Applied Time-Series Econometrics
Homework 3

Due to February 25^{th}

Exercise 1

Consider the following bivariate VAR(1):

$$\begin{bmatrix} x_t \\ y_t \end{bmatrix} = \begin{bmatrix} 0.5 & 0.3 \\ 0.1 & 0.8 \end{bmatrix} \begin{bmatrix} x_{t-1} \\ y_{t-1} \end{bmatrix} + \epsilon_t, \epsilon_t \sim N(0, \Omega), \Omega = \begin{bmatrix} 1.5 & 0.3 \\ 0.3 & 2.0 \end{bmatrix}$$

a Is the process covariance-stationary?

b Plot the theoretical impulse response function of a one-standard deviation shock.

c Simulate one sample of size $T = 100$ by taking random draws from ϵ and setting $x_1 = y_1 = 0$.

d From your simulated sample, estimate the coefficients of a VAR(1): $\hat{\Phi}$ and $\hat{\Omega}$.

e Using your sample, does variable y granger cause x? Does variable x granger cause y?

f Compute and plot the IRFs from your estimated reduced form VAR with 95% confidence bands. How does it compare with your answer in b?

Exercise 2

In the exercise you are going to replicate *Vector Autoregressions* an article by Stock and Watson published in 2001 in the Journal of Economic Perspectives.

a Download the data from FRED from 1955 to 2019. (Inflation: GDP implicit price deflator; Interest rate: federal funds rate; unemployment: unemployment rate).

b Replicate panel A of table Table 1.

c Replicate Figure 1.

d Chose an alternative order of the variables and redo the IRFs. Comment.