Time Series Analysis

A time series is an arrangement of statistical data in a chronological order; ie in accordance with its time of occurance.

A time series may be defined as a collection of readings belonging to different time periods, of some economic variable or composite variables.

$$Y = f(t)$$

Components of a time series

(a) Secular Trend:

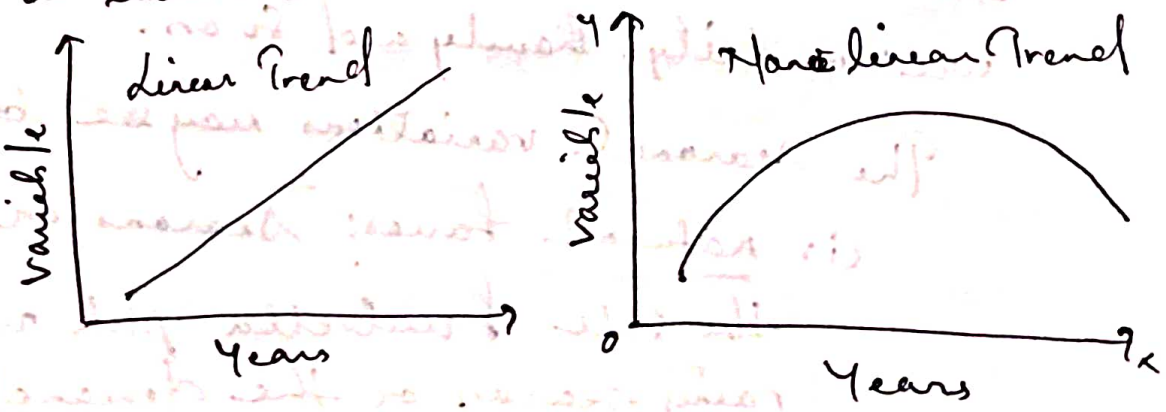
The general tendency of the time series data to increase or decrease or remain stagnate during a long period of time is called the secular trend or simple trend.

Ex: Series relating to population, Education, price, income, sales etc.

(i) It should be clearly understood that trend is the general, smooth, long-term average tendency.

(ii) The term 'long period of time' is a relative term and cannot defined exactly. It would very much depend on the nature of the data.

(iii) If the time series values plotted on graph cluster more or less round a straight line, the trend exhibited by the time series is termed as linear otherwise Non-linear.



(iv) It is not necessary that all the series must exhibit a rising or declining trend. Certain phenomena may give rise to time series whose values fluctuate round a constant reading which does not change with time. Ex: temperature.

(V) Uses of Trend:

* It enable us to have a general idea about the pattern of the behaviour of the phenomenon under consideration. This helps in business forecasting and planning future operations.

* By isolating trend values from given time series, we can study the short-term and irregular movements.

* Trend analysis enables us to compare two or more time series.

(b) Seasonal Variations

These variations in a time series are due to the rhythmic forces which operate in a regular or periodic manner over a span of less than a year, i.e, during a period of 12 months and have the ~~same~~ same or about same pattern year after year.

Thus, seasonal variations in a time series will be there if the data are recorded quarterly, monthly, weekly, daily, hourly and so on.

The seasonal variations may be because of

(i) natural forces: seasons or weathers.

the sale of umbrella pick up very fast in rainy seasons or the demand for electric fans goes up in summer season.

(ii) Man-made conventions: due to habits, fashions, etc. sales of jewellery and ornaments go up in marriages.

- The main objective of the measurement of seasonal variations is to isolate them from the trend and study their effects.

(c) Cyclical variations:

The oscillatory movements in a time series with period of oscillation greater than one year are termed as cyclical variations. Ex - business cycles (boom, recession, depression and recovery).

(d) Random or Irregular Variations:

Mixed up with cyclical and seasonal variations, there is inherent in every time series another factor called random or irregular variations. These fluctuations are purely random and are the result of such unforeseen and unpredictable forces which operate in absolutely erratic and irregular manner. Irregular variations are also known as episodic fluctuations and include all types of variations in a time series data which are not accounted for by trend, seasonal and cyclical variations.

Because of their absolutely random character, it is not possible to isolate such variation and study them exclusively nor we can forecast and estimate them precisely.

Reference: Fundamentals of Statistics by S.C. Gupta.