Econ 210C Homework 2

Instructor: Johannes Wieland

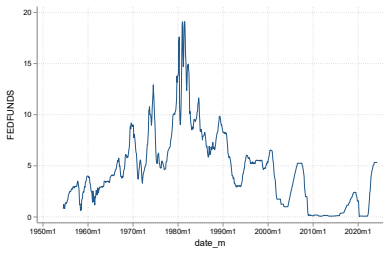
May 23, 2024

1. VARs

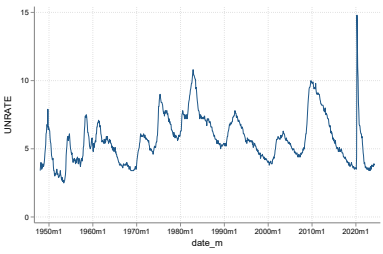
Download data for the Federal Funds Rate, the civilian unemployment rate, and the GDP deflator inflation rate from FRED.

(a) Plot the data. Make sure all graphs are appropriately labelled.

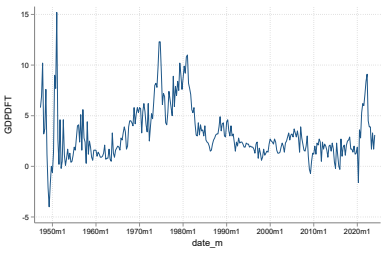
(a) Fed Funds Rate



(b) Unemployment Rate



(c) GDP Deflator



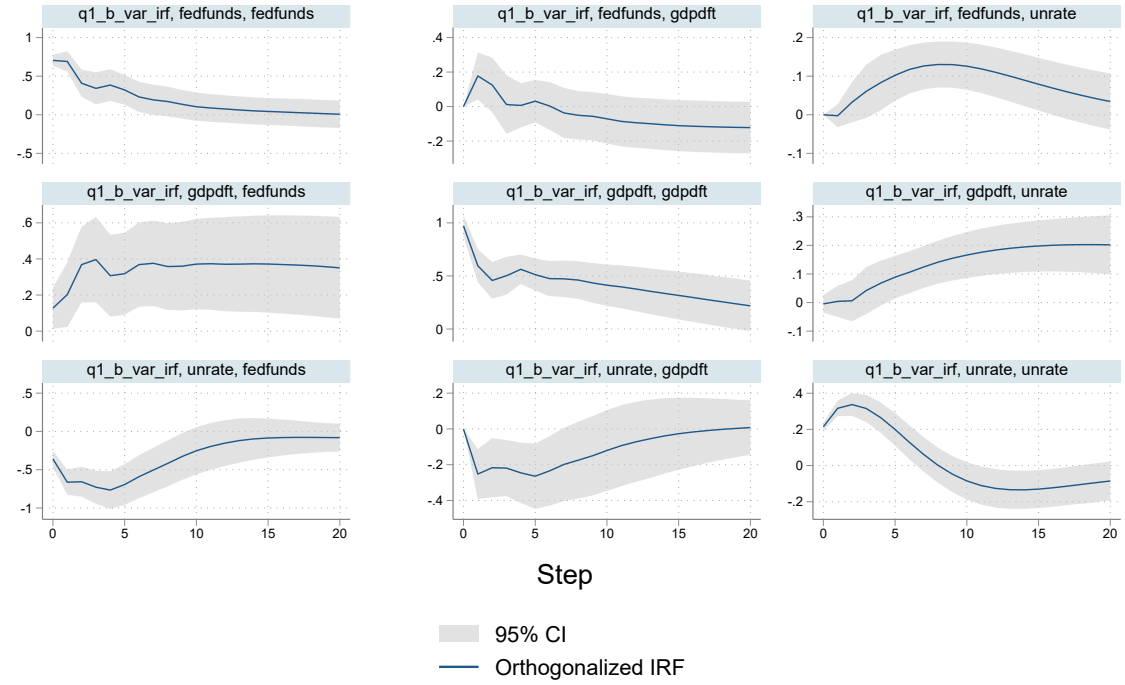
(b) Aggregate all series to a quarterly frequency by averaging over months.

The details are in Jupyter Notebook and Stata.

