Assignment Task 1

(with R)

Deadline: 2018-02-27, 23:59

Do not forget to explain your answers!

Note: when generating data use `set.seed(student.code)` where `student.code` is your unique student code.

1. Model generation and initial analysis

1.1 Generate the following model

$$(1 - 0.7L + 0.4L^2)Y_t = 0.7 + (1 - 0.5L)\epsilon_t$$

with sample size $T = 150$ and a WN component $\epsilon_t \sim \mathcal{N}(0, 1)$.

1.2 Plot the **sample** ACF and PACF - what can you say about the process using only these plots?

1.3 What kind of model is specified in `1.1` equation - $AR(p)$, $MA(q)$ or $ARMA(p, q)$ (do not forget to specify `p` and `q`)? Is the process stationary and/or invertible? Explain your answers.

2. Model estimation

2.1 Estimate the model from the generated data (note: use `Arima` from the `forecast` package and specify the lag order from part `1.3`). What are the coefficient values of your estimated model? Are they close to the actual values?

2.2 Use the `auto.arima` function (from the `forecast` package) to fit the best model for each series. Is the model and the coefficients estimated by `auto.arima` the same as the ones used to generate the data?

2.3 Using the estimated model from `auto.arima`, forecast 20 periods ahead. What can you say about the forecasts, i.e. how do the forecast values change as the forecast period increases?

3. Residual tests

Remember that the previous model is generated with shocks $\epsilon_t \sim WN(0, 1)$.

3.1 Plot the **residuals** of your estimated model from the `auto.arima`. Does the time series plot look like WN?

3.2 Plot the sample ACF and PACF of your model **residuals** - do they look like WN?

3.3 Perform the Ljung-Box Test on the residuals of your models. Are the residuals WN?