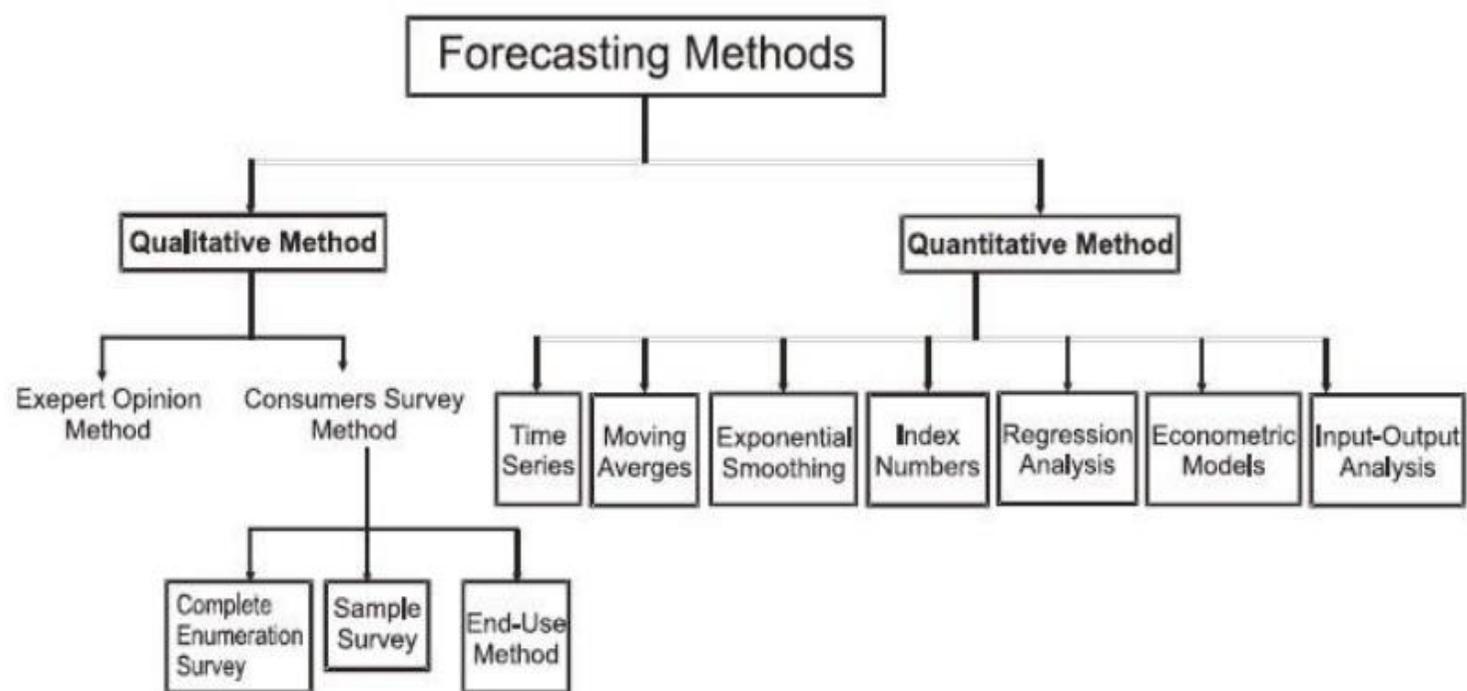# Demand Forecasting

INTRODUCTION

The firm must plan for the future. Planning for the future involves forecasting. **A forecast is an estimation or prediction about situations which are most likely to occur in near or distant future.** No businessman can afford to ignore forecasting if he wants to thrive and prosper in his business. The firm has to forecast the future level of demand for its product under different possible circumstances; such as prices, competition, promotional activities and general economic activity. Similarly forecasting will be necessary with reference to costs under changing conditions of availability of raw materials and their respective prices, changing technology, wage rates, labour training and capital acquisition programmes. Forecasting does play a key role in managerial decisions and hence forecasting is emphasized in the study of managerial economics. The objective of business forecasting is to minimize risk and the margin of uncertainty in business.

5.2 TECHNIQUES OF DEMAND FORECASTING

Many techniques are available that can be used in forecasting economic variables. Some forecasting techniques are quantitative, others are qualitative. When quantitative information is not quite available then qualitative technique is to be relied upon for getting the required forecasts.