Estimate a VAR with 4 lags from 1960Q1:2007Q4. The ordering of your variables should be π_t, u_t, R_t.

$$\begin{bmatrix} \pi_t \\ u_t \\ R_t \end{bmatrix} = C \times \begin{bmatrix} \alpha \\ \pi_{t-1} \\ u_{t-1} \\ R_{t-1} \\ \pi_{t-2} \\ u_{t-2} \\ R_{t-2} \\ \pi_{t-3} \\ u_{t-3} \\ R_{t-3} \\ \pi_{t-4} \\ u_{t-4} \\ R_{t-4} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \end{bmatrix} \tag{1}$$

(a) Reduced Form VAR Impulse Response



Graphs by irfname, impulse variable, and response variable

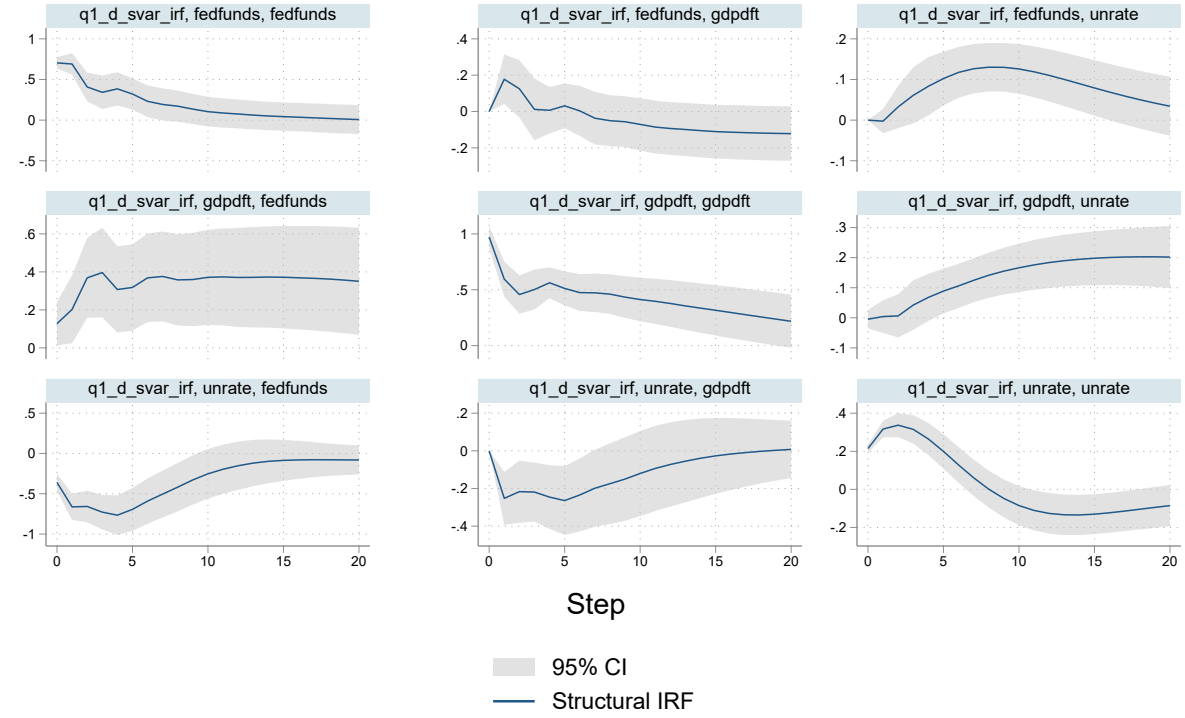
(c) Briefly, explain why it would make sense to end the sample in 2007Q4?

It makes sense to end the sample in 2007Q4 because we know there was a financial crisis in 2008 and it will impact all three variables at the same time and it is plausible that there is a structural change in the data generating process. This systemic shock makes the shocks to these three variables correlated.

(d) Plot the IRFs from the SVAR with the same ordering. [Optional: add 95% error bands]

$$A \times \begin{bmatrix} \pi_t \\ u_t \\ R_t \end{bmatrix} = A \times C \times \begin{bmatrix} \alpha \\ \pi_{t-1} \\ u_{t-1} \\ R_{t-1} \\ \pi_{t-2} \\ u_{t-2} \\ R_{t-2} \\ \pi_{t-3} \\ u_{t-3} \\ R_{t-3} \\ \pi_{t-4} \\ u_{t-4} \\ R_{t-4} \end{bmatrix} + A \times \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \end{bmatrix} = D \times \begin{bmatrix} \alpha \\ \pi_{t-1} \\ u_{t-1} \\ R_{t-1} \\ \pi_{t-2} \\ u_{t-2} \\ R_{t-2} \\ \pi_{t-3} \\ u_{t-3} \\ R_{t-3} \\ \pi_{t-4} \\ u_{t-4} \\ R_{t-4} \end{bmatrix} + I \times \begin{bmatrix} e_{1,t} \\ e_{2,t} \\ e_{3,t} \end{bmatrix} \tag{2}$$

Figure 3: Structual Form VAR Impulse Response



(e) Briefly, interpret your results.

