Effects of Monetary Policy Shocks on U.S. Economic Activity: A Bayesian Approach to TVP-VAR-SV Models

Kenneth Rich and Yiming Lin  Department of Economics, North Carolina State University

OBJECTIVES

We aim to build a Time-Varying Parameter Vector Autoregression model with Stochastic Volatility (TVP-VAR-SV) in order to study the transmission mechanism of monetary policy shocks to key macroeconomic variables.

In order to accomplish this task, we:
1. Collect data on key U.S. macroeconomic variables.
3. Check convergence using standard methods.
4. Use impulse response functions to examine the dynamic effects of a contractionary monetary policy shock on various economic variables throughout time.

DATA COLLECTION & METHODS

The data for this project come from the International Financial Statistics (IFS) and the St. Louis Federal Reserve Bank (FRED) databases.

The data used are real GDP, GDP deflator, the U-3 civilian unemployment rate, the Federal Funds rate, the M2 money stock, and the commodity prices index from the Federal Reserve Economic Data (FRED) databases.

Following Sims and Zha (2006), we define our data set, \( Y_t = [Y_t, P_t, U_t, R_t, M_t, P_{com_t}] \), where the measures of real output, aggregate price level, unemployment rate, interest rate, money supply, and commodity price level, respectively.

All the variables are expressed in year-to-year percentage changes:

\[ x_t^* = \log(x_t) - \log(x_{t-1}) \]

except for the interest rate and the unemployment rate, which are instead standardized:

\[ x_t^* = \frac{x_t^* - E(x_t^*)}{\text{std}(x_t^*)} \]

REFERENCES


CONCLUSION/FUTURE RESEARCH

- There is evidence that significant time variations in key U.S. economic variables.
- The ability of monetary policy to affect the real economy has considerably changed over time and policy interventions are interpreted in different ways across the sample period.
- A future research proposal is to include short and long run restrictions, as well as sign restrictions, to the TVP-VAR-SV model.
- With additional identification restrictions, we can study the interactions of monetary and fiscal policy shocks on the U.S. macroeconomy.

CONVERGENCE

We generate 150,000 draws from the Gibbs sampler à la Primiceri (2005), discard the first 100,000 draws, and thin every 100th draw of the remaining inference.

Convergence is verified by using the Geweke and Gelman-Rubin statistics and visual inspection of the chains.

RESULTS

As theory would suggest, a contractionary monetary policy shock (i.e. a sudden increase in the monetary policy instrument) should cause output growth, money growth, and inflation to fall, while unemployment rises. This theoretical result is evident in the early part of the sample, but disappears as time progresses (a consequence of the Classical Dichotomy).

As Figure 4 indicates, monetary policy shocks have the largest effects in 1981, while years 1975 and 1990 have similar, yet weaker effects. However in 2005, the dynamic responses of output growth, money growth, and inflation significantly increase and unemployment significantly falls after an interest rate increase. Thus, the effects of monetary policy shocks on U.S. economic activity has evolved over time.

Figure 1: Median and posterior 68% tunnels: volatility of monetary policy shock.

Figure 2: Estimates of \( \alpha \).

Figure 3: Convergence chain of \( A(\alpha_t) \)

Figure 4: Dynamic responses of key macroeconomic variables following a contractionary monetary shock: various dates

Email kmrich@ncsu.edu
Email ylin238@ncsu.edu