

Midterm Examination

Econ 835

Spring 2012

1 Analytical Questions

1. (15 points) Consider the following bivariate structural VAR

$$y_{1t} = \gamma_{10} - b_{12}y_{2t} + \gamma_{11}y_{1,t-1} + \gamma_{12}y_{2,t-1} + \varepsilon_{1t}$$

$$y_{2t} = \gamma_{20} - b_{21}y_{1t} + \gamma_{21}y_{1,t-1} + \gamma_{22}y_{2,t-1} + \varepsilon_{2t}$$

where $\begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \sim iid \left[\begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}, \begin{pmatrix} \sigma_1^2 & 0 \\ 0 & \sigma_2^2 \end{pmatrix} \right]$

- (a) Can you estimate above two equations by OLS separately? Explain.
 - (b) What are the different types of restrictions that have been proposed in literature to identify the above structural VAR?
 - (c) Show how recursive restrictions can identify the above model.
2. (10 points) If R_t is the daily stock return denoted by $\ln\left(\frac{P_t}{P_{t-1}}\right)$, where P_t is the stock price at time t . If $R_t(5)$ represents the weekly stock return, and is denoted by $\ln\left(\frac{P_t}{P_{t-5}}\right)$, where subscript 5 represents five trading days in a week. We can also write $R_t(5) = \sum_{j=0}^4 R_{t-j}$. Assume that $R_t \sim WN(\mu, \sigma^2)$. What kind of dynamic process does $R_t(5)$ have? Calculate the mean, the variance and the covariances for $R_t(5)$ process?

2 Empirical Questions

1. (13 points) Suppose the structural representation of a bivariate VAR(1) model is

$$By_t = \Gamma_1 y_{t-1} + \eta_t$$

The reduced form of the above model can be represented as

$$y_t = A_1 y_{t-1} + \epsilon_t$$

$$E(\epsilon_t \epsilon_t') = \Omega$$

Suppose we apply OLS to the reduced form equation and the estimation results give us

$$\widehat{A}_1 = \begin{bmatrix} 0.34 & 0.09 \\ -0.25 & 0.95 \end{bmatrix}, \widehat{\Omega} = \begin{bmatrix} 0.87 & -0.2 \\ -0.2 & 0.10 \end{bmatrix}$$

- (a) Check whether this reduced form VAR is stationary.
 - (b) Suppose you need to identify B matrix using the Blanchard-Quah decomposition. How would you use the estimated \widehat{A}_1 and $\widehat{\Omega}$ matrix to identify B. You don't need to solve for explicit value of B. Outline the steps involved.
2. (12 points) Suppose two forecasts for Y_{t+h} at time t are available: $Y_{t+h|t}^A$ and $Y_{t+h|t}^B$. Forecast A may refer to the forecast made by a private forecaster and forecast B may refer to the forecast made by Federal Reserve Board staff.
- (a) How would you test that these forecasts are unbiased?
 - (b) How would you test for the rationality of these forecasts?
 - (c) Suppose you want to test whether one forecast encompasses all the information in other forecast. How would you test forecast encompassing?
 - (d) Suppose MSE and are mean squared errors of these forecasts. Outline the steps involved in testing whether one forecast is significantly better than the other.