There are, as such, **two approaches to demand forecasting**. First is to obtain information about the intentions of the spenders through collecting experts' opinion or by conducting interviews with the consumers. Second is to use past experience as the guide and using or projecting the past statistical relationships to obtain the expected level of future demand. The first method is also considered to be **qualitative** and is mostly used for short- term forecasting; whereas the second method is **quantitative** and is used for long-term forecasting. We can forecast the demand for existing product by using any one or even mix of the above methods, but to forecast demand for new product we have to use survey method only because the new product has no past or historical data to offer.

Forecasting Methods

Qualitative Method

- Exepert Opinion Method
- Consumers Survey Method
  - Complete Enumeration Survey
  - Sample Survey
  - End-Use Method

Quantitative Method

- Time Series
- Moving Averges
- Exponential Smoothing
- Index Numbers
- Regression Analysis
- Econometric Models
- Input-Output Analysis

A. Qualitative Methods (Survey Methods)
1. Expert Opinion Method:

In this method, the firm makes an effort to obtain the opinion of experts who have long standing experience in the field of enquiry related to the product under consideration. If the forecast is based on the opinion of several experts then the approach is called forecasting through the use of **panel consensus**. Although the panel consensus method usually results in forecasts that embody the collective wisdom of consulted experts, it may be at times unfavourably affected by the force of personality of one or few key individuals.

To counter this disadvantage of panel consensus, another approach is developed called the **delphi method**. In this method a panel of experts is individually presented a series of questions pertaining to the forecasting problem. Responses acquired from the experts are analyzed by an independent party that will provide the feedback to the panel members.

Based on the responses of other individuals, each expert is then asked to make a revised forecast. This process continues till a consensus is reached or until further iterations generate no change in estimates.

The advantage of Delphi technique is that it helps individual panel members in assessing their forecasts. However Delphi method is quite expensive.

Often, the most knowledgeable experts in the industry will command more fees. Besides, those who consider themselves as experts may be reluctant to be influenced by the opinions of others on the panel.

If the number of experts is large and their predictions are different then a simple average or weighted average is found so as to lead to unique forecasts. This method of forecasting is called the hunch method.

The main advantage of the Experts' Opinion Survey Method is its simplicity. It does not require extensive statistical or mathematical calculations However this method has its own limitations. It is purely subjective. It substitutes opinion in place of analysis of the situation. Experts may have different forecasts or any one among them may influence others. Who knows experts may be biased or have their own intentions behind providing their opinions. **If the consulted experts are genuinely reliable then panel consensus could be perhaps the best method of forecasting.**

2. **Consumers Survey Metho**d:

Survey methods constitute another important forecasting tool, especially for shortterm projections. The most direct method of estimating demand in the short- run is to conduct the survey of buyers' intentions. The consumers are directly approached and are asked to give their opinions about the particular product. The questionnaire must be carefully prepared bearing in mind the qualities of a good questionnaire. It must be simple and interesting so as to evoke consumers' response.

Consumers' Survey may acquire three forms:

I. Complete Enumeration Survey

II. Sample Survey

III. End-Use Method

I. **Complete Enumeration Survey**: Complete Enumeration Survey covers all the consumers. It resembles the Census Data Collection which considers the entire population. In this case all the consumers are covered and information is obtained from all regarding the prospective demand for the product under consideration. The method of Complete Enumeration has the advantage of being absolutely unbiased as far as consumer opinions are concerned. We can obtain complete information by contacting every possible present, past

or would be consumers of the product. No doubt it is not very easy to carry out the survey on such a large scale. Even the collected information will be difficult and too tedious to be analyzed. The reliability on such consumers' information may be questionable, if the opinions are not authentic.

II. **Sample Survey**: In case of the sample survey method, few consumers are selected to represent the entire population of the consumers of the commodity consumed. The total demand for the product in the market is then projected on the basis of the opinion collected from the sample. The most important advantage of this method is that it is less expensive and less tedious compared to the method of complete enumeration. The sample chosen should not be too small nor too large. This method if applied carefully will yield reliable results especially in case of new brands and new products.

III. **End -Use Method**: A given product may have different end uses. For example: milk may have different end uses such as milk powder, chocolates, sweet -meats like 'barfi' etc. Therefore the end users of milk are identified. A survey is planned of the end users and the estimated demands from all segments of end users are added. This method of demand forecasting is easy to manage if the number of end-users is limited. In this method the investigator expects the end- users to provide correct information well in advance of their respective production schedules.

