Forecasting and Time-Series Analysis

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Abstract:

The increasing complexity of the business environment together with changing demands and expectation are compelling every organization to understand consequences of its decisions (actions or strategies) on the future businesses or services. The knowledge of forecasting methods is essential for decision makers to make reliable and accurate estimates and assess or evaluate the future consequences of decisions in the face of uncertainty. Basing on the above context the paper focuses various forecast timings, methods, types of forecasting and various steps of forecasting.

***Key words**: assess, changing demands, estimates, forecasting, forecasting methods,*

Introduction:

The changing demands and expectation are compelling every organization to understand consequences of its decisions basing actions or strategies on the future businesses trends or services. For this the knowledge of forecasting methods is essential for decision makers to make reliable and accurate estimates and assess or evaluate the future consequences of decisions in the face of uncertainty.

A flow chart of forecasts and the decision-making process is shown in Fig.1in which it was shown that the decisions are influenced by the chosen new strategy with regard to an organization's future priorities and activities. Once decisions are taken, the consequences are measured in terms of expectation to achieve the desired products/services levels.

Decisions get influenced by the supplement information obtained from the forecasting method used to make new strategies. Such information which was obtained from the forecasting method affects the strategy formulation of an organization. Thus, an organization needs to establish a monitoring system to compare planned performance with the actual. Divergence, if any, and no matter what is the cause of such divergence, should be fed back into the forecasting process, to generate new forecasts. Considering the above concept this paper analyses the pattern of the historical data then extrapolate the pattern into the future, understand the different approaches to forecasting that can be applied in business, gain a general understanding of time-series forecasting techniques and how to decompose time-series data into their various components and to forecast by using decomposition techniques

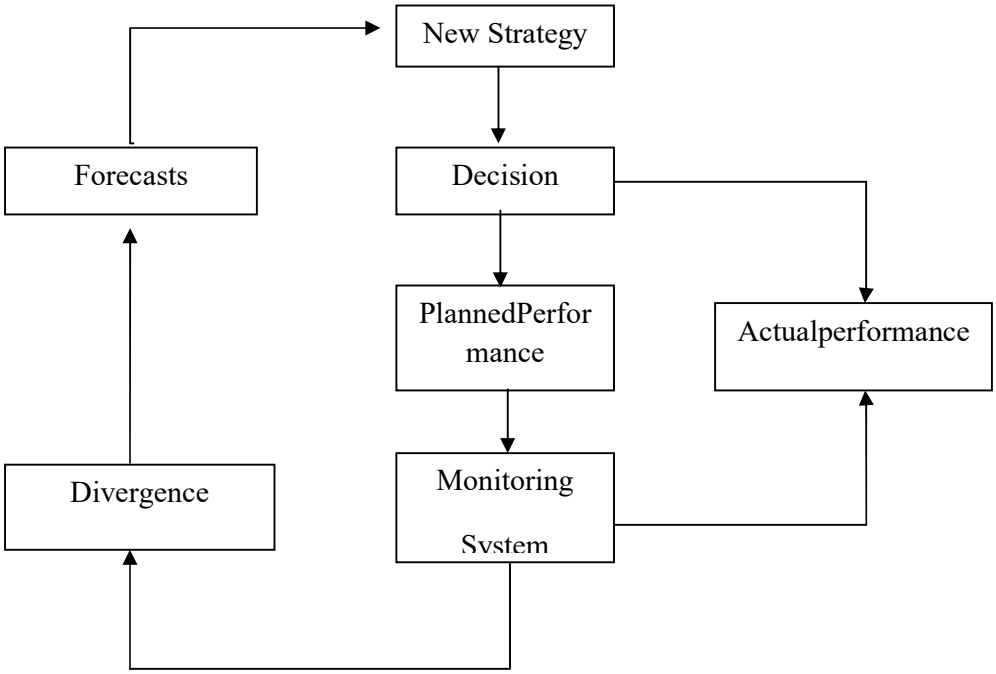

Fig.1: Decision-making Process and Forecasting

1.1 Types of Forecasts:

The aim of any organization is facilitated by a number of different types of forecasts. These may be related to cash flows, operating budgets, personnel requirement, inventory levels, and so on. However, the broad classification of the types of forecasts is *Demand Forecasts* which concerned with the predictions of demand for products (and/ or) services based upon sales and marketing information. These forecasts facilitates in formulating material and capacity plans, and also serves as inputs to financial, marketing and socio economic planning, *Environmental Forecasts* which concerned with the social, political and economic environments of the state and/or the country. Economic forecasts are helpful in predicting inflation rates, money supplies; operating budget and so on. Another type of forecast is *Technological Forecasts* which deals with new developments in modern technology. The technological forecast is important for technologically advanced companies dealing with computers, aerospace, nuclear and so on.

