

ECON 6310
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Practice Problems

Problem 1. Suppose you estimate a trivariate VAR(3) model with data on the federal funds rate, inflation, and log of real gdp. Suppose that estimation of the model produces the following error variance-covariance matrix:

$$\hat{\Omega} = \begin{bmatrix} 0.235984605272028 & 0.000607685319658703 & 3.00312709829014e - 05 \\ 0.000607685319658703 & 5.07801714129684e - 05 & 1.30153899716512e - 06 \\ 3.00312709829014e - 05 & 1.30153899716512e - 06 & 5.31910230853464e - 06 \end{bmatrix}$$

a. Using Matlab and the *chol(Omega, 'lower')* command, find the \hat{P} matrix for the Cholesky decomposition. Verify that it is lower triangular.

b. Show the relationship between the reduced form errors and the structural errors by forming $v_t = \hat{P}^{-1}\epsilon_t$. To do this you have to create \hat{P}^{-1} by using the $\hat{P}^{-1} = \text{inv}(\hat{P})$ command in Matlab. Write out v_t as a function of the elements of \hat{P}^{-1} and ϵ_t . What is the nature of the relationship between the reduced form errors and the structural errors? Discuss the economic implications of this relationship.

Problem 2. For this problem you are to use the data *bgrdata.xls* which can be found on the website.

a. Using in this order, logarithm of industrial production, the logarithm of consumer price index excluding shelter, the logarithm of commodity prices, and the federal funds rate to estimate VAR(12) model.¹ Do interest rates Granger cause industrial production?

b. Using the triangular factorization and Monte Carlo simulation to estimate the confidence intervals, estimate and graph the orthogonalized impulse response functions for a horizon of 50 periods. Remember setting *graphs=1* in the input will graph the IRFs automatically.

¹The default input is as follows: *[PiVar, OmegaP, IRFs, DEC, LagDiag, CI, GC] = vecar(Y, 0, lags, hor, stdIRF, 0, 0, 0, orth, graphs, 0)*. Setting *graphs=1* plots the orthogonalized IRFs, *orth=1* is for the Cholesky decomposition (*orth=0* for triangular factorization), *stdIRF=1* for Monte Carlo confidence intervals (*stdIRF=0* for Kilian method) and *lags* and *horizon* are chosen by the user.

- c. How does industrial production respond to a 1% increase in the federal funds rate? Discuss the magnitude and statistical significance. Pay special attention to the scale of the effect.
- d. Now repeat parts b and c but instead use the Cholesky decomposition method of orthogonalization. Interpret your results carefully. How do we interpret the results differently as compared to those obtained under the triangular factorization?
- e. Examine the variance decomposition for industrial production. How much of the variation in industrial production is explained by the federal funds rate at $s = 0$, $s = 10$, $s = 30$, and $s = 50$?