

Fit an ARIMA model

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Box and Jenkins present an interactive approach for fitting ARIMA models to time series. This iterative approach involves identifying the model, estimating the parameters, checking model adequacy, and forecasting. The model identification step usually requires judgment from the analyst.

1. Decide if the data are stationary. That is, do the data possess constant mean and variance.
 - a. Examine a time series plot to determine whether a transformation is required to give constant variance.
 - b. Examine the ACF to determine whether large autocorrelations do not die out, identifying that differencing might be required to give a constant mean. A seasonal pattern that repeats each k^{th} period of time indicates that you should take the k^{th} difference to remove a portion of the pattern. Most series should not require more than two difference operations or orders. Be careful not to overdifference. If spikes in the ACF die out quickly, there is no need for more differencing. A sign of an overdifferenced series is the first autocorrelation close to -0.5 and small values elsewhere. Use **Stat > Time Series > Differences** to calculate and store differences. Then, to examine the ACF and PACF of the differenced series, use **Stat > Time Series > Autocorrelation** and **Stat > Time Series > Partial Autocorrelation**.
2. Examine the ACF and PACF of your stationary data in order to identify what autoregressive or moving average models terms are suggested.
 - An ACF with large spikes at initial lags that decay to zero or a PACF with a large spike at the first and possibly at the second lag indicates an autoregressive process.
 - An ACF with a large spike at the first and possibly at the second lag and a PACF with large spikes at initial lags that decay to zero indicates a moving average process.

- The ACF and the PACF both exhibiting large spikes that gradually die out indicates that there are both autoregressive and moving averages processes.

For most data, no more than two autoregressive parameters or two moving average parameters are required in ARIMA models.

3. After you have identified one or more likely models, use the ARIMA procedure.
 - a. Fit the likely models and examine the significance of parameters and select one model that gives the best fit. The ARIMA algorithm will conduct up to 25 iterations to fit a specified model. If the solution does not converge, store the estimated parameters and use them as starting values for a second fit. You can store the estimated parameters and use them as starting values for a subsequent fit as often as necessary.
 - b. Verify that the ACF and PACF of residuals indicate a random process, signified when there are no large spikes. You can easily obtain an ACF and a PACF of residual using ARIMA's Graphs sub-dialog box. If large spikes remain, consider changing the model.
 - c. When you are satisfied with the fit, make forecasts.

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