



Auto Regressive Integrated Moving Average

time series analysis technique used for forecasting future values based on past observations



Time Series

Sequence of data points or observations measured over time at regular intervals

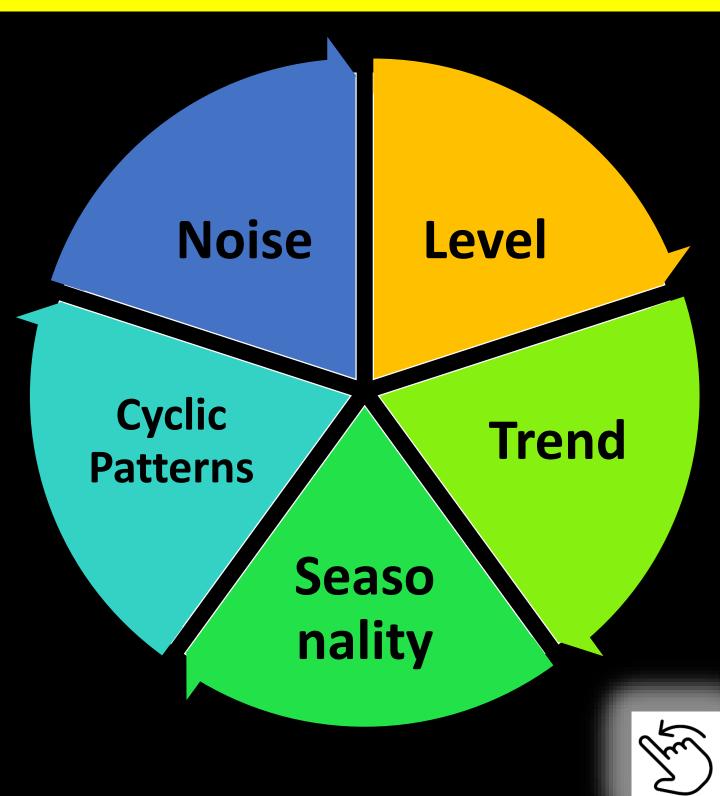
Order of observations is important

Examines patterns, trends, and fluctuations in the data

Key components include trend, seasonality, and randomness



Time Series



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ARIMA

Moving Average (MA)

Auto
Regressive
(AR)

Differencing (I)



Auto Regressive

Determines the number of past values used

Statistical Method

Order of auto regression "p"

Past observations predicts its future values



Integration

Determined by examining the autocorrelation plot and the partial autocorrelation plot

Differencing the time series data to achieve stationarity

Indicates the number of times differencing is applied to the data

Order of integration, denoted as "d"



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Moving Average

Order of the MA component, denoted by 'q', determines the number of lagged error terms to be included in the model

Models the noise or random fluctuations in the data

The weights of these error terms decrease exponentially as the lag between the current and past terms increases

Based on a series of weighted averages of past error terms



Stationarity

One can use differencing to make it stationary

Ensures that
statistical
properties of the
data remain
constant over time

Tests: Augmented
Dickey-Fuller (ADF)
test or the
KwiatkowskiPhillips-SchmidtShin (KPSS)

Constant mean, variance, and auto covariance structure



Autocorrelation Function

Choice of ARIMA model parameters such as the (p), (d), and (q)

Determine the presence of correlation between observations

Shape and pattern of the ACF plot can provide presence of seasonality, trend, or random fluctuations

Plotted as a function of the lag and the strength of the correlation is represented by the height of the bars



Partial Autocorrelation Function

Removes the effects of the intermediate observations

Identifies the direct relationship between two observations

Measures the correlation between a time series and its own lagged values at different time lags



Unit Roots

Differencing can be used to make the time series stationary

Has a root of unity as a characteristic root of its autoregressive (AR) polynomial

Identified by performing Augmented Dickey-Fuller (ADF) test

Leads to nonstationary time series



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Augmented Dickey Fuller Test

Returns a test
statistic and a pvalue indicating
that the null
hypothesis of unit
roots can be
rejected

Determines the presence of unit roots in a time series

Evaluates whether a linear trend can be removed from the time series through differencing

Determines the appropriate order of differencing needed to make a time series stationary



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