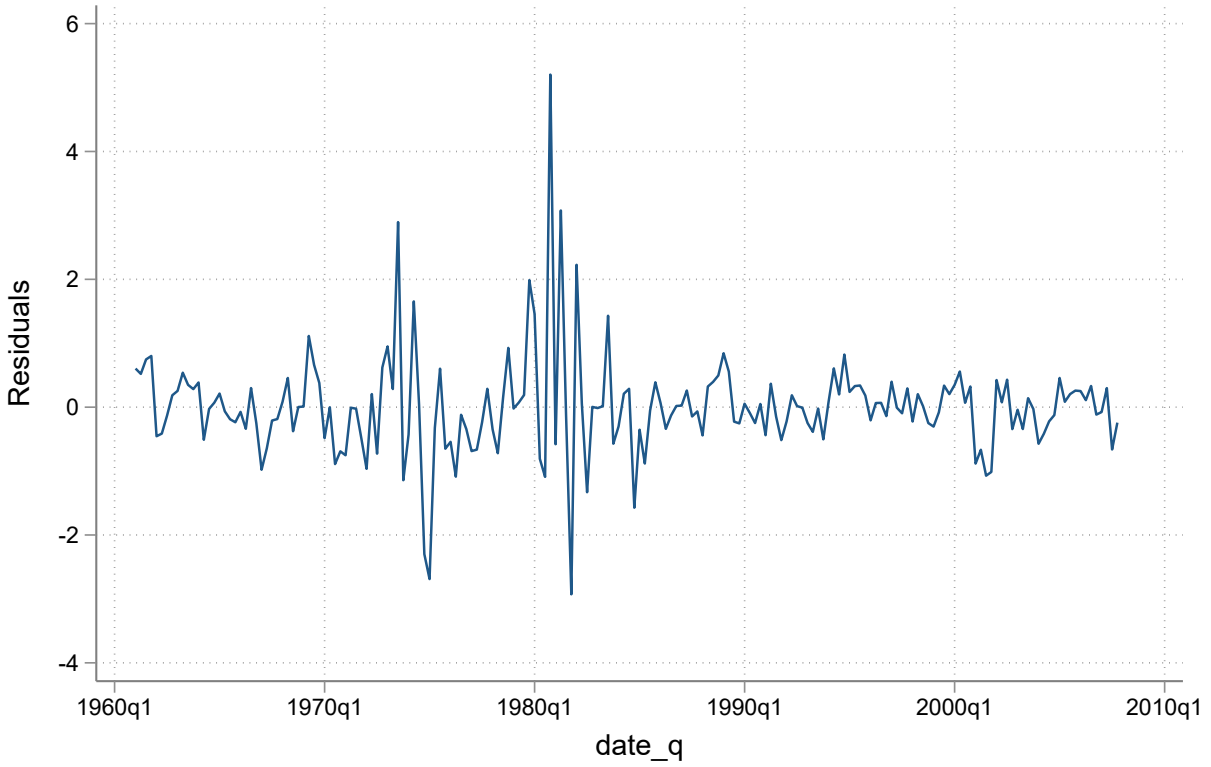
- When there is a shock to the fed funds rate:
  - The fed fund rate itself initially goes up and continuously goes down, this is just the decay effect of the temporary shock.
  - The inflation goes up, and then goes down and below the initial level. This initial spike may be related to expectations. Given that the FED increased the Fed fund rate unanticipatedly, people will infer that the current and near-future inflation will go up and therefore the inflation expectation increase. Then the inflation is controlled after some periods because the fed funds rate is higher than before.
  - The unemployment rate goes up for a longer period and then goes down around the initial level. This is the effect of the higher interest rate: a higher interest rate increases the financial cost for firms in the short run and reduces the cost and makes the firm lay off.
- When there is a shock to inflation:
  - The fed funds go up and then stay in a higher level compared to the initial level. This can be explained by Fed's response to the inflation and unemployment.
  - The inflation spikes initially and then goes down and this is the decay effect of the temporary shock.

