02417: Time Series Analysis
Rune Grønborg Junker DTU Compute
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Assignment 3: ARIMA model for amount of Bitcoin transaction

In this assignment you will use ARIMA models to model the development of daily Bitcoin transaction. The goal is to forecast the amount of bitcoin transactions two months into the future.
The data can be found in `A3_BitcoinTransactions.csv` and includes two columns: Date and amount of daily Bitcoin Transactions, from 2013 January 1st until 2021 October 13th. The data is provided by Nasdaq: `https://data.nasdaq.com/data/BCHAIN/NTRAN-bitcoin-number-of-transactions`
We reserve the two last months for testing the model, and so you are only allowed to use the first 3147 observations (up to and including 2021 August 13th) for training purposes.

Question 3.1: Plotting

Plot the data as a function of time. Indicate the training and test data in the plot. It might be necessary with a second zoomed plot, to see the variation and the test data.

Question 3.2: Correlation structure

Plot the autocorrelation function and the partial autocorrelation function of the amount of daily Bitcoin transactions.

If relevant you should also plot for transformations of the number of Bitcoin transactions.

Comment on the plot(s) including what can you say about a potential model structure at this stage.

Question 3.3: Procedure for identifying ARIMA model

State the approach/algorithm that you will/have use(d) for identifying the best model. Include your stopping criteria.

Question 3.4: ARIMA model

Try to find a suitable ARIMA model for the amount of daily Bitcoin transactions. Develop the model using graphical and numerical indicators (Including tests) as you described in Q3.3.

Present a full residual analysis for the final model. In case the residuals of your final model are not satisfactory, describe what you have tried and argue why you are not able to find a better model.

You do not have to present a full residual analysis for every single model that you have looked at. However, you should present some intermittent models and show what was wrong with them in order to argue for the choices that you have made.

Question 3.5: Predictions

Use the model you have developed for predicting the amount of daily Bitcoin transactions for the two last months, including prediction intervals. Compare with the data that was left out in a suitable plot.

Make a table presenting the predictions and prediction intervals 1, 2, 14, 31 and 61 days ahead.

Comment on your results.

Question 3.6: Improving the model

Describe some ways that the model might be improved by using other sources of information or model structures.