Components of a time series

Any time series can contain some or all of the following components:

1. Trend (T)
2. Cyclical (C)
3. Seasonal (S)
4. Irregular (I)

These components may be combined in different ways. It is usually assumed that they are multiplied or added, i.e.,

$$y_t = T \times C \times S \times I$$

$$y_t = T + C + S + I$$

To correct for the trend in the first case one divides the first expression by the trend (T). In the second case it is subtracted.

Trend component

The trend is the long term pattern of a time series. A trend can be positive or negative depending on whether the time series exhibits an increasing long term pattern or a decreasing long term pattern.

If a time series does not show an increasing or decreasing pattern then the series is stationary in the mean.

Cyclical component

Any pattern showing an up and down movement around a given trend is identified as a cyclical pattern. The duration of a cycle depends on the type of business or industry being analyzed.

Seasonal component

Seasonality occurs when the time series exhibits regular fluctuations during the same month (or months) every year, or during the same quarter every year. For instance, retail sales peak during the month of December.

Irregular component

This component is unpredictable. Every time series has some unpredictable component that makes it a random variable. In prediction, the objective is to "model" all the components to the point that the only component that remains unexplained is the random component.