EXERCISE ON IRF'S, GCP, SVAR'S

(1) Here are two first-order, four-variable VARs. In each case, is there a way to order the variables so that they show a Granger causal ordering? What is the implied ordering (e.g $\{a, b\} \to d \to c$)?

$$y_t = \begin{bmatrix} .1 & 0 & .3 & 0 \\ 0 & .9 & 0 & -.6 \\ .6 & 0 & -.3 & 0 \\ 0 & .1 & 0 & .1 \end{bmatrix} y_{t-1} + \varepsilon_t$$

$$y_t = \begin{bmatrix} 1 & 0 & .2, & .2 \\ 1 & 1 & 1 & 1 \\ 1 & 0 & .2 & .3 \\ -.6, & 0 & .8 & -.1 \end{bmatrix} y_{t-1} + \varepsilon_t$$

(2) For one of the systems in question 1 that does display a Granger ordering (and at least one does), calculate the first three matrices of impulse response coefficients, assuming a diagonal covariance matrix of shocks so that no orthogonalization is needed. [You will want to use R or Matlab or the like for this calculation. On an exam, a question like this would probably stick to two by two matrices.] This problem should verify an important point not emphasized in the lecture: Block triangular structure in the AR coefficient matrices $B(L)$ implies block triangular structure in $B^{-1}(L)$.

(3) In a two-dimensional structural VAR we have three choices of identifying assumption, any one of which we think is plausible. The model has the usual form $A(L)y = \varepsilon$ and we assume $A_0^{-1}\varepsilon$ is the innovation. One possible identifying assumptions $a_{210} = 0$ (i.e., the A_0 matrix is upper triangular, so that y_2 responds to shock 1 only with a 1-period delay). A second is instead $a_{210} = a_{211} = 0$, i.e. that it responds only with a 2-period delay. and a third is $a_{210} = a_{211} = a120 = a_{121} = 0$. One of these is much easier to handle than the others. Why? Explain how you could go about estimating the coefficients in $A(L)$ in each case.

Date: March 10, 2021.