



Project 2

Download the time series observations called “project2_data.txt” from the lecture homepage.

1. Implement methods to compute the sample autocovariance function and the sample partial autocorrelation function of a sample of arbitrary length. Plot both functions for the given data and enter a significance level into your plot. Explain how you chose the level.
2. Assume that the given data follows an $\text{ARMA}(p, q)$ model with unknown mean. Estimate the mean of the model.
3. Implement the AICC criterion for order selection of a suitable $\text{ARMA}(p, q)$ model as well as the sample autocovariance and partial autocorrelation functions. Do you obtain the same values for p and q with both methods? (*Hint*: You do not have to implement the maximum likelihood estimation from scratch.)
4. Fix p and q according to the results of the previous task and implement two methods to estimate the parameters for this $\text{ARMA}(p, q)$ model. Compare your obtained parameters with those you found from the maximum likelihood estimation in the previous task. Is your obtained model causal and/or invertible?
5. Understand and implement the method that was introduced in the lecture, which can be found in Section 3.2.4 of the lecture notes, to compute one-step predictors for $\text{ARMA}(p, q)$ models with your estimated parameters. Perform predictions on the observations from the same time series “project2_data_forecasting.txt” from the lecture homepage and compute the corresponding mean squared errors. Explain your results and conclude how you judge the quality of your model fitting.

Deadline: Monday, May 23, 2016, 23:59

Webpage:

<http://www.math.chalmers.se/Stat/Grundutb/CTH/tms087/1516/>

Requirement: To pass the course, both projects as well as the final exam have to be passed.

Formalities: You are allowed to work in groups up to two. Nevertheless, everybody should hand in his project individually to make sure that it arrives on time. Send your project report as pdf document to both annika.lang 'at' chalmers.se as well as annika.lang.chalmers 'at' analys.arkund.se. Your report should include all plots, explanations, and answers to the questions as well as your implemented code in an appendix. The code in your preferred language should include comments to be readable. Emails received after the deadline will be considered "failed".