  - The unemployment rate goes up. The explanation is the same as above. The higher interest rate gives firms an incentive to reduce costs and lay off.

- When there is a shock to unemployment
  - The fed funds rate goes down initially and then goes up and back to the initial level. This can be explained by Fed's action because the lower fed funds rate increases the aggregate demand and lower the financing cost for firms.
  - The inflation rate goes down first but then goes up and back to the initial level. The initial decrease could be explained by the unemployment shock and increase later can be explained by Fed's action: lowering the interest rate.
  - The unemployment rate goes up initially and then goes down. The explanation is the same as above. The lower interest rate gives firms an incentive to invest more and higher more, in order to offset the unemployment shock.

(f) Plot the time series of your identified monetary shocks.

Figure 4: Monetary Shock



(g) What are the identified monetary shocks in 2001Q3 and 2001Q4? How should one interpret these shocks?

In 2001Q3 and 2001Q4, we can see a negative monetary shock. This drop can be related to the 9-11 attack. In this case, the Fed responded by reducing the interest rate, in order to alleviate the negative effects of this shock on the economy.

The high volatility around 1981 was during Greenspan's period and he was famous as the unambiguous monetary policy maker.

2. Romer shocks

(a) Download the Romer-Romer shocks from my website and merge it with your VAR dataset. Set the values of the Romer shocks to zero before 1969Q1.

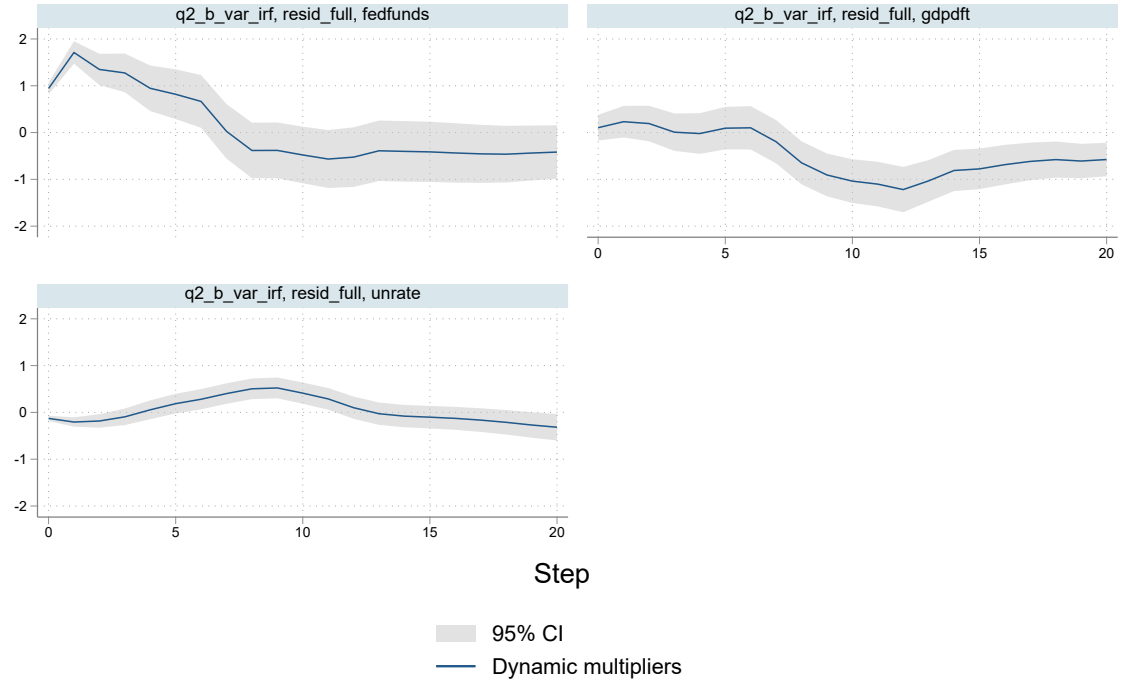
The details are in Stata.

