Problem Set 1: Impulse Responses and Phillips Curves

This is due September 7th, 2022, before class. Solutions should be typed and electronic (pdf) versions should be emailed to me prior to start of next class.

Question 1: *Sensitivity of Romer and Romer (2004) Estimates to IRF Procedure*

Go to David Romer's website and download the data for Romer and Romer (2004), which includes their estimated series of monetary policy shocks. Also, download seasonally adjusted industrial production from FRED (St. Louis Fed database) and work with its log. Download monthly average effective Federal Funds Rate as well.

a) Replicate the estimated effect of monetary policy shocks on industrial production in Romer and Romer (2004) over 48 months. Plot the impulse response for the (log) *level* of industrial production and bootstrapped standard errors.

b) Estimate the effect of monetary policy shocks on industrial production using the moving average representation of industrial production over 48 months. I.e., if $\hat{s}_t$ is the estimated shock series and y_t is industrial production, run the following regression:

$$\Delta y_t = c + \sum_{j=1}^{48} \beta_j \hat{s}_{t-j} + v_t$$

Plot the response and standard errors for the (log) *level* of industrial production (you'll have to bootstrap the standard errors).

c) Estimate the effect of monetary policy shocks on industrial production using the local projection method. Specifically, for *h*=1:48, run the following regressions

$$\Delta y_{t+h,t} = c + \sum_{j=1}^{24} \beta_j \Delta y_{t-j} + \gamma_h \hat{s}_t + v_t$$

where $\Delta y_{t+h,t} \equiv \log(y_{t+h}) - \log(y_t)$. Plot the impulse response and standard errors for the (log) *level* of IP (you don't need to bootstrap the standard errors here) over 48 months.

d) Estimate the effect of monetary policy shocks on industrial production using the local projection IV method. Specifically, for *h*=1:48, run the following regressions by IV, where $ffr_t$is the FFR.

$$\Delta y_{t+h,t} = c + \sum_{j=1}^{24} \beta_j \Delta y_{t-j} + \gamma_h ffr_t + v_t$$

using $\hat{s}_t$ as an instrument for FFR.

e) Replicate part a) using different lag specifications. Specifically, vary the number of lags of shocks used to construct the impulse responses from 1 to 36 months. Construct impulse responses for each specification (you don't need to plot these). Then, in two figures, plot how the maximum effect and timing of maximum effect of MP shocks on industrial production change with the number of lags of shocks used.

f) Download from FRED quarterly data over same periods for real GDP, total real consumption, real consumption of durables, total real investment, real residential investment, real non-residential investment, real wages, the CPI and the PPI. Take the log of each series. Create a quarterly series of the monetary policy shocks as the average over monthly shocks each quarter. For each series y_t, regress

$$\Delta y_t = c + \sum_{j=1}^{8} \beta_j \Delta y_{t-j} + \sum_{j=1}^{12} \beta_j \hat{s}_{t-j} + v_t$$

and plot resulting IRFs and bootstrapped standard errors in individual subpanels of a common figure. Discuss briefly how the implied comovement of variables after a monetary policy shock compares to average recession facts and general business cycle comovement. What does this tell you about whether monetary policy shocks are a plausible candidate for explaining much of historical U.S. business cycle variation?