1.2Timing of Forecasts:

Forecasts are based on time period which is broadly classified into three categories (i) *Short-range forecast* which has a time-span of one year but usually is less than three months. It is generally used for job scheduling, work force levels, job assignments and production levels. (ii) *Medium-range forecast* which has a time-span from one to three years. It is normally used for sales planning, production planning, budgeting and so on. (iii)*Long-range Forecast* which has a time-span of three or more years. It is used for designing and installing new plants, facility location, capital expenditures, research and development.

The medium-and long-range forecasts differ widely from short-range forecast on account of following three factors that is

1. Medium- and long-range forecasts deal with more comprehensive issues and support decisions regarding design and development of new products, plants and processes.

2. Mathematical techniques such as moving averages, exponential smoothing and trend extrapolation are used for short-range forecasts.

3. The short-range forecasts tend to be more accurate than long-range forecasts. For example, sales forecasts need to be updated regularly in order to maintain proper inventory level of products. After each sales period, the forecast should be reviewed and revised.

1.3 Methods of forecasting

Forecasting is either quantitative or qualitative which can also be called as opinion or judgmental are shown in Figure-2.Quantitative Forecasting Methods are applied when past data about the variable is being forecast, information can be quantified, and Pattern of the past will continue into the future. The quantitative methods of forecasting are further classified into two categories:

1. **Time-series forecasting Methods:** A time-series is a set of variable which changes through time. The time variable fluctuates uniformly in the same direction from past to future rather than arbitrarily. Thus, there is a freedom to choose the time periods at which observations can be made. The time-series data are gathered on a variable characteristic over a period of time at regular intervals. The time-series forecasting methods attempt to predict the outcome for a future time period by analyzing patterns, cycles or trends over a period of time and

2. Causal Forecasting Methods: The causal forecasting methods are based on the assumptions that the variable value to be forecasted has a cause-effect relationship with one or more other variables. A linear regression analysis is one of the best examples of casual forecasting methods.

