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UCSD, Spring 2019
Econ 214

Project 1: Empirical Macroeconomics Basics
Due Thursday April 25 at 11:59 pm
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1. Adventures with SVAR identification. Use the data in the Excel file "faketax.xlsx" for this question.

Suppose we specify the following bivariate structural VAR representation:

(1a)
$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 R_{t-1} + \alpha_3 R_t + \varepsilon_{Yt}$$
$$R_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 R_{t-1} + \beta_3 Y_t + \varepsilon_{Rt}$$

Y is real GDP and R is real tax revenues. I have created fake data that is already stationary so you don't need to worry about trends. Assume that the ε_Y and ε_R are mean zero, unit variance, serially uncorrelated and mutually uncorrelated structural shocks.

Consider also the reduced form VAR:

(1b)
$$Y_t = \gamma_0 + \gamma_1 Y_{t-1} + \gamma_2 R_{t-1} + \eta_{Yt}$$
$$R_t = \theta_0 + \theta_1 Y_{t-1} + \theta_2 R_{t-1} + \eta_{Rt}$$

η_Y and η_R are the reduced form innovations.

A. Suppose we want to estimate the parameters in the SVAR (1a). Why can't we estimate the two equations as written using ordinary least squares (OLS)? Be specific in your answer, referring to the particular elements of the equation.

B. Use economic intuition to predict the signs of the coefficients α_3 and β_3 if there are no lags in the effects.

C. Suppose that you think that tax shocks (ε_R) affect GDP (Y) only with a lag.

(i) Show how you would impose that identifying assumption in the system in equation (1a), being specific about what parameter(s) you would set to what value.

(ii) Use the data in faketax.xls to estimate the impact effect (i.e. horizon h = 0) of an output shock ε_{Yt} on tax revenue R_t using two equivalent methods: (a) Estimate one of the equations from (1a); and (b) Estimate the equations in (1b) in conjunction with a third regression. What is the estimated coefficient and standard error of the impact effect in each case? (They should be the same across the two methods.)

(iii) Referring to your estimation in (ii), explain why some coefficients are identical across the two methods while others are not.

D. Suppose that a researcher did painstaking narrative work to create a new series Z that has the following properties:

$\text{Corr}(Z_t\ \varepsilon_{Yt}) = 0$

$\text{Corr}(Z_t\ \varepsilon_{Rt}) \neq 0.$

In addition, assume that Z_t is serially uncorrelated and is not predictable from past values of any other variable.

(i) Use Z_t as an instrument to estimate the structural parameters in (1a) (in two steps). What are your estimates of α_3 and β_3?
(ii) What is the first-stage F-statistic for this instrument?
(iii) Run a proxy SVAR, i.e., estimate the reduced form residuals from (1b) and then run a proxy SVAR. What are your estimates of α_3 and β_3? How do they compare to (i)?
(iv) Compare the estimated value of β_3 (which is also the impact effect of an output shock on tax revenue) to the estimate you obtained in C(ii). Give econometric intuition for why one is bigger than the other.

E. Suppose that you want to estimate impulse responses of output to a tax shock using the Jordà method. In particular, estimate:

$$Y_{t+h} = \lambda_{0,h} + \lambda_{1,h} Z_t + \lambda_{2,h} Y_{t-1} + \xi_{Yt}$$

What is your estimate of $\lambda_{1,4}$ and the 95% confidence intervals based on Newey-West standard errors (allowing autocorrelation up to lag 5)?

2. Estimate a proxy SVAR using Matlab for a monetary SVAR containing (i) federal funds rate (ffr); (ii) log industrial production (lip); (iii) log CPI (lcpi); and (iv) log commodity prices (lpcom). Allow for 12 monthly lags in the SVAR. Use the Romer-Romer (2004) monetary shock (rrshock) as the external instrument. Show the impulse responses for the federal funds rate, log industrial production and log CPI up through horizon 48 of a monetary shock that raises the federal funds rate by 100 basis points on impact.

The data are available at: http://econweb.ucsd.edu/~vramey/econ214/monthlydat.xlsx . Delete the data before 1969.

Hints: You can go about this in several ways. Here are some ideas:

(a) Download Karel Mertens' programs for Mertens-Ravn JME 2014 from here: https://karelmertenscom.files.wordpress.com/2017/09/replicationfilesjme2014.zip .

(For reference, the fiscal data used by those programs is here: https://karelmertenscom.files.wordpress.com/2017/09/jme2014_data.xls)

Use the ReplicateFigure4.m programs and auxiliary files. You need to make the following changes (this list is not exhaustive):

- Convert things from quarterly to monthly.
- Omit the deterministic trends and 1975q2 dummy variable.
- Use 12 monthly lags, not 4 quarterly lags.
- Use a 48 month horizon, not a 20 quarter horizon.
- You should normalize so that your shock results in a 100 basis point increase in the federal funds rate.

Or

(b) Download Gertler-Karadi's programs from the AEJ Macro website (their paper appears in the January 2015 issue) and work with those programs. Note that Gertler-Karadi modified Mertens-Ravn's AER proxy SVAR programs. Gertler-Karadi's programs are already set up for monthly monetary VARs, but they have a lot of additional complications. In addition, they do not normalize their shocks so their confidence bands incorporate additional uncertainty. Thus, I am not sure whether it is easier to modify their programs or Mertens-Ravn's programs.