DEMAND FORECASTING

USING TIME SERIES

ABOUT DEMAND FORECASTING

Demand Forecasting refers to the process of predicting the future demand for the firm's product. In other words, demand forecasting is comprised of a series of steps that involves the anticipation of demand for a product in future under both controllable and non-controllable factors.

Forecasting is often compared to driving a car while looking in the rear-view mirror. The past gives a few clues about the future, but not enough to stop you from driving off a cliff.

The sales forecast is particularly important as it is the foundation upon which all company plans are built in terms of markets and revenue. Management would be a simple matter if business was not in a continual state of change, the pace of which has quickened in recent years.

ADVANTAGES

- It helps in the effective scheduling of the supply chain.
- It makes budgeting more accurate.
- The tracking of sales becomes easy.
- It helps in optimizing inventory.
- Labor management is made easy.

DEMAND FORECASTING USING TIME SERIES:

- Stationary Time Series :A stationary time series is one whose statistical properties such as mean, variance, auto-correlation, etc. are all constant over time.
- Non - Stationary Time Series: Hence, a non-stationary series is one whose statistical properties change over time.

Stationary Time Series

- **Auto Regressive (AR):** Statistical forecasting model in which future values are computed only on the basis of past values of a time series data.

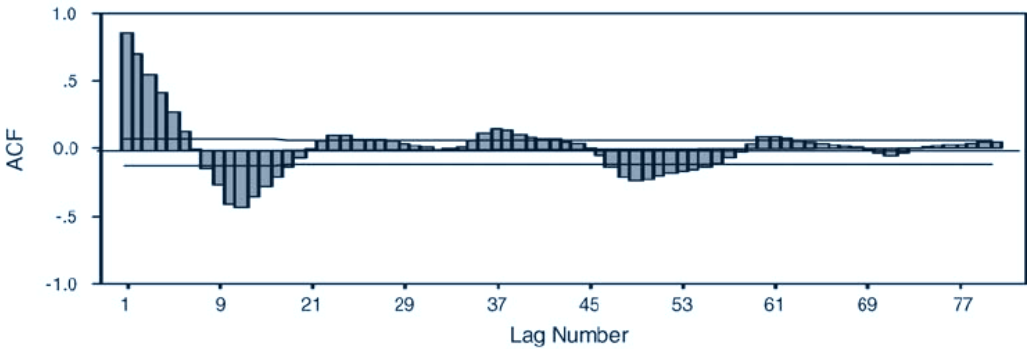
- **Moving Average (MA):** Mean of time series data (observations equally spaced in time) from several consecutive periods. Called 'moving' because it is continually recomputed as new data becomes available, it progresses by dropping the earliest value and adding the latest value. For example, the moving average of six-month sales may be computed by taking the average of sales from January to June, then the average of sales from February to July, then of March to August, and so on.

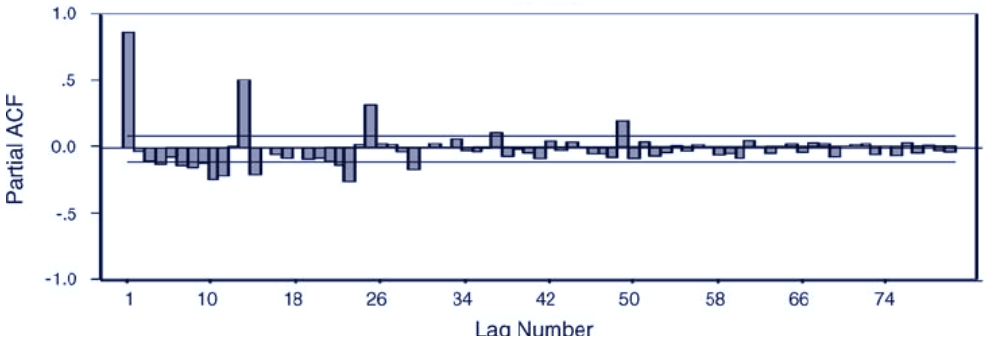
- **ARMA (P,Q):** Forecasting model or process in which both auto regression analysis and moving average methods are applied to a well-behaved time series data. ARMA assumes that the time series is stationary-fluctuates more or less uniformly around a time-invariant mean.