Although the Survey Method is the most direct method of estimating demand in the short-run; **Joel Dean** criticized this method by saying "there are formidable barriers to learning the buying intentions of the household consumers." He adds "consumers are often inconsistent. The inability to foresee what choice the consumers will make when faced with multiple alternatives in the market, restrict the usefulness of this method of forecasting."

B. Quantitative Methods (Statistical Methods)

The Quantitative Methods of demand include the Time Series Analysis, Moving Averages, Exponential Smoothing, Index Numbers, Regression Analysis as well as Econometric Models and Input-Output Analysis.

1. **Time Series Analysis**: Time Series Analysis is used to estimate future demand. The Time Series Method is based on obtaining the historical data regarding the demand for the product so as to project future occurencies on the basis of what has happened in the past. The Time Series data are chronologically arranged data from a population at different points of time. For example: demand for steel in India may be plotted for years beginning from 1951 to 2003. Based on the data plotted on the graph, a line or curve is drawn. This helps to establish a trend over a period of time. This pattern is then smoothed to eliminate the effect of random fluctuations and it can then be extrapolated into the future to provide a forecast.

The Time Series forecasting models are based on historical observations of the values of the variable that is being forecast.

The Time Series data would indicate different types of fluctuations which can be classified as Secular Trends, Cyclical Variations, Seasonal Variations and Random Fluctuations.

I. Secular Trend refers to the long run increase or decrease in the series.

II. Cyclical Fluctuation refers to the rhythmic variations in the economic series.

III. Seasonal Variation refers to the variations caused by weather patterns social habits such as festivals etc.

IV. Random Fluctuation refers to the irregular and unpredictable shocks to the system, such as wars, strikes, natural catastrophes etc.

When a forecast is to be made, the Seasonal, Cyclical and Random variations are eliminated from the collected data leaving behind the secular trend only. The Secular Trend is then projected. This trend may be a linear trend or non linear. When the trend is linear then we use the least squares method or the line-of-best fit.
Since the extrapolation technique assumes that a variable will follow its established parts, the problem is to determine accurately the appropriate trend curve. The selection of the appropriate curve is guided both by empirical and theoretical considerations. The trend projection method is more useful for long term forecasting then for short run estimation. The trend projections assume that the historical relationships involved in the Time Series will continue in future, which need not always be the case. Finally trend projections involve no analysis of causal relationship and hence offer no help in analyzing as to why a particular series moves as it does or what would be the impact of a particular policy decision on future movement of the series.
2. **Moving Averages**: The method of Moving Average is useful when the market demand is assumed to remain fairly steady over time. The Moving Average for 'n' months is found by simply summing up the demand during the past 'n' months and then dividing this total by 'n'.

Moving Average = Demand in the previous n month divide by n

3. **Exponential Smoothing**: In this technique more recent data are given more weightage. This is based on the argument that the more recent the

observations, the more its impact on future and therefore is given relatively more weight than the earlier observations.

4. **Index Numbers**: The Index Numbers offer a device to measure changes in a group of related variables over a period of time. In case of index numbers we select a Base Year which is given the value of 100 and then express all subsequent changes as a movement of this number. The most commonly used is the Laspeyres' Price Index.

5. **Regression Analysis**: This Statistical method is undertaken to measure the relationship between two variables where correlation appears to exist. For example: we can establish a relationship between the age of the air condition machine and the annual repairs expenses. However this is purely based on the availability of statistical data irrespective of the actual causes of damage for which the repair expenses have to be incurred.

6. **Econometric Models**: The Econometric Models used in forecasting takes the form of an equation or system of equation which seems best to express the most probable interrelationship between a set of economic variables according to economic theory and statistical analysis. The Econometric Models can be quantitatively and qualitatively formulated. One of the first steps in the construction of an Econometric Model is to determine all or most of the factors influencing the series to be forecast. Then the influence of these factors is reflected in the form of an equation. These models are generally used by econometricians. One of the major limitations of Econometric Model approach is the assumption that the relationships established in the past will continue to prevail in the future. The Econometric Models have failed in many cases but this does not imply that we should abandon them. Being analytical in nature and process oriented in approach they throw more light on problems of a theoretical and statistical nature provided the statistical data are reliable.

