The Changing Transmission Mechanism of U.S. Monetary Policy

Shuran Zhang, Pao-Lin Tien | Wesleyan University Economics Department | QAC Summer 2011

Introduction

- Policymakers' dilemma: what policy or policies, if any, should be implemented to reduce business cycle fluctuations?
- Monetary policy an option, but how does monetary policy work?
- This project uses vector autoregression (VAR) with sign restrictions to identify monetary policy shock and examine the relative importance of transmission channels of monetary policy

Monetary Policy Affects the Real Economy

There is much agreement on the view that monetary policy has a significant influence on the real economy but there is no consensus regarding how monetary policy works and the relative importance of the many possible transmission channels of monetary policy.

Possible Transmission Mechanisms

Money View

Interest rate channel

expansionary monetary policy => r↓ => I↑ => Y↑

Exchange rate channel

expansionary monetary policy => r↓ => E↓ => NX↑ => Y↑

Credit View

Bank lending channel

expansionary monetary policy => reserves & deposits ↑ => bank loans ↑ => I↑ => Y↑

Link to the Great Moderation

- Is there a connection between changes in transmission mechanism and the Great Moderation?
- The Great Moderation refers to the recent moderation of U.S. business cycle that has been documented in numerous studies.
- Boivin and Giannoni (2006) show that from the 1960s and 1970s to the 1980s and 1990s, the standard deviation of output growth has fallen 30% while that of inflation has decreased more than 40%. The standard "break point" in macroeconomic volatility found by researchers tend to be around 1984.
- This project explores possible connections between changes in the transmission mechanism and the Great Moderation by considering the impact of different transmission channels pre and post 1984.

VAR Model Estimation and Identification

- Basic structural VAR model with 1 lag

$$Y_t = B\,Y_{t-1} + A\,\varepsilon_t \qquad E[\varepsilon\,\varepsilon'] = D$$

- Standardized VAR model with 1 lag

$$Y_t = B\,Y_{t-1} + T\,\eta_t \qquad E[\eta\,\eta'] = I$$

- Reduced form VAR model with 1 lag

$$Y_t = BY_{t-1} + e_t \quad E[ee'] = E[A\varepsilon\varepsilon'A'] = ADA' = \Sigma$$
$$E[ee'] = E[T\eta\eta'T'] = TIT' = TT' = \Sigma$$

- Identification problem (T^* and η^* not unique)

$$Y_t = BY_{t-1} + A\varepsilon_t = BY_{t-1} + e_t = BY_{t-1} + T\eta_t = BY_{t-1} + T^*\eta_t^*$$
$$e_t = TQ'Q\eta_t = \underbrace{TQ'}_{T^*}\underbrace{Q\eta_t}_{\eta_t^*} = T^*\eta_t^*$$
$$E\left[\eta^*\eta^{*\prime}\right] = Q\eta\eta'Q' = QIQ' = QQ' = I$$
$$E[ee'] = E[T^*\eta^*\eta^{*\prime}T^{*\prime}] = TQ'Q\eta\eta'Q'QT' = TT' = \Sigma$$

- How to find Q? (Givens rotation matrix)

$$Q = Q_{1,2}(\theta_1)\times Q_{1,3}(\theta_2)\times Q_{1,4}(\theta_3)\times Q_{1,5}(\theta_4)\times Q_{1,6}(\theta_5)\times Q_{1,7}(\theta_6)\times Q_{1,8}(\theta_7)$$
$$\times Q_{2,3}(\theta_8)\times Q_{2,4}(\theta_9)\times Q_{2,5}(\theta_{10})\times Q_{2,6}(\theta_{11})\times Q_{2,7}(\theta_{12})\times Q_{2,8}(\theta_{13})$$
$$\times Q_{3,4}(\theta_{14})\times Q_{3,5}(\theta_{15})\times Q_{3,6}(\theta_{16})\times Q_{3,7}(\theta_{17})\times Q_{3,8}(\theta_{18})$$
$$\times Q_{4,5}(\theta_{19})\times Q_{4,6}(\theta_{20})\times Q_{4,7}(\theta_{21})\times Q_{4,8}(\theta_{22})$$
$$\times Q_{5,6}(\theta_{23})\times Q_{5,7}(\theta_{24})\times Q_{5,8}(\theta_{25})$$
$$\times Q_{6,7}(\theta_{26})\times Q_{6,8}(\theta_{27})$$
$$\times Q_{7,8}(\theta_{28})$$

