Problem Set 3
Econ 40357 Financial Econometrics
University of Notre Dame
Professor Nelson Mark
Fall 2020

1. Let y_t be a 3×1 vector of variables. We model it as a VAR(2),

$$y_t = A_0 + A_1 y_{t-1} + A_2 y_{t-2} + \epsilon_t$$

   (a) Write out all the equations of the VAR in full, carefully defining any new notation that you use.

   (b) Louie and Kai use the same set of data but work independently. They arrive at different lag lengths for the VAR. Describe and evaluate two methods for determining the appropriate lag length.

2. Define the following terms and describe the processes they represent

   (a) Weak (covariance) stationarity

   (b) Strict stationarity

   (c) Deterministic trend

   (d) Stochastic trend

3. Louie wants to test for a unit root in some time-series data. He uses the ADF test and runs the regression

$$\Delta y_t = a_0 + \beta y_{t-1} + \gamma_1 \Delta y_{t-1} + \gamma_2 \Delta y_{t-2} + \epsilon_t$$

   He obtains regression output $\hat{\beta} = -0.24$,se$\left(\hat{\beta}\right) = 0.12, \hat{\gamma}_1 = 0.04$ se$(\hat{\gamma}_1) = 0.22, \hat{\gamma}_2 = 0.10$, se$(\hat{\gamma}_2) = 0.10$.

   (a) Which coefficient should he use to form the t-ratio to do the test?

   (b) The 5% critical value for the test is -2.86. What is the conclusion from this test?

   (c) What should be the next step?

4. Use the Eviews workfile ps03.wf1, sheet CPI_Venezuela. The variable P is the CPI. For $\ln(P)$,use the ADF test to answer the following.

   (a) Is $\ln(P)$ stationary or not? Explain your answer.

   (b) Is $\Delta \ln(P)$ stationary or not? Explain. What do we typically call $\Delta \ln(P)$?

   (c) Is $\Delta^2 \ln(P) = \Delta(\Delta \ln(P))$ stationary or not? Explain

5. Use the Eviews workfile ps03.wf1, sheet vars_lps_climateexra. q_cyp is the logarithm of the real U.S. dollar price of the Cypriot pount, spliced to the euro in 1999. clim_factor is the global temperature shock. dq_cyp is the change in q_cyp

   Estimate a VAR(2) for dq_cyp and clim_factor.

   (a) Does dq_cyp Granger cause clim_factor? Does clim_factor Granger cause dq_cyp? Which variable is econometrically exogenous to the other?

   (b) Generate cumulated impulse responses of dq_cyp to a shock in clim_factor at horizons 1-48. Report the graph of the responses. Comment on what you find.

   (c) Generate the impulse response for q_cyp(p)-q_cyp for $p = 1, 12, 24, 36, 48$, by local projection. Comment on what you find, and contrast with your results in part b.

6. Event study. Use the Eviews workfile ps03.wf1, sheet Event. The event in question is the date at which a firm was included in an index. The Eviews workfile contains the $\hat{\epsilon}_{t,i}$, in event time, from the regression

$$r_{t,i} = \hat{\alpha}_i + \hat{\beta}_i r_{t,m} + \hat{\epsilon}_{t,i}$$

   for firms $i = 1, ..., 20$. α and β are estimated with observations $1 - 259$ (the pre-event window). Obseveration 260 is the event date. We will use observations $260 - 290$ as the event window. Treat $\hat{\epsilon}_{t,i}$ as the abnormal return $AR_{t,i}$.

   From the pre-event window, assume $\epsilon_{t,i} = AR_{t,i} \sim N\left(0, \sigma^2_{ar(i)}\right)$

   (a) Plot the cumulated abnormal returns for all 20 firms over the pre-event and the event window. Put them all in one graph.

   (b) For each firm, individually test the hypothesis that the event had no effect on its cumulated abnormal return.

   (c) Plot the cumulated abnormal returns averaged over all 20 firms, over the pre-event and the event window.

   (d) Test the null hypothesis that the event had no effect on the cumulated abnormal return, averaged across all firms.