Does Monetary Policy Help Least Those Who Need It Most?

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Abstract

We estimate the impact of U.S. monetary policy on the cross-sectional distribution of state economic activity for a 35-year panel. Our results indicate that the effects of policy have a significant history dependence, in that relatively slow growth regions contract more following contractionary monetary shocks. Moreover, policy is asymmetric, in that expansionary shocks have less of a beneficial impact upon relatively slow growth areas. As a result, we conclude that monetary policy on average widens the dispersion of growth rates among U.S. states, and those locations initially at the low end of the cross-sectional distribution benefit least from any given change in monetary policy.

Introduction

Complex propagation mechanism of monetary policy
- Non-linear effects of monetary policy
  - History dependence
  - Asymmetry
  - Expansionary and contractionary effects have asymmetric effects on states with relatively fast and slow growth
- Most common approaches to quantify the macroeconomic effects of monetary policy ignore the possibility of non-linearity.

Distributional effects of monetary policy
- Our approach:
  - Use state-level data; income growth as the growth variable
  - Use the local business cycle position instead of the industrial mix as a distinguishing characteristic of the states.
  - Monetary Policy instrument interacts with initial condition of each state.

Data

- The state activity variable:
  - personal income for all 50 states since 1999Q1 reported by the U.S. Bureau of Economic Analysis.
  - The personal income data is converted into real 2000 dollars by the U.S. implicit price deflator for GDP due to unavailability of price indexes for individual states.
  - The deflated personal income is divided by quarterly state population reported by the U.S. Census Bureau to produce per capita real income.
- The measure of state economic activity, \( y_t \), the annualized one-quarter growth rate of real per capita personal income.
- The preferred measure of the monetary policy instrument:
  - the effective Federal Funds rate: the final month of each quarter as the quarterly observation.
- The sample consists of a balanced panel of 6,550 observations over period 1970Q2 – 2003Q4 accounting for lags and the computation of the income growth rate.

Methodology

Empirical Model:

1) Symmetric Policy Effects

\[
y_t = \sum_{k=1}^{n} \alpha_k y_{t-k} + \sum_{k=1}^{n} \beta_k z_{t-k} + \sum_{k=1}^{n} \gamma_k y_{t-k} z_{t-k} + \epsilon_t + \mu_t + \nu_t
\]

where:
- \( y_t \): observations of the endogenous measure of economic activity for state i in time period t.
- \( \epsilon_t \): the composite error term including state fixed effects.
- \( \mu_t \): a stochastic time trend
- \( \nu_t \): idiosyncratic state-level shocks
- \( y_{t-k} \): is a parameter of interest that measures the role of the interaction of state economic activity with the monetary policy instrument in \( z_t \).
- We presume that \( z_t \) is pre-determined with respect to state-level dynamics.

To purge the regressors of endogeneity in equation (1), we subtract the cross-sectional average of the endogenous activity variable from each state observation at every point in time:

\[
y_{t-k} = y_t - \frac{1}{N} \sum_{i=1}^{N} y_{t-k_i}
\]

Transforming the other variables in equation (1) in a similar manner yields:

\[
y_{t-k} = \sum_{j=1}^{n} \alpha_j y_{t-k} + \sum_{j=1}^{n} \beta_j z_{t-k} + \sum_{j=1}^{n} \gamma_j y_{t-k} z_{t-k} + \epsilon_{t-k} + \nu_{t-k}
\]

2) Asymmetric Policy Effect

\[
y_{t-k} = \sum_{j=1}^{n} \alpha_j y_{t-k} + \sum_{j=1}^{n} \beta_j z_{t-k} + \sum_{j=1}^{n} \gamma_j (y_{t-k} z_{t-k}) + \sum_{j=1}^{n} \sum_{k=1}^{n} \gamma_{j,k} (y_{t-k} z_{t-k}) + \epsilon_{t-k} + \nu_{t-k}
\]

\[
\text{Where } z_{t-k} \text{ and } z_{t-k} \text{ are the contractionary and expansionary changes to monetary policy, respectively.}
\]

A positive/negative sign on \( y_{t-k} \) implies that contractionary policy widens/reduces the gap between relatively slow and fast growth states.

A positive/negative sign on \( y_{t-k} \) implies that expansionary policy reduces/widens the gap between relatively slow and fast growth states.

We expect \( y_{t-k} \) and \( y_{t-k} \) to be positive and negative, respectively.

Alternative Methods

Other approaches for dynamic panel data estimation:
- Random Effects Estimation:
  - Time-invariant individual fixed effects are uncorrelated with explanatory variables
  - Correct for serial correlation in the composite error term by quasi-demeaned transformation
- Fixed effects in our model are correlated with explanatory variables - LSDV or RE estimator are preferred to RE estimator
- Generalized Method of Moments:
  - Correct for fixed individual effects as well as heteroskedasticity and autocorrelation in the error term
  - Asymptotically consistent with small T, large N panel data
  - forward orthogonal deviations transformation
- Our sample has large T and large N - GMM estimator will not be consistent
  - GMM estimation commands are built in Stata 10

Preliminary Results

- Equation (2) and (3) are estimated with p=4 lags of de-meaned income growth and q=4 lags of the Funds rate (plus the contemporaneous observation).
- Equation(2)
  - Our hypothesis: a positive sum of \( y_{t-k} \), terms (p-values are in parenthesis)
  - \( \gamma_1+y_2 \Rightarrow \gamma_3 \gamma_4 = 0.06 (0.02) \gamma_1+y_2 \Rightarrow \gamma_4 = -0.02 (0.05) \)
  - \( \gamma_1+y_2 \Rightarrow \gamma_3 \gamma_4 = 0.03 (0.22) \gamma_1+y_2 \Rightarrow \gamma_4 = -0.02 (0.30) \)
- The sum of \( y_{t-k} \) supports our hypothesis with statistical significance.
- Equation(3)
  - Our hypothesis: a positive sum of \( y_{t-k} \) and a negative sum of \( y_{t-k} \)
  - \( \gamma_1+y_2 \Rightarrow \gamma_3 \gamma_4 = 0.01 (0.84) \gamma_1+y_2 \Rightarrow \gamma_4 = -0.04 (0.36) \)
  - \( \gamma_1+y_2 \Rightarrow \gamma_3 \gamma_4 = 0.04 (0.12) \gamma_1+y_2 \Rightarrow \gamma_4 = 0.01 (0.74) \)
  - \( \gamma_1+y_2 \Rightarrow \gamma_3 \gamma_4 = -0.01 (0.80) \gamma_1+y_2 \Rightarrow \gamma_4 = -0.07 (0.09) \)
  - \( \gamma_1+y_2 \Rightarrow \gamma_3 \gamma_4 = 0.00 (0.88) \gamma_1+y_2 \Rightarrow \gamma_4 = -0.03 (0.21) \)
- The signs support our hypothesis despite weak statistical significance.

Conclusion

- History dependence of effects of monetary policy
- Adverse distributional effects
  - upon relatively slow growth areas
  - Expansionary shocks have a less beneficial impact.
  - Contractionary shocks have a more severe impact.
- Monetary policy helps least those who need it most.