02417: Time Series Analysis

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Assignment 3: Estimating ARMA Processes and Seasonal Processes

The city of Malm wants to be carbon neutral by 2030. One step on the way is to get a better understanding of the consumption and production of energy in the city. To balance the electricity grid it is important to make good forecasts covering the planning horizon. In this assignment the focus will be on predicting the electricity consumption from a district in Malḿo. The data is provided by E.On.se and is in the file `A3_power.csv`. The file is made using "\t" (tabulator) as column separator and ',' as decimal point.
The three columns are:

Date: Date for observation
Hour: Hour within day for the observation
Power: The consumption for that hour in MWh

Exclude observations from 15-10-2017 and onwards when estimating parameters so that these can be used for out of sample validation.

Question 3.1: Presenting the data Plot the power consumption over the entire period - indicating which part is left as test data. Consider if additional plots can provide further insights in potential patterns. Comment on the behaviour including considerations on stationarity and transformations.

Question 3.2: ACF and PACF Estimate the autocorrelation function and the partial autocorrelation function of the power consumption and if relevant also for derived series, e.g. transformations. Include reflections on potential model stucture.

Question 3.3: Model selection procedure Describe your approach: How will you find your model? Which criteria will you prioritise to stop model selctions.

Question 3.4: Model selection Select an initial model structure. Estimate the parameters. Validate the model. Consider tests for lower model order. Consider updating the model structure.

Argue for the choices you make. Remember that the model building process is an iterative process and you should always consider stepping back and reconsider your choices.

Question 3.5: Predictions Use the model you have developed for predicting the power consumption for the 2.5 days that were left out. Do include 95% include prediction intervals. Compare with the data for the corresponding period - using both plots and a table. (In the table it is sufficient to include the 1, 6, 12, 24, 48 hour predictions.)

Question 3.6: Comments Comment on your results. Do include ideas for future work.

HINT: If you want to convert the first two columns of the data to a time stap then the following functions may be useful: `paste` and `as.POSIXct`.