

Assignment Project Exam Help

Fitting, Diagnosing, Selecting ARIMA Models

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2/5/2018

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- ▶ Today -
- ▶ 2/7 - Forecasting
- ▶ 2/12 - Seasonal ARIMA
- ▶ 2/14 - Seasonal ARIMA
- ▶ 2/19 - Special/Advanced Topics
- ▶ 2/21 - Review
- ▶ 2/28 - Final

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- ▶ Submissions:

- ▶ One submission per group, with everyone's name.
- ▶ Don't submit the same thing 3 times.
 - ▶ Don't submit one version with your group and a different version on your own.

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- ▶ RMD Comments

1. Don't leave warnings and messages in your document
2. Don't print out several pages of residuals, fitted values, etc. . .
never type my data into your document and leave it. . .

- ▶ **LOOK AT YOUR OUTPUT**

- ▶ If it's hideous, fix it
- ▶ If it's filled with unnecessary output, remove it

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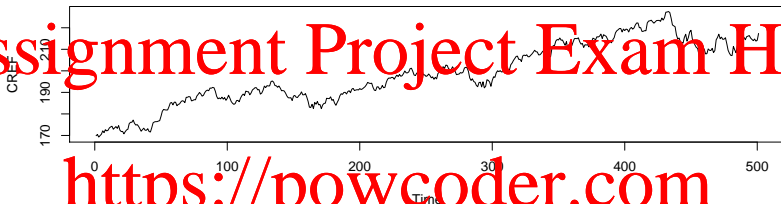
- ▶ Previously, we determined if a time series was nonstationary via the time series plot.
- ▶ It's generally quite obvious.
- ▶ However, if unsure, fit the ACF
 - ▶ **Very** slow decay if non-stationary/trending
 - ▶ Keep this pattern in mind, if you forget to plot the time series and jump straight to ACF/PACF, this should help you realize you need to difference.

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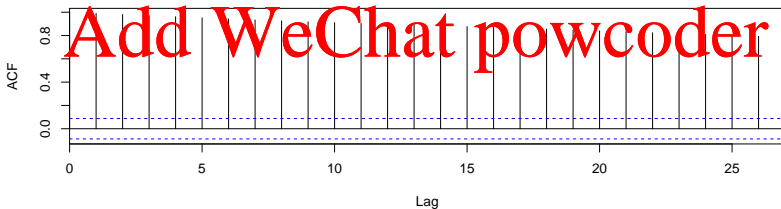
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Example with CREF Data

CREF Time Series



Sample Autocorrelations



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- ▶ What do we mean by model specification?
- ▶ How do we diagnose the appropriateness of a model?
 1. How do we *eyeball* assumptions?
 2. How do we get p-values to *test* assumptions?

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- ▶ Specification involves studying the time series plot, the ACF, PACF, and EACF and trying to determine an appropriate model or models for the data
 - ▶ Common to come away with a couple candidate models
 - ▶ Reading ACF/PACF/EACF not always straight forward
- ▶ You're trying to find a reasonable starting point, and you want to be able to justify that model should you ultimately use it

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- ▶ Residual diagnostics to check appropriateness of the model

- ▶ **Normality**

- ▶ Histogram, Normal Q-Q plot, Shapiro-Wilks test

- ▶ **Independence**

- ▶ Time series plot, ACF of residuals, Ljung-Box p-values

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Overfitting

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- ▶ After going through the steps to specify a model, you fit that model and diagnose the fit
- ▶ If it looks bad, you start iterating through the process of *overfitting*
 - ▶ Add an MA term, check results
 - ▶ Add an AR term, check results

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- ▶ When overfitting, you are looking at these things -

1. Are the added terms significant?
2. Do the assumptions appear to better hold (better residual diagnostics)
3. Did the AIC/BIC improve?

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- ▶ There is often multiple models that will fit the data well and look appropriate according to the residual diagnostics
 - ▶ Can select between them using AIC/BIC
 - ▶ Want a simple model that fits well
 - ▶ If an ARMA(1,1) and an ARMA(3, 5) both fit reasonably well, I'm going with the ARMA(1,1)

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