TIME SERIES

Data collected at different time period arranged & presented in a chronological order is called as Time Series data. It is a set of observations taken at specified time, usually at equal intervals. It is useful for forecasting future values.

Components of Time Series : The time series is affected by 4 components

(1) Long Term Movement or Secular Trend / Simple Trend

It depicts the long term tendency to move in upward or downward direction.

Eg: Population of a country has increasing trend over the year. Due to modern technology health facilities, death rate is decreasing & life expectancy is increasing over the years

Determination of Secular Trend & Estimation of Values

- **Graphics or freehand curve method**
  It is simple and easy to understand. However since it is a subjective concept, different free hand lines can be drawn.
- **Method of semi – average** (used when trend is linear)
  Under this method, whole series is divided into 2 equal parts and average of each half is calculated. (If years are odd, middle year is left.) Then these two points are joined to form a trend line.
- **Method of moving average**
- **Method of least squares :** Under this method, regression equations are formed to predict the future value

(2) Seasonal Variation

Over a span of one year, seasonal variation take place due to rhythmic forces which operate in a regular & periodic manner. They have almost a similar pattern year after year.

Eg: Sale of cold drinks go up in summer & go down in winters.

Eg: Sales of product generally go up during festivals like Eid, diwali, christmas.

Eg: Sale of restaurants go down during navratri.

To identify seasonal variation, data need to be recorded on regular intervals within a year. Eg daily, weekly, monthly, quarterly, etc

The method of seasonal variation are

- Simple Average Method
- Ratio to Trend Method
- Ratio to Moving Average Method
- Link Relative Method

(3) Cyclical Variation

Cyclical Variation also known as business cycle. It consist of prosperity(boom), recession, depression and recovery.

(4) Random or Irregular Variation

These fluctuations are result of unforeseen and unpredictably external forces which operate in absolutely random or erratic manner. They do not have any definite pattern & it can not be predicted in advance .

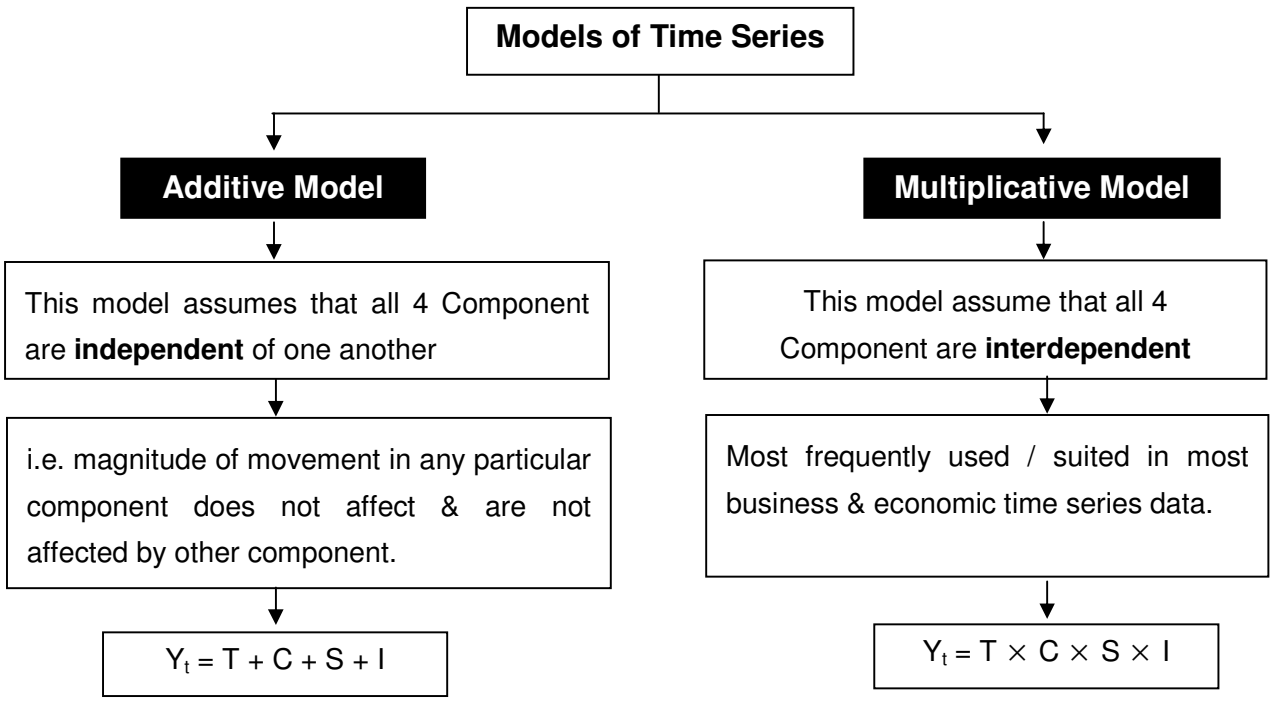
Eg: Variation due to war, floods, earthquakes.

Irregular variations is generally measured as residue after eliminating all other fluctuations from he data.

The first there components are said to be systematic components of time series which follows a regular pattern of variation and therefore called as **SIGNAL**.

The last component has no pattern and is highly unsystematic and is therefore called **NOISE**

Models of time series : It is used for decomposition of time series into 4 components to bring out the relative impact of each on the overall behavior of time series.



Eg: Given T = 20,000 S = 1,500 C = - 800 I = 410

Y_t using additive model = 20,000 + 1,500 - 800 + 410 = 21,110

Eg: Given T = 20,000 S = 1.15 C = 0.90 I = 1.02

Y_t using multiplicative model = 20,000 x 1.15 x 0.9 x 1.02 = 21,114