7. **Input-Output Analysis**: The Input-Output Analysis provides perhaps the most complete examination of all the complex inter-relationships within an economic system. The Input-Output forecasting is based on a set of tables that explain the inter-relationship among the various components of the economy. The Input-Output Analysis shows how an increase or decrease in the demand for cars will lead to increase in production of steel, glass, tyres etc. The increase in demand for these materials will have second line effect. The Input-Output Analysis helps us to understand the inter-

industry relationships to provide information about the total impact on all industries as a result of the original increase in demand forecast.

There is no unique method for forecasting the demand for any product. The forecaster may try any one or the other method depending upon his objective, the data availability, the urgency with which forecasts are needed, resources he intends to devote for forecasting and the nature of commodity whose demand he wants to forecast. If the objective is short term forecast he may try any one of the survey methods. For long term forecasts he may use the trend method or regression method of forecasting. If the commodity in question is a new product, then Joel Dean has recommended the use of survey methods of forecasting. For old products the producer will use statistical methods. For consumer goods the end use method is not feasible; whereas the end use method is more convenient for forecasting producers' capital goods.

5.3 FORECASTING METHODS USED DURING THE PRODUCT LIFECYCLE

The lifecycle of a product is divided into several stages such as the i) research and development phase, ii) introduction of product, iii) market development, iv) advertisement and sales promotion phase, v) maturity phase , vi) saturation phase and lastly vii) the phase of possible decline. For the purpose of selecting the suitable method of forecasting the product lifecycle is divided into following three stages.

a) Development and introduction stage

b) Rapid growth stage

c) The phase of steady growth.

In the development and introduction stage the suitable methods of forecasting are the market trial survey, Delphi method or a method of an in- house survey of experts. During the rapid growth phase trend projection, Time Series Analysis and Regression Analysis are useful in estimating the demand. During the steady growth phase there is slowing down of demand. Econometric Models are used to predict the long term demand for the commodity. The Time Series Model correlation and regression techniques are also popularly used as method of forecasting in the steady growth phase.

5.4 CRITERIA FOR SELECTING A GOOD FORECASTING METHOD

1. **Accuracy**: Different methods of forecasting yield accurate results under different circumstances. An appropriate choice of method will ensure more accurate results.

2. **Reliability**: A time tested method increases the reliability of that method. If a particular method was used to give reliable result in the past then the same method can be reused for forecasting future.

3. **Economical**: Although complete enumeration method of forecasting demand would perhaps yield more accurate result yet it would be a very expensive method. The team conducting forecast cannot afford to discuss the economic aspect of forecasting and therefore should select the least expensive of the methods which would give some reliable forecasts.

4. **Data availability**: Forecasting is made on the basis of the availability of primary or secondary data and therefore the required data should be easily available preferably in the required form.

5. **Flexibility**: As the managerial economist is faced with a number of uncontrollable variables, flexibility in using them would be a necessary condition for a good forecast.

6. **Durability**: The forecast that are made should be valid in the long run because there is a certain time lag in conducting the forecasts and the period when the product is likely to enter the market.

7. **Simplicity**: Depending upon the objective the researcher should apply a simple and straightforward method of forecasting.

5.5 LIMITATIONS OF DEMAND FORECASTING
1. Although the opinion surveys are simple and straightforward, there is an element of subjectivity involved.

2. As the surveys are expensive and time consuming there is a tendency to limit the sample of the consumers. The sample selected may not be very representative.

3. Although the Time Series Analysis is used in forecasting cyclical fluctuations, yet we cannot be sure about such forecasts because there is no regular pattern of a business cycle. Different phases of the cycle may have different intensities and timings which can make the forecast go astray.

4. Although efforts are made to use scientific method in forecasting yet there is bound to be difference between field experiments and experiments conducted in laboratories.

Afterall demand forecasting depends on the responses from the human beings but the tastes and preferences of human beings keep changing. And thus the application of even the quantitative or statistical models may not give us very reliable forecast.
Depending upon the resources and time the forecaster must use more than one method to cross check the accuracy of his forecast.

Despite the limitations associated with forecasting, we all agree that forecasting by some technique or the other is essential. No businessman can afford to do without it. The question faced is not whether he should forecast but rather how he should forecast. Good forecasting essentially constitutes the core of business management.