**Time series analysis: Note -1**

**B.A 6th Sem (Major)**

**Time series analysis**

A time series is a set of statistical data spread over time. Example: the daily production of milk in a milk plant, the weekly sales in a departmental store, the monthly publication of the Consumer Price Index, the quarterly statement of GNP, as well as the annual revenue of a firm. A number of factors influence the value of the variable under study. The aim of the time series analysis is to identity and isolates these influencing factors for forecasting purposes.

Time series analysis provides knowledge about the fluctuations in economic and business phenomena. The past trend is projected into future trend, to predict the changes, which are likely to occur in the economic activity.

In other words, time series is asequence of numerical data points in successive order, usually occurring in uniform intervals. A time series is simply a sequence of numbers collected at regular intervals over a period of time.

**Components of time series:**

The four components of time series are:

1. Secular trend
2. Seasonal variation
3. Cyclical variation
4. Irregular variation

**Secular trend:** A time series data may show upward trend or downward trend for a period of years and this may be due to factors like increase in population, change in technological progress, large scale shift in consumers demands, etc. For example, population increases over a period of time, price increases over a period of years, production of goods on the capital market of the country increases over a period of years. These are the examples of upward trend. The sales of a commodity may decrease over a period of time because of better products coming to the market. This is an example of declining trend or downward trend. The increase or decrease in the movements of a time series is called Secular trend.

**Seasonal variation:** Seasonal variation is short-term fluctuation in a time series which occur periodically in a year. This continues to repeat year after year. The major factors that are responsible for the repetitive pattern of seasonal variations are weather conditions and customs of people. More woollen clothes are sold in winter than in the season of summer. Regardless of the trend we can observe that in each year more ice creams are sold in summer and very little in winter season. The sales in the departmental stores are more during festive seasons that in the normal days.

**Cyclical variations:** Cyclical variations are recurrent upward or downward movements in a time series but the period of cycle is greater than a year. Also these variations are not regular as seasonal variation. There are different types of cycles of varying in length and size. The ups and downs in business activities are the effects of cyclical variation. A business cycle showing these oscillatory movements has to pass through four phases-prosperity, recession, depression and recovery. In a business, these four phases are completed by passing one to another in this order.

**Irregular variation:** Irregular variations are fluctuations in time series that are short in duration, erratic in nature and follow no regularity in the occurrence pattern. These variations are also referred to as residual variations since by definition they represent what is left out in a time series after trend, cyclical and seasonal variations. Irregular fluctuations results due to the occurrence of unforeseen events like floods, earthquakes, wars, famines, etc.

**Forecasting:**

Forecasting involves the generation of a number, set of numbers, or scenario that corresponds to a future occurrence. It is absolutely essential to short-range and long-range planning. By definition, a forecast is based on past data, as opposed to a prediction, which is more subjective and based on instinct.

Forecasting is based on a number of assumptions:

1. The past will repeat itself. In other words, what has happened in the past will happen again in the future.

2. As the forecast horizon shortens, forecast accuracy increases. For instance, a forecast for tomorrow will be more accurate than a forecast for next month; a forecast for next month will be more accurate than a forecast for next year; and a forecast for next year will be more accurate than a forecast for ten years in the future.

3. Forecasting in the aggregate is more accurate than forecasting individual items.

A number of characteristics that are common to a good forecast:

Accurate—some degree of accuracy should be determined and stated so that comparison can be made to alternative forecasts.

Reliable—the forecast method should consistently provide a good forecast if the user is to establish some degree of confidence.

Timely—a certain amount of time is needed to respond to the forecast so the forecasting horizon must allow for the time necessary to make changes.

Easy to use and understand—users of the forecast must be confident and comfortable working with it.

Cost-effective—the cost of making the forecast should not outweigh the benefits obtained from the forecast.

Forecasting techniques range from the simple to the extremely complex. These techniques are usually classified as being qualitative or quantitative.

**QUALITATIVE TECHNIQUES**

Qualitative forecasting techniques are generally more subjective than their quantitative counterparts. Qualitative techniques are more useful in the earlier stages of the product life cycle, when less past data exists for use in quantitative methods.

**QUANTITATIVE TECHNIQUES**

Quantitative forecasting techniques are generally more objective than their qualitative counterparts. Quantitative forecasts can be time-series forecasts (i.e., a projection of the past into the future) or forecasts based on associative models (i.e., based on one or more explanatory variables). Time-series data may have underlying behaviors that need to be identified by the forecaster. In addition, the forecast may need to identify the causes of the behavior. Some of these behaviors may be patterns or simply random variations. Among the patterns are:

Trends, which are long-term movements (up or down) in the data.

Seasonality, which produces short-term variations that are usually related to the time of year, month, or even a particular day, as witnessed by retail sales at Christmas or the spikes in banking activity on the first of the month and on Fridays.

Cycles, which are wavelike variations lasting more than a year that is usually tied to economic or political conditions.

Irregular variations that do not reflect typical behavior, such as a period of extreme weather or a union strike.

Random variations, which encompass all non-typical behaviors not accounted for by the other classifications.

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