man is removed from physical need, the more open he is to persuasion—or management—as to what he buys.*

The management of demand consists in devising a sales strategy for a particular product. It also consists in devising a product, or features of a product, around which a sales strategy can be built. Product design, model change, packaging and even performance reflect the need to provide what are called strong selling points.