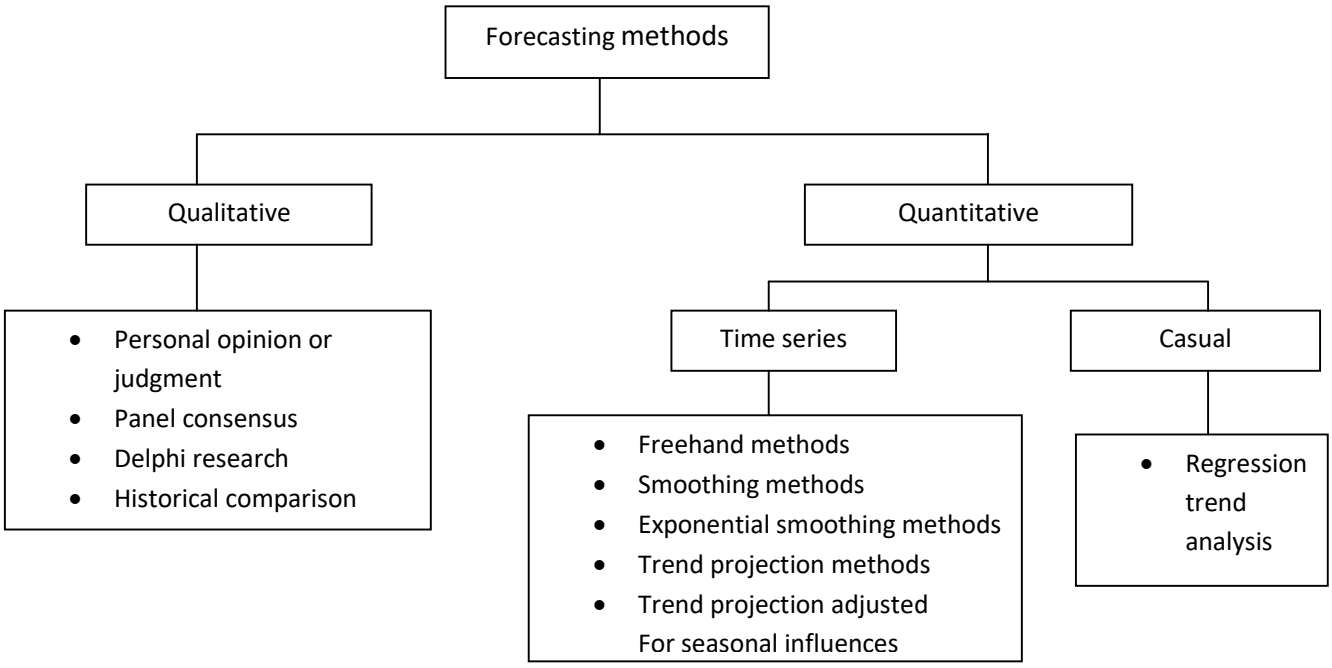

Figure.2: forecasting methods

1.4 Qualitative Forecasting Methods:

In the qualitative forecasting methods we are used to collect opinions and judgments of individuals who are expected to have the best knowledge of current activities or future plans of the organization. For example, marketing professionals through regular contact with customers are presumably familiar with retail market segment, trends by product line, demand trend and so on. In qualitative forecasting methods, decision makers can incorporate subjective experience as inputs along with objectives data. Since each human being has different knowledge, experience and perspective of reality, intuitive forecasts are likely to differ from one individual to another individual. The quantification of data gives decision makers a more precise meaning than words which are inexact and capable of being misunderstood. Few qualitative forecasting methods which are basically used in forecasting that are

1)Personal Opinion: Here in this approach an individual does some forecast about a variable of interest based on his/her own judgment or opinion without using a formal quantitative model for forecasting. Such a forecast can be relatively reliable and accurate. This type of approach is usually recommended when conditions in the present are not likely to hold in the future. For example, an assessment whether inventory levels are likely to last until the next replenishment; a machine will require repair in the next month and so on.

2) Panel Consensus: This approach, developed consensus among group of individuals to reduce the prejudices and ignorance that may arise in the individual judgment. Such a panel of individuals is encouraged to share information, opinions, assumptions and analysis (if any) to predict the future value of a variable of interest. The main disadvantage of this method is that it is dependent on group dynamics and frequently requires a facilitator or convener to coordinate the process of developing a consensus.

3) Delphi Method: Here in this approach a panel of experts uses the collective experience and judgment. The panel members may be located in different places, never meet and do not know each other. Each member is given a questionnaire to complete relating to the area under investigation. Based on the responses in questionnaire form from members, a summary is prepared and a copy of it is sent to each member for revision of responses, (if any) based on the summary report. This process of updating the summary report is repeated until the desirable consensus is reached among members. This method produces a narrow range of forecasts rather than a single view of the future.

4) Market Research: This method is used to collect data based on well-defined objectives and assumptions about the future performance of a variable. For market research, a questionnaire related to the subject of interest is distributed among respondents. A summary report based on the responses in questionnaire form from respondents is prepared to develop survey results.

5) Historical Comparison: In this method, the data are arranged chronologically and the time-series approach is used to facilitate comparison between one time period and to the next. It provides a basis for making comparisons by isolating the effects of various influencing factors on the patterns of variable values.

1.5 Steps of Forecasting:

The following are the general steps to present a systematic procedure of initiating, designing and implementing a forecasting system:

1. Define organization's objectives of forecasting in order to make use of the best available information to guide future activities and policies to be achieved.
2. Select the variables to be forecasted such as capital investment, employment level, and inventory level and purchasing of new equipment.
3. Determine the time horizon--short, medium or long term-of the forecast in order to predict changes which may follow the present level of activities.
4. Select an appropriate forecasting method to make projections of the future keeping in view the reasons of changes in the past.
5. Collect the relevant data required for forecasting.
6. Make the forecast and implement its results.

Conclusion:

The above paper concludes with certain recommendation of creation of plans of action of forecasting without which it is not possible to evolve a system of business control without an acceptable system of forecasting, Monitoring of the progress of action plans continuously based on forecasts, developing a warning system of the critical factors because they might drastically affect the performance of the plan.

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