Macroeconometrics VAR Exercises

Moving on to ...

Exercise I

Consider the following VAR model with two variables, y_t and z_t:

$$
\begin{aligned}
y_t &= 0.1 + 0.1y_{t-1} + 0.4z_{t-1} + e_{1t} \quad (1) \\
z_t &= 0.8 - 0.3y_{t-1} + e_{2t} \quad (2)
\end{aligned}
$$

and that the residual variance-covariance matrix is given by:

$$
\Sigma = \left[\begin{array}{cc} 0.5 & 0.4 \\ 0.4 & 2 \end{array} \right].
$$

Exercise I - Cont.

a) Write the equations in (1) - (2) in vector format.

b) Find the two steps-ahead conditional forecast of y_t, $E_t[y_{t+2}]$. Discuss how z_t affects $E_t[y_{t+2}]$.

c) Assume z_t does not affect contemporaneously y_t (recursive identification approach). Show your matrix B after imposing this restriction and find all coefficients of the structural VAR (including σ_y and σ_z).

d) Under the restriction imposed in c), compute the IRF for both variables to a one standard deviation shock in z_t at impact and step 1. Interpret them. What if the size of the shock doubles. What are the responses at impact and step 1?

e) Compute the FEVD of y_t at impact and step 1. How do your findings in terms of FEVD complement your conclusions in d)?

Moving on to ...

Exercise II

Suppose we have the following estimated VAR with two variables, money aggregate M and GDP Y:

$$M_t = \underset{(0.01)}{0.3^{\star\star}} Y_{t-1} + \underset{(0.2)}{0.9^{\star\star}} M_{t-1} + e_{2t} \qquad (3)$$

$$Y_t = \underset{(0.05)}{0.4^{\star\star}} Y_{t-1} + \underset{(0.3)}{0.1} M_{t-1} + e_{1t} \qquad (4)$$

where the term inside the brackets are the estimated standard errors and the stars represent coefficients that are significant at a 5% confidence level. Also the Cholesky decomposition of the residual variance-covariance matrix is given by:

$$P = \left[\begin{array}{cc} 0.3 & 0 \\ 0.5 & 0.4 \end{array} \right].$$

Exercise II - Cont.

a) Does money Granger cause GDP? And does GDP Granger cause money?

b) Find the structural VAR representation with the information given to you (i.e. Find Φ_0 and Φ_1 in $Y_t = \Phi_0 + \Phi_1 Y_{t-1} + \epsilon_t$). Hint: no need to inverse matrix).

c) Find the contemporaneous and one step ahead impulse responses using what you found in b). Interpret the results.

d) Interpret the forecast error variance decomposition in the Figure below. Discuss how the information contained in the FEVD and the IRFs complement each other.

Money - M		
Steps	Y (%)	M (%)
0	0	100
5	20	80
10	30	70
20	50	50
GDP - Y		
Steps	Y (%)	M (%)
0	95	5
5	95	5
10	94	6
20	90	10

Figure: Hypothetical FEVD for Exercise II.