Data

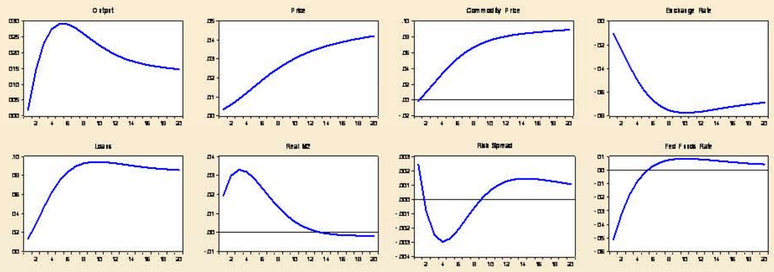
- 8 variable quarterly VAR from 1959Q3 to 2011Q1
  - Output (GDP)
  - Price (PCE)
  - Commodity prices (PPI)
  - Exchange rate (trade weighted index)
  - Loans
  - Risk spread (BAA bond yield – 10 year TB yield)
  - Real M2
  - Fed funds rate

Identification Restrictions

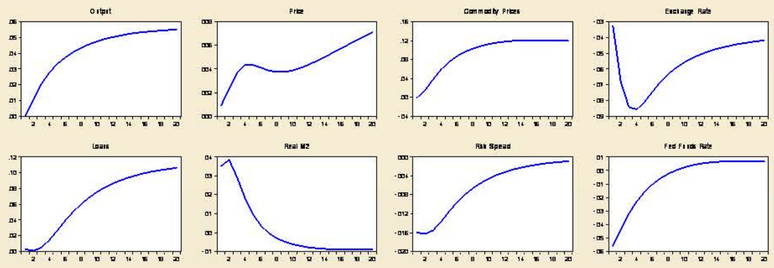
- Sign restrictions (for on impact of the shock and 2 quarters after)
  - Output and price (positive)
  - Price and real balances (positive)
  - Real balances and output (positive)
  - Real balances and interest rate (negative)
  - Interest rate and loans (negative)
  - Interest rate and exchange rate (positive)
- Normalization restrictions
  - Interest rate stays negative for 4 quarters

Results: Impulse Responses

Subsample 1 (59Q3 – 84Q1)

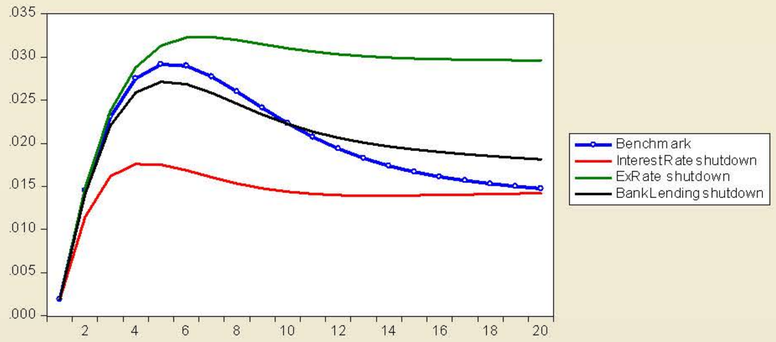


Subsample 2 (84Q4 – 11Q1)

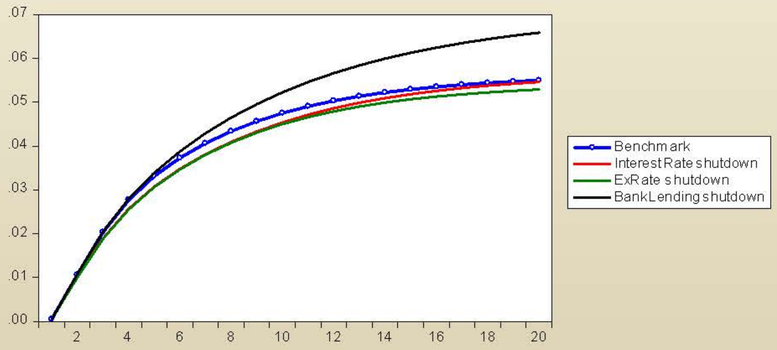


Analysis of Transmission Channels

Subsample 1 (59Q3 – 84Q1) Output IRF



Subsample 2 (84Q2 – 11Q1) Output IRF



ACKNOWLEDGEMENT

I would like to thank my sponsoring professor, Pao-Lin Tien, for providing me with the opportunity to participate in QAC SUMMER 2011. I would also like to thank Director Manolis Kaparakis for making the QAC Program possible.