- The P and Q values can be calculated using **ACF** and **PACF** plots.

Behavior of the ACF and PACF for ARMA Models

	$\mathrm{AR}(p)$	$\mathrm{MA}(q)$	$\mathrm{ARMA}(p,q)$
ACF	Tails off	Cuts off after lag q	Tails off
PACF	Cuts off after lag p	Tails off	Tails off

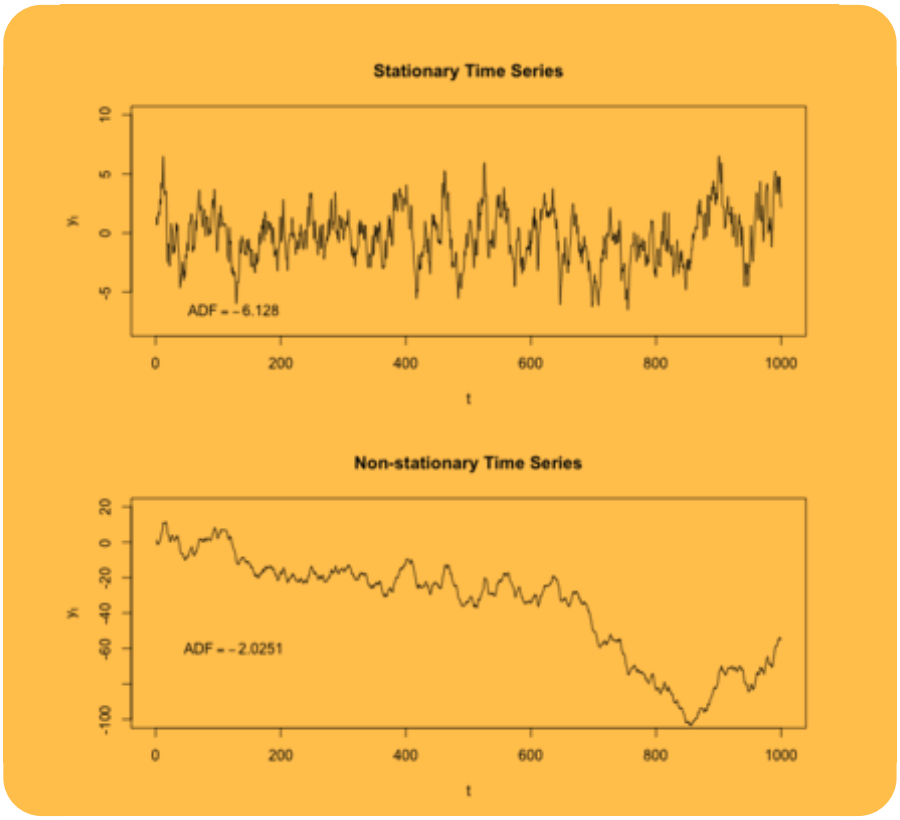




ARIMA

- One of the problems that one often runs into when analysing time series models is the issue of non-stationarity (i.e. where the time series does not have a constant mean, variance, and autocorrelation).
- A time series with a constant mean, variance, and autocorrelation, i.e. a stationary one, is much easier to work with - since future values of the series become more predictable.
- ARIMA is a generalization of ARMA model.
- ARIMA(p,d,q): Auto Regressive Integrated Moving Averages.
- This is used when the given Time Series is not stationary. In ARIMA the data is differenced to convert it to stationary. Time Series. This removes the variability in mean, variance and autocorrelation in the data and applies a ARMA model.

- Here the "d" value is the no. of times the data has been differenced in order to achieve stationarity.
- "p" and "q" values are calculated in the same was as in ARMA.



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