MADS – “Statec Workshop” (Vasja S.), 24.10.2024

Homework II – ARIMA model

In this homework, you will **forecast the time series that you selected in HWI**. You can reuse the R and Python codes that are uploaded on the moodle. You can also use alternative packages, commands, or software. Please submit the homework in both a "knitted" Jupyter or R markdown file (html, pdf...) and an un-knitted script+data (so that I can re-run it if there are mistakes). ***The deadline for HW II is November 4th.***

Name and **submit the following files**:

HWII_analysis_[yourLastName]. html/pdf – In this file you present the results

HWII_data_[yourLastName].* - this file should contain the data

HWII_script_[yourLastName].* - this file should contain the code which produces results

While writing the analysis file, please follow the headings outlined below.

***HOMEWORK INSTRUCTIONS*:**

POINT 1 [**STATIONARITY&TRANSFROMATIONS**]: Clean the data of outliers or breaks. Decide and describe whether the series is stationary or not. Support your argument with ACF and PACF functions, as well as statistical tests. Explain which transformation you will use to make the series stationary and ready for modelling.

POINT 2 [**ARIMA MODEL**]: Take the stationary series from point 1, use the first 80% of the sample for estimation, and select an appropriate ARIMA model. Justify your choice by means of tests and selection criteria.

POINT 3 [**FORECASTS**]: Use the model from point 2 and perform ***one-step-ahead forecasts, with expanding window***, for your series for the remaining 20% of the sample (you can refer to the code from “Ex_multi_TS_real_data.ipynb”). Plot the forecasts and the true values. Also, report the RMSE of the forecasts. You will later compare this RMSE to the RMSE obtained in a VAR and NN model. For example, if you have 100 observations, the 1st one-step-ahead forecast: Estimate the model on T = 1…80 and forecast the value for T=81. The 2nd one-step-ahead forecast: Estimate the model on T = 1…81 and forecast T=82, and so on.

BONUS points: Explain what is the consequence of estimating an ARIMA model on a non-stationary data.