(b) Following Romer-Romer, construct the IRF from the estimation equation

$$y_t = \alpha + \sum_{s=1}^{8} \beta_s y_{t-s} + \sum_{s=0}^{12} \gamma_s RR_{t-s}$$

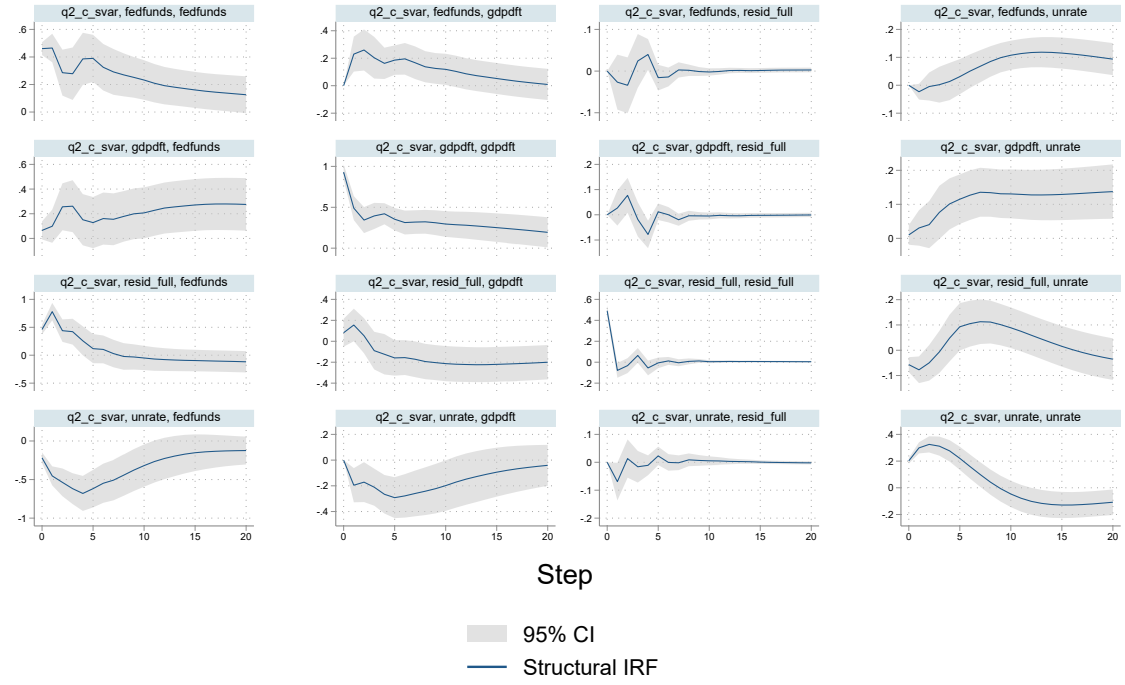
where $y_t \in [\pi_t, u_t, R_t]$ are the outcome variables and RR_t are the Romer shocks estimated from 1960Q1:2007Q4. [Optional: add 95% error bands]

(a) Reduced Form VAR Impulse Response



(c) Now estimate an SVAR ordered RR_t, π_t, u_t, R_t with four lags from 1960Q1:2007Q4 and plot the IRFs. [Optional: add 95% error bands]

(a) Structual Form VAR Impulse Response



Graphs by irfname, impulse variable, and response variable

(d) Briefly, explain why it is sensible to order the Romer shock first in the VAR.

It is sensible to order the Romer shock first because we believe that the Romer shock is the most exogenous variable and it has a contemporaneous effect on the interest rate, inflation, and unemployment. The author argue that this measure has impact on the federal funds rate and other macro variables in the model.

(e) Compare the IRFs for the Romer shocks from the two methods. How are they different, and why?

Compared to the SVAR IRFs, the magnitude of the response in VAR is higher to a positive Romer shock. This is because in the SVAR model, there are contemporaneous effects of the Romer shock. In SVAR model, the Romer shock is an endogenous variable, however, in the VAR model, it is an exogenous variable.

(f) Compare the VAR IRFs for the Romer shocks with the VAR IRFs for the SVAR shocks in Question (1d). How are they different, and why?

In part 1(d), the impact of interest rate on inflation initially spikes and then fades away. However, when we include the Romer shocks, the inflation decreases a lot. This is because when we added the Romer shocks, we can control for Fed's expectations on inflation and future economic conditions. The endogeneity issue is alleviated.

(g) Compare the Romer-Romer the identified monetary shocks in 2001Q3 and 2001Q4 with the SVAR identified monetary shocks. How are they similar / different?

The magnitude of the shock is smaller than the SVAR-identified monetary shocks, which means the monetary shocks are smaller in the Romer model. This makes sense because the monetary policy shock is captured by the definition of Romer shock. The unexplained component of the change of fed funds rate is smaller.