

Assignment Task 5

(with R)

Deadline: 2018-04-25, 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.

Part A

Generate an artificial two-dimensional VAR(2) process with a sample size of 200 and of the form:

$$\vec{Y}_t = \begin{pmatrix} Y_{1t} \\ Y_{2t} \end{pmatrix} = \begin{pmatrix} 5 \\ 10 \end{pmatrix} + \begin{pmatrix} 0.5 & 0.2 \\ -0.2 & -0.5 \end{pmatrix} \begin{pmatrix} Y_{1,t-1} \\ Y_{2,t-1} \end{pmatrix} + \begin{pmatrix} -0.3 & -0.7 \\ -0.1 & 0.3 \end{pmatrix} \begin{pmatrix} Y_{1,t-2} \\ Y_{2,t-2} \end{pmatrix} + \begin{pmatrix} \epsilon_{1,t} \\ \epsilon_{2,t} \end{pmatrix}$$

where $\begin{pmatrix} \epsilon_{1,t} \\ \epsilon_{2,t} \end{pmatrix} \sim \mathcal{N}\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\right)$

Part B

Plot the data. Inspect the ACF and PACF. Is the data stationary?

Part C

Create a VAR model using the `VARselect` function. Depending on the data plots, consider at least two different selection types: `type=c('const', 'trend', 'both', 'none')`. Choose a model with the **minimum** value of `SC(n)`.

Part D

Estimate the selected model from part C. Are all of the coefficients statistically different from zero? Compare the estimated coefficients with the ones used in the model generation, are they similar?

Part E

Perform a Granger Causality test on the variables. Interpret the results.

Part F

Check the reaction of a unit Y_1 and a unit Y_2 impulse via the impulse-response function and answer the following:

- Which impulse has the **largest** effect at T period, which - at $T + 1$ period and on which equation(-s)?
- Which impulse has the **longest** effect, and on which equation(-s)?

Part G

Forecast \vec{Y}_t 20 steps ahead.